

APPENDIX 6

AGRICULTURAL PRODUCTION

AGRICULTURAL PRODUCTION

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AGRICULTURAL PRODUCTION

6-1. General

Thailand has an area of 514,000 sq.km in its total national land, of which a total farm holding land occupies about 36.2 percent about 18.6 million hectares (1975 - 76). Approximately 63.8 percent of the total national land (about 32.8 million hectare) is unspecified lands, most of which are presumed to be forest lands.

The agricultural population totaled 25.09 million (1977), accounting for about 59.3 percent of the total population of the country. The working population in agriculture was estimated at about 15.43 million (1977), accounting for 78 percent of the total number of employment (about 19.74 million in 1977).

The percentage of agriculture in Gross Domestic Production (GDP) was 33.8 percent, of manufacturing 21.6 percent, and of other services 44.6 percent in 1973. In 1977, that of agriculture was 28.5 percent, of manufacturing 27.1 percent, and of other services 44.6 percent, respectively. The average annual growth rate of GDP for five years 1973 through 1977 was 7.3 percent at 1972 price level while that of agriculture was 5.1 percent in the same period.

The export of five farm products of rice, maize, tapioca in powder and pellet, sugar and rubber occupied about 60 percent of the total exports, among them only rice occupying about 19 percent in 1977. On the other hand, the import of food and cereals occupied as small as about 2.5 percent of the total in 1977.

The size of farm holdings averaged 2.35 ha (14.7 rai). A major crop is paddy, which was produced by 15.3 million tons in rough rice (1.72 ton/rai), occupying about 37.6 percent of the total farm products. Fruits (15.5%), sugarcane (8.5%), cassava roots, vegetables and maize follow paddy in order (1976).

The average farm income per annum was 7,113 Baht, which is extremely low as compared with those in industrial sector (฿ 44,215), commercial sector (฿ 70,339) and service sector (฿ 32,665).

In the province of Nakhon Pathom including the Project Area, the paddy fields of 18,554 ha account for above 67.6 percent of the total farm lands of 27,603 ha. The rate of farm households to the total households in the Province is about 66 percent, and the average size of farm holdings is 3.87 ha (24.2 rai), which is higher than that of the national average (1976).

Agricultural product in the gross provincial product was found at 35.8 percent, manufacturing at 20.8 percent, and other services at 43.4 percent, respectively (1977). The share of the agricultural products in Nakhon Pathom is higher than that of the national average.

6-2. Land use

(1) Present land use

Topographically, the Project Area gently slopes from the area along the Malaiman road toward the Nakhon Chaisi river. All the irrigation/drainage canals and rivers flow down along the slope. The residential areas and the roads are provided in comparatively high-elevated dry lands. The villages, each composed of 20 to 60 households, scatter along the roads or rivers.

The Project Area include those farm lands of 14,640 ha paddy fields, 4,680 ha sugarcane fields, 1,490 ha various cropping lands and 1,340 ha fallow lands. Other area of 5,170 ha, non-arable lands, are used for residential areas and public facilities. However, the irrigable area under the project is 17,200 ha, which was estimated based on available irrigation water at present. (See Table 6-1)

In the Project Area, most of comparatively high-elevated fields along the Malaiman road are cropped with sugarcanes and low-lying fields are cropped with paddy; more paddy fields are found in the

downstream part of the Area. In the upperstream part, many fields are cropped with wet season transplanting paddy or broadcasting paddy, while in the downstream part many fields are cropped with dry season transplanting paddy. Two paddy cropping a year has been carried out in some well-irrigated fields (about 30% of the total paddy fields) in the Project Area.

Vegetables and other crops are grown in some areas along the Nakhon Chaisi river and irrigation canals with enclosure by bounds. Coconuts and other fruit-trees are sparsely planted around villages, not collectively planted. The fallow lands and marshes are found in the low-lying swampy area in the middle of the Area. A housing lot is about 1.17 rai per house and vegetables and fruit-trees are grown around the house. (See Figure 6-1).

Table 6-1 Present Land Use

| <u>Classifications</u> | <u>Acreage</u> | | <u>Percentage</u> | <u>Irrigable</u> |
|--|----------------------|-------------------------|---------------------|----------------------|
| | ha | (Rai) | (%) | |
| Paddy fields | 14,640 | (91,500) | 52.3 | 14,640 |
| Sugarcane fields | 4,680 | (29,250) | 16.7 | 1,220 |
| Vegetables & others | 1,490 | (9,313) | 5.3 | - |
| Fallow lands, Orchard etc. | 2,020 | (12,625) | 7.2 | 1,340 |
| Total of arable lands | <u>22,830</u> | <u>(142,688)</u> | <u>81.5</u> | <u>17,200</u> |
| Residential areas including schools, etc. | 2,110 | (13,187) | 7.5 | |
| Public lands (roads, canal routes) | 2,060 | (12,875) | 7.4 | |
| Others (non-arable lands, ponds, marshes) | 1,000 | (6,250) | 3.6 | |
| Total of Non-arable lands | <u>5,170</u> | <u>32,312</u> | <u>18.5</u> | |
| Grand Total | <u>28,000</u> | <u>(175,000)</u> | <u>100.0</u> | <u>17,200</u> |

The total arable lands in the Project Area are 22,830 ha, including fallow lands and orchards around the housing lots and the total cropped acreage per annum is 21,490 ha including two paddy

cropping a year and multiple cropping with vegetables and others. The land use rate, thus, becomes 120 percent.

The considerably low rate of land use would result from the following three problems, which are to be solved with this Project.

- a) There are no on-farm facilities available, which prevent the successful irrigation to the terminal fields.
- b) The combined adverse effects of ill-drainage and inflow of surplus water from the upstream areas hamper the low-lying lands from introducing the wet season paddy cropping.
- c) In the end of the wet season cropping (October, November), high water level in the Nakhon Chaisi river causes difficulty in introducing the wet season paddy cropping due to heavy inundation in the right bank of the Nakhon Chaisi river and the downstream of the other rivers. This helps largely in lowering the land use rate.

(2) Proposed land use

The consolidation of on-farm irrigation facilities for smooth distribution of water as well as drainage facilities for reducing inundation to allowable level will permit the existing fallow lands of 1,340 ha to be converted to paddy fields.

Most of the sugarcane fields, vegetable fields and orchards would not be converted to other categories in view of the present situation, although the Project plans to upgrade the existing irrigation and drainage facilities. Some of these lands, however, might be used for canal lots or roads in the right-of-way by providing on-farm facilities. Thus, the estimation on the arable lands with Project was made on the basis that these lands in the right-of-way, about 840 ha, was deducted from the total arable lands to obtain about 21,990 ha as a result. (See Table 6-2) The categorywise farm losses were obtained from the on-farm development plan.

6-3. Agricultural population and labors

The population of the Project Area was estimated at 65,500 as of early 1979, of which agricultural population was 43,600, occupying about 68 percent of the total population. The agricultural population density is thicker in the northeast in the Project Area than in the southwest. The gradual population growth in the Area was estimated at the rate of 1.80 percent per annum. The agricultural population tends to increase in number in the north of the Project Area, while decrease in the south.

The age-group composition of the agricultural population in the Project Area is illustrated in the following table.

The working age-group being taken in a range of 16 to 60, the total working population is estimated at about 25,500, averaging 3.85 per farm.

Working Population in the Project Area

| <u>Sex</u> Age | <u>Male</u> | | | | Sub-total | Total of Working Population |
|-------------------|-------------|--------|-------|--|-----------|-----------------------------------|
| | 0-15 | 16-60 | 61- | | | |
| Percentage | (16.1) | (29.0) | (3.9) | | (49.0) | |
| Actual Number | 7,140 | 12,864 | 1,730 | | 21,734 | |
| No. per farm | 1.08 | 1.94 | 0.26 | | 3.28 | |

| <u>Sex</u> Age | <u>Female</u> | | | | Sub-total | Total of Working Population |
|-------------------|---------------|--------|-------|--|-----------|-----------------------------------|
| | 0-15 | 16-60 | 61- | | | |
| Percentage | (18.1) | (28.5) | (4.4) | | (51.0) | (100.0) |
| Actual Number | 8,028 | 12,641 | 1,951 | | 22,640 | 44,354 |
| No. of farm | 1.21 | 1.91 | 0.30 | | 3.42 | 6.70 |

Data Source: (1) Age-groupwise percentage is referred to the Economic Survey by RID, 1979.

(2) The population per farm is based of 6.70 persons of the average in the Project Area.

Under the condition that the actual workable population is taken by 90 percent of the estimated one, the working days are taken twenty five (25) days for a month, and the house keeper are engaged in farming at the rate of half of the males in number, the actual working population is calculated at 19,900 in the whole Project Area, and at 3.0 per farm. The expected workable population in the target year (1995) would be about 28,390.

6-4. Land Tenure and Farm Size

(1) Land reform

The Thai government enforced the Agricultural Land Reform Act in 1975 for successful implementation of the land consolidation and increase in land productivity. The Act aims at realizing the reform in the size of land holding through government redeem of absentee owners lands and too large farmers' lands in the holding for facilitating landless farmers, small farmers or farmers' groups to purchase or borrow these lands and to acquire the cultivation right. The act prescribes that large farmers' lands should be restricted to 50 rai (8 ha) at maximum and the absentee land owners should be restricted to hold their lands less than 20 rai (3.2 ha).

A five-year plan incorporating special projects will be formulated to redeem lands for farmers on a nationwide basis. In this respect, some organization such as Land Bank may have to be set up as a responsible organization for the implementation of this policy. During the first stage, the redemption of lands will be carried out in areas where land deeds or land title certificates are already available. The Land Department will have to carry out surveys within the possible shortest time to determine the number of land holdings that should be redeemed. As for the areas where land title certificates are to be issued, the Land Department will carry out a survey on land ownership concurrently with the issuance of land title certificates to facilitate subsequent formulation of a land redemption plan.

(2) Land ownership

According to the survey by DLD of MOAC, in 1975/76, the lands owned by landlords occupy about 21.4 percent (about 5,090 ha) of the total farm lands in the Project Area. Most of these landlords (about 77 percent) live in Nakhon Pathom Province. The owner/farmers and the partial tenants possess about 7.4 percent and four (4) percent of the farm lands in the Area, respectively.

The land ownership is almost authorized by the title deeds (96%) and the rest of the ownership is guaranteed by the certificate of title for using the lands.

The relations between the land ownership and the land use in the Project Area are shown in the following table.

| | <u>No. of farms</u> | <u>Owned acreage (ha)</u> | <u>Land use</u> | |
|-----------------|---------------------|---------------------------|-----------------------|--------------------------|
| | | | <u>Own lands (ha)</u> | <u>Leased lands (ha)</u> |
| Landlords | (867) | 5,090 | - | - |
| Owner farmers | 4,448 | 16,734 | 16,734 | - |
| Partial tenants | 341 | 1,006 | 1,006 | 1,363 |
| Tenant farmers | 886 | - | - | 3,727 |
| Total | 5,675 (5,656) | 22,830 (100%) | 17,740 (77.7%) | 5,090 (22.3%) |

The average acreage of owned lands by landlords is 5.9 ha (36.7 rai) although 92 percent of the land owner possesses only less than eight (8) ha (50 rai), averaging about 3.4 ha (21.0 rai).

The average acreage of owned lands by the owner/farmers and the partial tenants is about 3.8 ha (25.3 rai) and 3.0 ha (18.4 rai), respectively. Most of them hold lands below 50 rai and slightly less than the average cropping acreage of 4.0 ha.

Distribution of the land ownership is shown in the following table and detailed in Table 6-3.

| <u>Land Size</u> (ha) | <u>No. of Landowners</u> | | <u>Acreage of lands held by owners</u> | |
|--------------------------|--------------------------|-------|--|-------|
| | (No.) | % | (ha) | % |
| Less than 8.0 | 5,177 | 91.5 | 16,111 | 70.6 |
| 8.1 - 16.0 | 387 | 6.9 | 4,554 | 19.9 |
| 16.1 - 24.0 | 73 | 1.3 | 1,370 | 6.0 |
| 24.1 - 32.0 | 9 | 0.2 | 260 | 1.1 |
| More than 32.0 | 10 | 0.2 | 535 | 2.4 |
| Total | 5,656 | 100.1 | 22,830 | 100.0 |

The landlords in this classification are defined as those who own the lands within the boundary of the villages surveyed and may live inside or outside the villages surveyed. The survey may include the case that one landlord who holds his lands in two village areas is classified by two different landlords or that the owner/farmers who lease their lands to other farmers are counted in the number of the landlords. Consequently, the average land holdings by landlords may be actually slightly larger than the figures quoted as above.

The agro-economic survey conducted by RID during this survey period revealed the complicated land tenure that the owner farmers and the partial tenant farmers lease their lands or borrow from others; for instance, about 10 percent of their lands to others. The number of the landlords and the size of their holdings were obtained districtwise in proportion to juridical area in the Project Area, although the situation is complex.

The partial-tenants are those who concurrently operate their own lands and the leased lands. The tenants are those who rent all of their operating lands.

The survey was made for these farmers who, in principle, live in the villages surveyed but may operate their farm lands either inside or outside the villages surveyed. All the farm lands they operate are counted in number of the village where they live.

Therefore, the farm lands were estimated districtwise in proportion to the number of farmers in the Project Area.

The owner/farmers are who operate their own lands and some lands of others without rental fees. Since these owner/farmers were not included in the survey, their number was obtained by deducting the numbers of partial-tenants and landless farmers from the total number of the farms, and their land holdings were estimated by deducting the acreages of lands owned by landlords and partial-tenants from the total acreage of farm lands. Table 6-3 shows the numberwise and acreagewise land ownership in the Area.

On the other hand, information obtained from layout design of the sample areas in the on-farm development scheme clarified that the low-lying flat lands in the eastern part of the Project Area include many lands owned by landlords, while in the western part include many lands owned by the owner/farmers, being used for two paddy cropping a year.

The average land holdings by the owner/farmers tend to decrease in acreage and the landless farmers are increasing in number. In taking into account the lower growth rate of the population in the Project Area, the social factor of decreasing tendency in population would result from discharging farmers to other industrial area and/or to Bangkok, the Metropolitan area.

Under the circumstances, the Project will provide an opportunity to prevent population discharge as well as to give lands to landless farmers through the land improvement scheme by the government effort.

(3) Land tenure

The number of the owner/farmers is 4,448, occupying about 78.4 percent of the total farms, the partial-tenants are 34 or 10 percent, and the tenants are 886 or 15.6 percent. More than half of the farmers have operated the lands below 3.2 ha, and there exists a

considerably wide gap of the size of operating lands among farmers, although the farmers in the Project Area holds a larger size of operating lands (4.0 ha/farm) than that of the national average (3.4 ha/farm).

As illustrated in Table 6-4 on distribution of land holdings by sizes, the partial-tenants hold operating lands as large as 7.0 ha/farm, and the owner/farmers and the tenants holds about 3.8 ha/farm and 4.2 ha/farm, which are near to the size of the Project average. The following table shows the general descriptions of the land tenure in the Project Area.

| Size (ha) | No. of Farms | | Area | |
|---------------|--------------|------------|---------------|------------|
| | No. | % | (ha) | % |
| less than 1.6 | 1,716 | 30 | 2,309 | 10 |
| 1.7 - 3.2 | 1,503 | 26 | 4,031 | 18 |
| 3.3 - 4.8 | 1,032 | 18 | 4,495 | 20 |
| 4.9 - 6.4 | 492 | 9 | 2,630 | 12 |
| 6.5 - 8.0 | 437 | 8 | 3,072 | 13 |
| More than 8.0 | 495 | 9 | 6,293 | 27 |
| Total | <u>5,675</u> | <u>100</u> | <u>22,830</u> | <u>100</u> |

6-5. Cropping Pattern and Yield

(1) Present cropping pattern and yield

i) Present cropping pattern

The present cropping pattern in the Project Area was prepared based on the zonewise cropping pattern made by RID's O & M office in Kamphaeng Saen.

Western part: Along the Malaiman road, the elevated lands are cropped mainly with sugar canes, while the low-lying lands are cropped with the wet season paddy and two season paddies a year and with some vegetables around residential lots.

Central Part: The elevated lands are cropped with sugar canes, while the low-lying lands are cropped with two season paddies a year or dry season paddy, or the wet season broadcasting paddy in some limited fields.

Southeastern Part: The area, belonging to the low-lying lands, are mostly cropped with the dry season paddy in single cropping, excepting some vegetable cropping in the enclosed fields by bounds.

In some parts of in this area the rotational cropping with paddy and sugar cane has been carried out unintentionally. Vegetables and fruit-trees are grown in the enclosed fields by bounds and not planned to be put in the rotation with paddy for several years to some.

The present cropping pattern and the cropping calendar are shown in Figure 6-2.

ii) Unit Yield and production of the crops

The unit yield of the crops was determined on the basis of the following data.

- (i) Districtwise and municipalitywise cropping acreages and yields for 1968 - 1978
RID Survey Data by Agro-economic Section in 1978
- (ii) Interview with 64 farms - By RID Agro-economic Section in March 1979,
- (iii) Random Sampling Interview:
By RID Zoneman of the Kamphaeng Saen O & M Office, 1978,
- (iv) Data prepared by the Greater Mae Klong Irrigation Project
- (v) Data prepared by the Chao Phya Irrigated Agriculture Development Project
- (vi) Data prepared by the Irrigated Agriculture Development Project on the West Bank Tract of the Greater Chao Phya

- (vii) Data prepared by the Master Plan Study of the Greater Mae Klong Irrigated Project
- (viii) Measurement by simple method for yield survey for dry season paddy, 1 - 5 July, 1979.

According to the Extension Office in the Area, the average unit yield of the paddy in the Project Area was 0.88 t/ha (140 kg/rai) in 1968 by broadcasting floating rice in single cropping. The unit yield, however, has been increasing since 1973 by introduction of transplanting paddy (dry season transplanting paddy around 1974).

The above data, however, might be collected in distortion to exemplary farms and fields at sampling made by the Extension Office and RID O & M Office. The same tendency was observed on the data collected in 1979 survey conducted by RID Agro-economic Section.

Under the present conditions of the fields surveyed, there are many fields observed at higher elevation or contrarily lower elevation due to much more undulation than expected. Some fields have suffered from thick weeds to result in poor harvest.

Consequently, to multiply the above data by the total cropping acreage may be to overestimate the production.

On the other hand, if the commanded area by irrigation canals constructed by RID occupies about 60 percent of the total paddy fields, some reduction in harvest in the drought years should be taken into account.

In due consideration on the above factors, the unit yield in the Area was decided as follows:

| | | | |
|---------------------------------|---------------|----------|--------------|
| Wet season broadcasting paddy | | 1.6 t/ha | (256 kg/Rai) |
| Wet season trans-planting paddy | RID irrigated | 2.6 | (416) |
| | Others | 2.0 | (320) |
| Dry season trans-planting paddy | RID irrigated | 2.8 | (448) |
| | Others | 2.4 | (320) |
| Sugarcane | | 45.0 | (7,200) |
| Vegetables | | 10.0 | (1,600) |
| Fruit-trees | | 5.0 | (880) |

And the present farm production is shown in Table 5-4.

(2) Future cropping pattern

The future cropping pattern in the Project Area was determined on the basis of the proposed land use by 15,180 ha of paddy fields, 4,660 ha of sugarcane fields, 1,460 ha of vegetable fields and 680 ha of orchards, and for the early growing stage of sugarcane, vegetable and fruit-trees the necessary irrigation water will be supplied. However, under the project, the irrigation water would be served to paddy area and sugarcane area of about 1,200 ha.

In future the sugarcane planting, which was carried out in May or June when the wet season starts, should be made smoothly on schedule after the third harvesting so that proper irrigation can be made for yield increase with well growth in the early stage. And in ratooning, intertillage, weeding, fertilization and irrigation should be properly practised immediately after harvesting.

The intensified cropping pattern should be introduced in future for vegetable growing with such crops to meet the local farming condition and demand as sweet-potatoes, melons and cucumbers, tomatoes, chillis and other local vegetables which have high productivity, and it is proposed to provide eventually the trickle irrigation method for vegetable cropping in the Area.

For paddy cropping, the improved strains like RD-7 and -11 should be introduced as many as possible to establish the paddy double cropping.

For the chronic inundation areas, proper facilities should be provided so as to reduce the water to the extent below allowable level to paddy cropping, and the deep-water resistant strains should be introduced to those areas where the flood protection facilities are insufficiently provided, in taking into account the flood season and flooding water level. The following three types of cropping pattern for increasing in unit yield and cropping intensity.

Type I: External area of the Klong Tha Sarn embankment in the northern part of the Project Area, low-lying paddy fields below EL 2.0 m, 540 ha.

The river water increase by checking-up for irrigating the Mae Klong Project Stage II Area has resulted in increasing the field water level by EL 2.5 m in so around the end of August and September. Therefore, the deep-water resistant strains (photo sensitive) like BNK 6986-147-2 or RD-5 should be introduced to this area.

Type II: External area of embankment in the southeastern part of the Project Area, paddy fields below EL 1.5 m, 2,020 ha.

This area has been inundated with increase in water level of the Nakhon Chaisi river and standing of water in the area. The water level in the area has increased the end of October through the beginning of December. Therefore, the cropping pattern should be established to finish harvesting of the wet season paddy by the time when the water level increases with advancing the paddy cropping. In the case that delay in paddy cropping is unavailable, the deep-water resistant strains like BNK 6986-66-2 (non-photo sensitive) are commendable.

Type III: Central part of the Project Area, the paddy fields free from floodings, 12,620 ha.

This area occupies most part of the Project Area and land consolidation by type B or C will be executed together with construction of irrigation and drainage facilities. Therefore, the improved strains should be introduced to establish the paddy double cropping.

Some low-lying fields (below EL 1.5 m), however, may retain the standing water by rainfall in the area, and the deep-water resistant strains should be introduced to such low-lying fields.

The cropping pattern summarizing the above is shown in Figure 6-3.

(3) Target of yield

A new farm management is proposed in taking into consideration various conditions on land use scheme, irrigation/drainage scheme, land consolidation, and particularly field condition.

It is unquestionable that the present farm management in the Project Area is less advanced than in the North of the Country. This has resulted from that the field conditions have been unfavorable to applying new farm management, and consolidation of these field conditions would enable the farmers to introduce new farming techniques with proper training and guidance. Thus, the farm management in the Project Area would reach the advanced level which has been maintained in the other areas of the country.

In Thailand, the farmers are wise enough to learn from others. Therefore, if any farmers have a good success in new farming practices with fertilizers and chemicals, most of others will positively follow up them to enjoy good harvest. Under the circumstances, it would be the first thing to provide the favorable field conditions to meet the requirements of new farming techniques. This means that the land consolidation is essentially required to grade up the present farm management in the Project Area.

The target of unit yield is decided depending upon the respective field conditions.

i) Paddy

Type 1 Fields: 540 ha

Wet season - Water resistant variety (RD-5 or BNK 6986-147-2);
3.3 t/ha

Dry season - RD-7 or -11; 4.3 t/ha

The fields extend in strip at external areas along the flood prevention embankment/road of the Klong Tha Sarn, and suffer the flood damage by the Klong Tha Sarn.

Irrigation water is introduced from the Klong Tha Sarn both in the wet and the dry seasons. No land consolidation nor land levelling will be carried out in the fields. Pumping irrigation may be required in some fields in drought years.

Under the conditions, the target of unit yield was established at 4.3 t/ha for dry season transplanting paddy.

In September and October, the water level of the Klong Tha Sarn is raised up to EL 2.5 m by checking-up and intrusion of water from the Mae Klong river for irrigating the fields under the Mae Klong Irrigation Project Stage II. Hence, the fields located below EL 2.5 m are flooded and the crops are damaged by inundation in low-lying fields. The deep-water resistant strains, RD-5 or BNK 6986-147-2 should be adopted for the wet season cropping to minimize the damages.

In this case, the estimated target is set up by 3.3 t/ha.

Type 2 Field: 2,050 ha

Wet season - BNK 6986-66-2, if necessary; 3.3 t/ha

Dry season - RD-7: 4.3 t/ha

The fields extend in strip in the external areas along the flood embankment of the Nakhon Chaisi river and the Klong Tha Sarn. The fields are damaged in the wet season by floods from the Nakhon Chaisi. And a plan should be made for paddy cropping to be free from flood, but some fields below EL 1.5 will be cropped with the deep-water resistant strains, if necessary. The water sources of irrigation for the fields will be the Nakhon Chaisi river for the time being. The Type A land consolidation will be carried out in the fields.

Pumping irrigation may be required in some fields in drought years. The target of unit yield was decided in due consideration of the above factors.

Type 3 Field: 12,620 ha

Wet season - Improved varieties RD-7, -11 : 4.2 t/ha

Dry season - Improved varieties RD-7, -11 : 4.6 t/ha

The fields of this type are free from floodings by rivers and irrigated mainly under the irrigation system which the RID provided, excepting about 690 ha which are irrigated by the water from the Nakhon Chaisi river because of short supply by RID irrigation system during the dry season.

For these fields, type-C (1,550 ha) or -B (11,070 ha) land consolidation will be implemented, and the respective target unit yields were estimated as followings in referring to types of land consolidation, irrigation/drainage condition, etc.

| <u>Field Type</u> | <u>Target unit yield</u> | |
|-------------------|--------------------------|-----------------------|
| | <u>For wet season</u> | <u>For dry season</u> |
| B | 4.1 t/ha | 4.5 t/ha |
| B | 4.8 t/ha | 5.3 t/ha |

ii) Target unit yield of sugarcane

The partial irrigation has been carried out from time to time for the sugarcane fields. The type A land consolidation will be implemented for those fields where the gravity or pumping irrigation is available (1,200 ha). And these fields are expected to increase the yield. Furthermore, possibly early plantation is scheduled to prolong the growing period, and for ratooning, intertilling and other preparation after harvesting should be carried out for increasing pre-sprouting effects.

As a result of taking these measures, about 78 percent yield increase (from 45 t/ha to 80 t/ha) was estimated, including 30 percent by 3-month prolongation of growing period, 30 percent by irrigation and 18 percent by land consolidation, etc.

In other fields, the yield increase was estimated at about 33 percent by target year, including annual increase by three (3) percent; (from 45 t/ha to 60 t/ha).

The above present unit yield of 45 t/ha seems to be unreasonably applied to 1,220 ha of the inadequate irrigated fields; however, no further data were available to adjust the same figure.

iii) The yield increase in vegetable was not estimated so much, excepting for natural increase. In the future, however, when more irrigation water is secured from the Mae Klong river, the yield increased should be estimated based on the improved irrigation method.

All of the above are summarized in Table 6-6.

6-6. Farm Management

(1) Types of farm management

The following six (6) types of farm management were found in the Project Area and the details are shown below as a result of Agro-economic Survey conducted by RID in 1979,

| | |
|-------------------------------|-------|
| Only Paddy | 65.6% |
| Paddy + Sugarcane | 17.2% |
| Paddy + Sugarcane + others | 4.7% |
| Paddy + Vegetables | 6.3% |
| Paddy + Fruit-trees + others | 3.1% |
| Animal husbandry + Vegetables | 3.1% |

The farms which crop paddy occupy about 96.9 percent of the total, including about 10 percent of farms which crop only the wet season paddy, about 40 percent of farms which crop only the dry season paddy, and the rest 50 percent of farms which crop both of the wet and the dry season paddy (this does not always mean the double cropping).

(2) Poultry and livestock

Swine, ducks and chickens are the major animals in breeding, while buffalos have recently been decreasing in number. Most of the farms (about 90%) have been breeding animals in one kind or more (Table 6-7). The kinds and numbers of animals and poultry bred in the Project Area are tabulated as follows:

| <u>Animals & Poultry</u> | <u>Number</u> (head) | <u>Average/farm</u> (head) |
|------------------------------|-------------------------|-------------------------------|
| Swine (for pork) | 34,100 | 5.15 |
| Zebu (for beef) | 5,150 | 0.77 |
| Buffalos (for drafting) | 1,120 | 0.17 |
| Ducks (for egg and meat) | 142,500 | 21.54 |
| Chickens (for egg and meat) | 284,100 | 42.92 |

Sources: Statistics by Provincial office (1977) and adjusted by the survey results for 64 farms.

(3) Labors availability and farm mechanization

i) Present labor requirements

The paddy cultivation requires labors of about 80 man-day per hectare on an average, although slightly different from the wet season and the dry season cropping. And the broadcasting method requires only about a half of the above.

The sugar cane cultivation by ratooning requires labors about 70 man-day per hectare and that by planting 110 man-day per hectare.

The vegetable cultivation with enclosure by bounds, which need for much labor, requires labors of 500 man-day per hectare. The vegetable cultivation without enclosures requires only 200 man-day per hectare.

The labors required for animal husbandry are estimated at about 2,500 man-day in the whole Project Area.

The study on the labor requirements revealed that the total labor requirements are 3.6 million/year and the peak labor requirements are 17,000 man-day. As a result, the labor shortage will not take place except the busiest season.

The farms in the Project Area have employed about 10 percent for transplanting and harvesting, in the wet season cropping and about 16 percent in the dry season cropping. In the sugarcane cropping, about 70 percent of the labors has been employed for planting and harvesting.

ii) Present status of farm mechanization

Most popular farming machines used for paddy cropping in the Project Area are small-size power tillers (6-10 Hp) made in Thailand^{1/} and more than numbers necessity requires have been in operation^{2/}.

^{1/} Most of machines mount the Japanese-made engines.

^{2/} According to survey for 1,061 farms.

Some large-size tractors (65Hp class) have become popular in operation on the rental basis for broadcasting cropping, and most of tilling and land preparation have been carried out by these machines, whereas the draft animal works have been drastically decreased.

Transplanting and harvesting, however, have been still made by man-power, not by power planters or harvesters.

Threshing has been made by animal treading or machines. Winnowing has been also made by manual winnow or power winnower. Drying has been made by sun-dry, and the dryers has been rarely found in the Project Area.

Tillage for sugarcane cropping has been made by rental large-size machines. Planting and harvesting of sugarcanes have been mostly made by man-power as well as binding the harvests. Harvested sugarcanes are hauled to processing plant by trucks owned by factories.

Ridges in the upland fields have been made by man-power (with spare), and only a very few power tillers have been used for the purpose.

The kinds and necessary costs for the farming implements which the farms in the Project Area provide are listed in Table 6-8.

iii) Future labors and mechanization

Expected labors available

In taking the target year for labors in the Project Area by 1990 at full project development, the labors available will be about 28,390 for 7,410 farms (2.97/farm), and the average operating lands will be about 3.0 ha per farm.

Future labor requirements

The labor requirements for the proposed cropping pattern was estimated at about 2,595,000 man-day per year, 1.66 times as many as the present.

The busiest season for farming works occurs in June/ July when transplanting of the wet season paddy and harvesting of dry season paddy coincide each other.

The required machine power will be 46,300 units/day by 6-10 Hp power tillers, which is equivalent to 1.67 times as many as the present. These machine powers would be mobilized for preparatory works of the dry season paddy cropping.

Supply of farm labors and mechanization

The suppliable labors will be short with the required labors to cover the busiest season (July), however, the shortage may be supplied by employing the labors from non-farm households, not requiring machine powers.

The power-tillers will be short in number by 900 units for the requirements at the busiest season. The increase rate in number of power-tillers is expected to be about six (6) percent, though 10 percent at present, to exceed the required number of 32,800 units by 1990. These figures suggest that no specific scheme will be needed for introduction of machine power in this line. Particularly, draft animal powers should be more useful for saving energy under the critical situation of petroleum supply.

If 7,400 farms can keep one buffalo each, the animal powers available will be 4,400 heads which was computed by multiplying 7,400 by availability ratio of 60 percent. These buffalos (4,400 heads) can provide the labor powers equivalent to 1,500 power-tillers. Thus, about 25 percent of power-tillers (600 units would be reduced in number.

Recently, the farm mechanization in the Project Area has been remarkably advanced. The survey conducted for 1,061 farms (16% of the total farms) by RID zoneman revealed as follows;

| | | | |
|---------------------|----------|-----------------|-------------------|
| Large-size tractors | 13 units | Power-tillers | 381 units |
| | (1.2%) | | (35.9%) |
| | | Power-winnowers | 300 units (28.2%) |
| | | Autobicycle | 469 units (44.2%) |

On the basis of the above figures, the total numbers of the machines held by all the farms (6,620 farms as of early 1979) in the Project Area were estimated as below, and the actually required numbers are shown in the parentheses.

| | <u>Large-size Tractors</u> | <u>Power-tillers</u> | <u>Power-Winnowers</u> | <u>Autobicycle</u> |
|-------------------|----------------------------|----------------------|------------------------|--------------------|
| Numbers | 79 | 2,378 | 1,867 | 2,926 |
| Necessary Numbers | (113) | (2,486) | (1,830) | |
| Coverage/ Machine | 60ha | 6ha | 8ha | 2.26/farm |

Shortage in number of the large-size tractors may be filled with those rented from the neighboring villages, and power-tillers, etc. are generally sufficient in numbers.

(4) Agricultural Inputs

General

i) Seeds

Paddy: The seeds of the local varieties have mostly been self-supplied by farms, while those of the improved varieties have been supplied through the respective extension offices.

Three or four consecutive croppings with the same variety cause degeneration of the said variety because of mixing with different varieties, degrading the properties of the variety and natural crossing. The seed renewal is inevitably required every two or three years. The extension offices are trying to make seed renewal at every three cropping under the cooperation with the Rice Experimental Station.

According to Agro-economic Survey by RID in 1979, the average amount of seeds required is 10 kg/rai (62.5 kg/ha) for transplanting paddy and 20 kg/rai (125 kg/ha) for broadcasting paddy.

Sugar cane: The sugar cane growing takes about 10 to 12 months (planting or ratooning in April and harvesting in February in the following year, or ratooning in January and harvesting in February in the following year). For planting, it is recommendable to grow a variety taking 12 - 15 months in growing, and well-grown young plants in the nursery beds should be planted in the fields. The necessary young plants for planting will be 0.3 t/rai at least and 1.0 ton/rai at maximum, which are equal to 1.8 t/ha - 6.25 t/ha.

Vegetables: The seeds of sweet-potatoes, cucumbers, tomatoes and chinese cabbages, which are commonly found in the Project Area, are purchased from the extension office, nearby markets or shops.

Seed potatoes: The young plants of potatoes are self-supplied by farms in growing plants from seed potatoes planted in the nursery beds of the respective farms. The necessary amount of seed potatoes is 62 kg/rai or 40 kg/ha.

ii) Amount of fertilizers applied

In Thailand, compound fertilizers are commonly used, while single element manures are rarely used. The paddy cropping in the country, which originated with the wet season floating rice, had used no fertilizers. Introduction of new varieties (RD strains),

however, has required the fertilization in the dry season cropping and many efforts of the extension offices have permitted fertilization diffused to farmers. Particularly, the fertilization remarkably affects the paddy plants, in the dry season cropping, although not so much in the wet season cropping. This has been proven in the survey for 64 farms in the current study.

For sugarcane fields, fertilization has been carried out by every farm concerned because the sugarcane factories give the fertilizers to farms in credit.

All of the farmers have fertilized their vegetable fields with enclosures by bounds which give favourable effects to preventing water infiltration and to increasing efficacy of the fertilizers. Furthermore, since no fertilization can not produce any marketable vegetable, farmers never fail to apply fertilizers to their vegetable fields.

Most of the farmers buy the fertilizers through the merchants, excepting for the members of the agricultural cooperatives who can buy through the organization.

Fertilization should be properly carried out in taking into account the farming method and effects of fertilizers, although presently in top dressing only in most cases.

Reduction of organic matters to the soils should be carefully made in future for introduction of double cropping, multiple cropping or crop diversification, although needed no consideration in the old cropping method of single cropping in the wet season and high level cutting of the paddy plants in harvesting.

Potassium would be little required for paddy cropping because the water can supply much of it in natural state. For upland field cropping, well balanced fertilization is necessary with potassium, phosphate and nitrogen.

iii) Agri-chemicals

According to the results of survey on 64 farms, the insecticides are used by 49 farms (76.6%), the herbicides by 32 farms (50%) and the pesticides by two (2) farms (3%). Such chemical application has been carried out in almost every month in a year. In the tropical zones, the pest control is one of the important measures in the improvement of the farming practices because of severe occurrences of pests, insects and weeds are expected therein. Therefore, the cost of the pest control may exceed that of fertilization.

The chemicals application will be carried out for 40 to 73 per cent of cropping acreages by 64 farmers.

These farmers do not know the brand names of the chemicals they apply but know their use. The extension offices concerned have given the guidance on how to use the chemicals.

The survey by the provincial extension office and cooperative revealed the kinds, names of the chemicals the farmers have applied in the Area.

| | | |
|--------------|--------------------------------------|---|
| Insecticides | Sevin-85 (258 page) [Paddy] | Malathion Emulsion [Paddy] [Vegetables] |
| | NAC Hydration or Hydration | |
| | Folidon E605 (Hydration [Chilli]) | Lannat } Dimeton } [Water-melon] Ditain } |
| Pesticides | Kitasin [Paddy] (Blast) | Culatain [Sweet potato] |
| | Sukumin | Fuladan Insecticide/pesticide |
| Rodenticides | Fratol | |
| Herbicides | Maschet granule | |
| | Heddroan | |

iv) Proposed farm management

The Project would implement the land consolidation in either type of A, B or C in the whole area, construct irrigation/drainage facilities with rearrangement of farm lands, and provide the new criteria of the farming practices. According these programs, the target yield and necessary amount of inputs could be determined.

Seeds supply: Paddy seeds would be supplied after the new cropping pattern would established in every irrigation block under new irrigation organization and the cropping acreages by varieties would be decided. The Seed Center, which will be provided by the government, would supply the seeds in the amount to meet the above requirements under the close cooperation of the extension offices concerned.

The sugarcane seeds would be supplied by certain specialized farmers in raising well-grown seedlings because the yield increase depends upon securing the well-grown seedling with longer maturing period.

The vegetable seeds, which are new commonly purchased from the seed dealers, is recommended to be purchased from the cooperatives with guarantee in quality.

Fertilizers: Most of the fertilizers have been supplied by merchants, except for some cooperative members who have bought through their cooperatives. It is recommended, however, that all of the farmers, who would be cooperative members, should purchase the fertilizers through cooperatives.

The irrigation/drainage control would be ensured with proper facilities provided in the Project; thus, the necessary amount of fertilizers would be determined based on the criteria of fertilization under the planned paddy cropping.

The target paddy yield will require increasing fertilization by more than 150 percent of the current input amount.

In the Project Area, about 400 ha of low-laying paddy fields were found with Ayutthaya and Sena Series, which will be turned out to show strong acidity - the hazardous factor for paddy cropping, when dried up by drainage improvement. Under the situation, if these paddy fields would remain in wet conditions, no application of lime materials would be needed for soil improvement.

If, however, the said fields are converted to well-drained fields under the land consolidation scheme, liming neutralization of the soils will be necessary as recommended in Appendix 2.

Chemicals:

The planned paddy requires the planned pest controls. The irrigation/drainage control by proper facilities would prevent the input chemicals from giving adverse effects to the other areas. And the collective pest control should be carried out under the guidance of the Extension staff.

Since many agro-chemicals are toxic, a proper countermeasure should be established to protect the inland fisheries from the harms.

The preventive rodent control should be made after thorough study on the fact of the rodent harms in the wet season.

It is recommended that all of these input materials should be supplied through the cooperatives. This cooperative business would benefit both farmers and cooperatives, particularly, the agro-chemical business would bring about much more benefit than those by other business like fertilizers.

Mechanization in transplanting works

The estimation of labor requirements for the proposed cropping pattern with improved farming practices clarified that the necessary labors for transplanting works (including preparation) could be sufficiently supplied with man-power available in the Project Area. Thereby, a plan for introduction of transplanting machines (Planters) is not needed at present stage.

Mechanization in harvesting works

Since no power shortage is expected in this field, there is no need to make a plan for mechanization in harvesting works. It is, however, proposed that a model farm mechanized by power binder, power thresher, small-size combine and dryer should be established as a countermeasure to be taken for future paddy double cropping because in the proposed cropping pattern only a short interval exist between the dry season and the wet season cropping and this may cause troubles with harvesting for the dry season cropping by floodings, if there is any delay in the wet season cropping.

(5) Harvesting, drying and storage

Dry season paddy harvesting - Type 1: 2 months for May & June
Type 2: " June & July
Type 3: " "

June and July fall under the early wet season, but the sun-dry of the harvests will be available because not so much rainfall is expected.

Wet season paddy harvesting - Type 1: End November and December
40 days
Type 2: End August to early October
2 months
Type 3: November and December 2 month

The harvesting may not be troubled in November and December when the dry season starts (Type 1 & 3), but in Type 2, the harvesting has to be carried out in the middle of the wet season, August through early October. Under the situation, a special treatment with care should be made for drying the harvests in the wet season.

In terms of labor distribution, there will be no need for mechanization in harvesting works, but in the above Type 2, it is recommendable to introduce a power thresher and a dryer operated by husk fuel in trial for smooth processing in a very limited time of 45 days or 30 days, at the shortest, between the dry season paddy harvest and the wet season paddy transplanting.

Introduction of binders and small-size combines should be carefully studied in taking into account the field conditions in the wet season.

In Thailand, since there are few long consecutive rainy days the sunshine of the harvests may be possibly available. Therefore, introduction of the dryer should be considered with prudence to meet the situation. A development of husk fuel dryer (flat type) will be very useful under the critical situation of petroleum supply.

For paddy storage, the harvested paddy is currently stored in the respective farm houses in the spaces enclosed by wooden blocks. In future when the paddy production reaches 2.75 times as much as at present, the provincial cooperatives should be provide the warehouses for the paddy collected.

Sugar cane harvesting and transport

At present, all works of collecting and transporting the harvested sugarcane are planned and carried out by sugar factories and quartermen, who decide the costs of sugarcane and their transportation. However, the strengthened cooperative take initiative for deciding these work schedule as well as costs of the works in future.

Vegetables

The harvested vegetables are sold to wholesalers or to the markets near Bangkok. It is also desirable to establish the collective system for their collection and forward under the control of the cooperatives.

Figure 6-1. Land Use Map

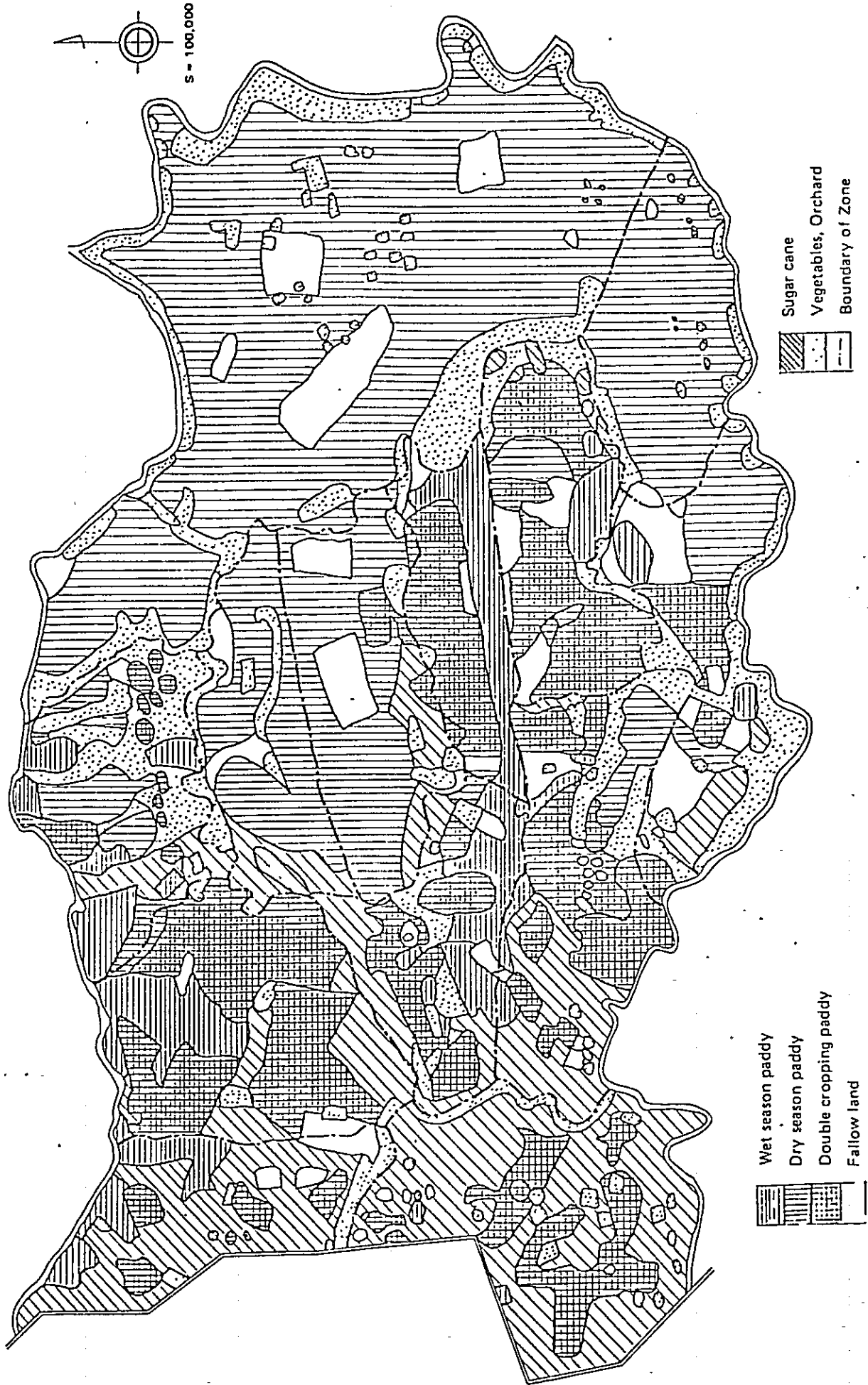


Table 6-2 Proposed Land Use

| <u>Type of Land</u> | <u>Total</u> | | <u>Irrigable</u> |
|-------------------------------|---------------------|------------|---------------------|
| | <u>Area</u> (ha) | <u>%</u> | <u>Area</u> (ha) |
| Paddy | 15,180 | 54.2 | 15,180 |
| Sugar cane | 4,660 | 16.6 | 1,200 |
| Vegitable & others | 1,470 | 5.3 | - |
| Orchard | <u>680</u> | <u>2.4</u> | <u>-</u> |
| Sub-total for Arable Land | 21,990 | 78.5 | 16,380 |
| Homestead | 2,110 | 7.5 | |
| Public Land | 3,810 | 13.7 | 820 |
| Others | <u>90</u> | <u>0.3</u> | <u>-</u> |
| Sub-total for Non-arable Land | 6,010 | 21.5 | 820 |
| Total | <u>28,000</u> | <u>100</u> | <u>17,200</u> |

Table 6-3. Land Ownership Distribution

| Size (rai) | Landlord | | Owner-operator | | Partial-Tenant | | Total | | | | | | | | | |
|--------------------|----------|--------|----------------|--------|----------------|--------|--------|-------|-------|-------|-------|-------|-------|--------|--------|-----|
| | Nos. | % | Nos. | % | Nos. | % | Nos. | % | | | | | | | | |
| less than 50 | 709 | 82 | 47 | 4,127 | 98 | 12,721 | 76 | 341 | 100 | 1,006 | 100 | 5,177 | 92 | 16,111 | 71 | |
| 51-100 | 112 | 13 | 1,351 | 26 | 275 | 3,203 | 19 | - | - | - | - | 387 | 7 | 4,554 | 20 | |
| 101-150 | 27 | 3 | 560 | 11 | 46 | 810 | 5 | - | - | - | - | 73 | 1 | 1,370 | 6 | |
| 151-200 | 9 | 1 | 260 | 5 | - | - | - | - | - | - | - | 9 | 0 | 260 | 1 | |
| more than 200 | 10 | 1 | 535 | 11 | - | - | - | - | - | - | - | 10 | 0 | 535 | 2 | |
| Total | 867 | 100 | 5,090 | 100 | 4,448 | 100 | 16,734 | 100 | 341 | 100 | 1,006 | 100 | 5,656 | 100 | 22,830 | 100 |
| (%) | (15.4) | (22.3) | (78.6) | (73.3) | (6.0) | (4.4) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | |
| Average (ha/owner) | | (5.87) | | (3.76) | | (2.95) | | | | | | | | | (4.04) | |

Note: i) Each figure were derived from the surveyed data of Agricultural Land Tenure, Nakhon Pathom 1975/76 by DLD,MOAC.

ii) Figures for owner-operate were estimated by proportional method by using numbers and area operated by both partial tenants and pure tenants, for each district.

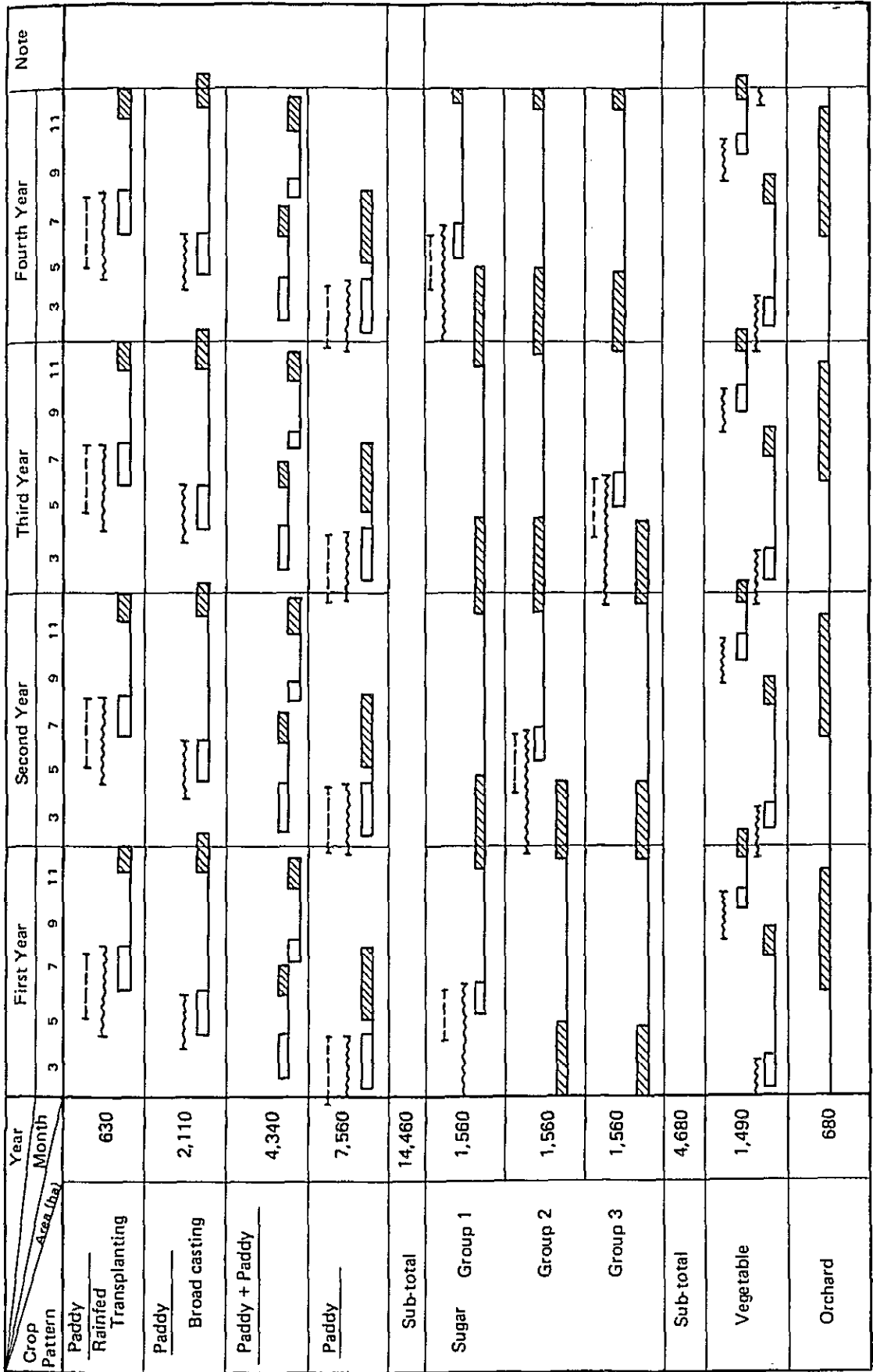
Table 6-4. Land Tenure Distribution

| Size (ha) | Owner Operator | | | Partial-Tenant | | | Tenant | | | Total | | | | | |
|----------------------|-----------------|-----|--------------|-----------------|-------|--------------|-----------------|-----|--------------|-----------------|--------|--------------|-----|--------|-----|
| | Nos. (farms) | % | Area (ha) | Nos. (farms) | % | Area (ha) | Nos. (farms) | % | Area (ha) | Nos. (farms) | % | Area (ha) | | | |
| less than | | | | | | | | | | | | | | | |
| 1.6 | 1,446 | 33 | 1,991 | 12 | 19 | 6 | 25 | 1 | 251 | 28 | 8 | 1,716 | 30 | 2,309 | 10 |
| 1.7-3.2 | 1,220 | 27 | 3,306 | 20 | 70 | 20 | 169 | 7 | 213 | 24 | 556 | 1,503 | 26 | 4,031 | 18 |
| 3.3-4.8 | 798 | 18 | 3,495 | 21 | 69 | 20 | 292 | 12 | 165 | 19 | 708 | 1,032 | 18 | 4,495 | 20 |
| 4.9-6.4 | 355 | 8 | 1,826 | 11 | 54 | 16 | 305 | 13 | 83 | 9 | 499 | 492 | 9 | 2,630 | 12 |
| 6.5-8.0 | 308 | 7 | 2,103 | 12 | 42 | 12 | 302 | 13 | 87 | 10 | 667 | 437 | 8 | 3,072 | 13 |
| more than | | | | | | | | | | | | | | | |
| 8.0 | 321 | 7 | 4,013 | 24 | 87 | 26 | 1,276 | 54 | 87 | 10 | 1,004 | 495 | 9 | 6,293 | 27 |
| Total | 4,448 | 100 | 16,734 | 100 | 341 | 100 | 2,369 | 100 | 886 | 100 | 3,727 | 5,675 | 100 | 22,830 | 100 |
| (%) | (78.4) | | (73.3) | | (6.0) | | (10.4) | | (15.6) | | (16.3) | (100) | | (100) | |
| Average (ha/farm) | | | (3.76) | | | | (6.95) | | | | (4.21) | | | (4.02) | |

Note: i) Each figure were derived from the survey data of Agricultural Land Tenure, Nakhon Pathom Province, 1975/76 by PLD, MOAC.

ii) Distributions by size for owner operate were estimated by the proportional method to numbers and area operated by both partial-tenants and pure tenants for each district.

Figure 5-2. Present Cropping Pattern



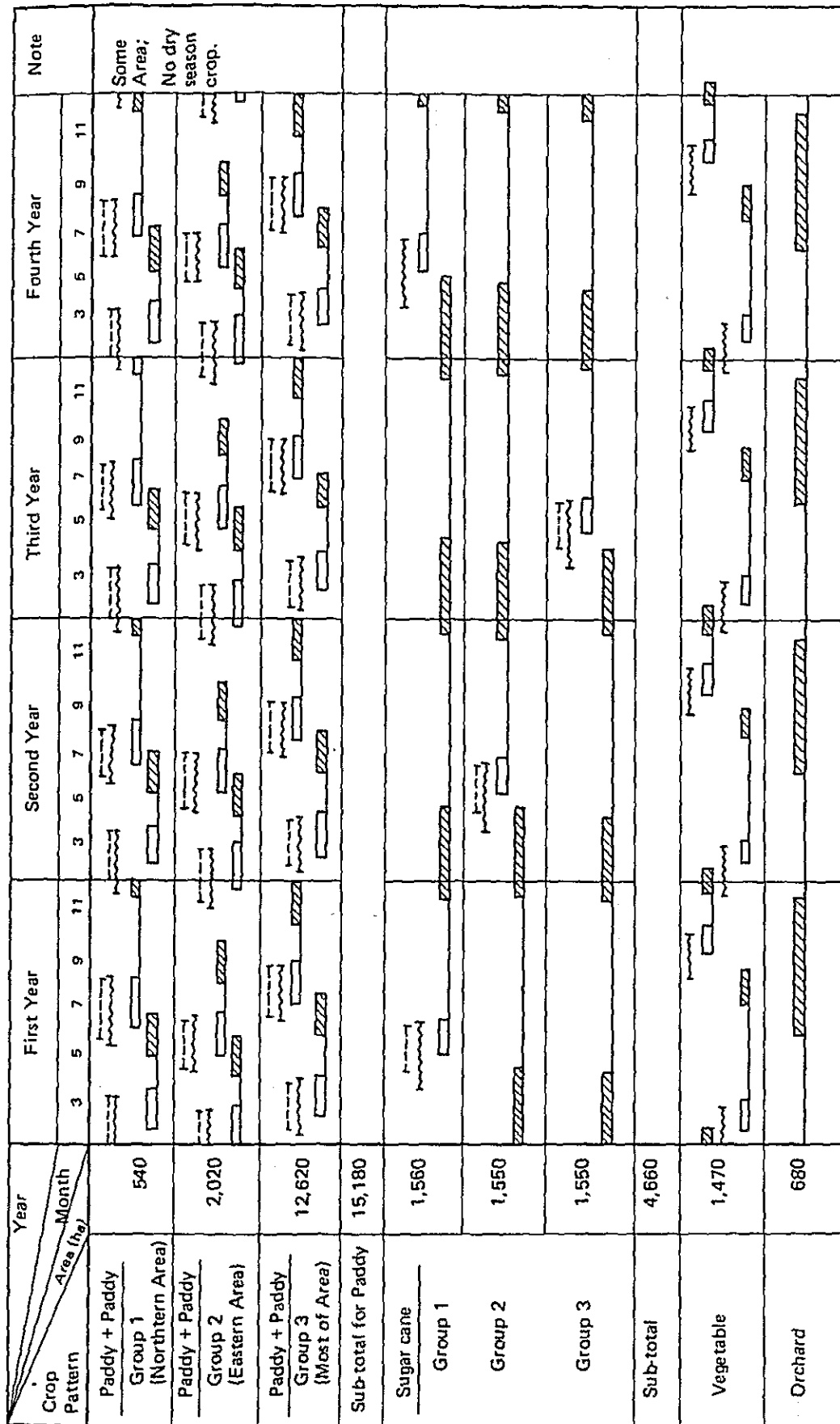
3-5 Land preparation
 6-11 Nursery bed
 12-11 Transplanting - Harvesting

Table 6-5 Present Agricultural Yield and Production

| | <u>Area</u> (ha) | <u>Yield</u> (ton/ha) | <u>Production</u> (ton) |
|---|---------------------|--------------------------|----------------------------|
| <u>Paddy</u> | | | |
| <u>Wet Season</u> | | | |
| Rainfed Broadcasting | 2,110 | 1.60 | 3,376 |
| Irrigated A ^{a/} Transplanting | 839 | 2.00 | 1,678 |
| Irrigated B Transplanting | <u>4,131</u> | <u>2.60</u> | <u>10,740</u> |
| Sub-total (Average) | 7,080 | (2.23) | 15,794 |
| <u>Dry Season</u> | | | |
| Irrigated A Transplanting | 4,761 | 2.40 | 11,426 |
| Irrigated B Transplanting | <u>7,139</u> | <u>2.80</u> | <u>19,989</u> |
| Sub-total (Average) | <u>11,900</u> | <u>(2.64)</u> | <u>31,415</u> |
| Total for Paddy (Average) | 18,980 | (2.64) | 47,209 |
| <u>Sugar cane (Rainfed)</u> | 1,220 | 45.00 | |

Note: a/ A: Irrigated with poor facilities
 B: Irrigated with adequate facilities

Figure 6-3. Proposed Cropping Pattern



Nursery bed
 Land preparation
 Transplanting (Growing period)
 Harvesting

Table 6-6. Expected Agricultural Yield and Production in Future with and without Project

| Crop | Area | | Yield | | Production | |
|---------------------|------------------|--------|----------------------|--------|-------------------|---------|
| | w/o | w/ | w/o | w/ | w/o | w/ |
| | ----- (ha) ----- | | ----- (ton/ha) ----- | | ----- (ton) ----- | |
| <u>Paddy</u> | | | | | | |
| <u>Wet Season</u> | | | | | | |
| Rainfed | 2,110 | - | 2.00 | - | 4,220 | - |
| Irrigated A | 839 | 2,250 | 2.30 | 3.30 | 1,930 | 7,425 |
| Irrigated B | 4,131 | 12,620 | 3.20 | 4.20 | 13,219 | 53,009 |
| Sub-total (Average) | 7,080 | 14,870 | (2.74) | (4.11) | 19,369 | 60,434 |
| <u>Dry Season</u> | | | | | | |
| Irrigated A | 4,761 | 2,560 | 2.80 | 4.30 | 13,331 | 11,008 |
| Irrigated B | 7,139 | 11,520 | 3.40 | 4.60 | 24,273 | 52,992 |
| Sub-total (Average) | 11,900 | 14,080 | (3.16) | (4.55) | 37,604 | 64,000 |
| Total (Average) | 18,980 | 28,950 | 3.00 | 4.33 | 56,973 | 124,434 |
| <u>Sugarcane</u> | | | | | | |
| Irrigated | 1,220 | 1,200 | 60 | 80 | 73,200 | 96,000 |
| Grand Total | 20,200 | 29,690 | | | | |

Notes : Irrigated land would be planted with transplanting Paddy

A = Irrigated thru. extensive facilities

B = Irrigated thru. intensive facilities

w/o = without Project w = with Project

Table 6-7 Animals and Poultry by Each Amphoe (1977)

| <u>Amphoe</u> | <u>Nos. of farms (farms)</u> | <u>Sntne (head)</u> | <u>Beef cattls (head)</u> | <u>Buffalo (head)</u> | <u>Duck (Nos.)</u> | <u>Fowl (Nos.)</u> |
|----------------|------------------------------|---------------------|---------------------------|-----------------------|--------------------|--------------------|
| Kamphaeng Saen | 868 | 4,640 | 581 | 180 | 9,785 | 19,499 |
| Nakhon Phatom | 934 | 7,940 | 787 | 188 | 21,985 | 43,811 |
| Don Jum | 2,862 | 14,425 | 3,239 | 387 | 67,637 | 134,789 |
| Bang Len | 990 | 2,747 | 356 | 88 | 19,768 | 39,386 |
| Nakhon Chaisi | 966 | 4,352 | 144 | 277 | 23,400 | 46,631 |
| Total | <u>6,620</u> | <u>34,104</u> | <u>5,107</u> | <u>1,120</u> | <u>142,575</u> | <u>284,116</u> |

Table 6-8 Inventory of Agricultural Machinery (per ha)

| <u>Name of Machinery</u> | <u>Machinery per/farms</u> | <u>Holding per/ha</u> | <u>Unit Price</u> | <u>Price/ha</u> | <u>Life time year</u> | <u>Annual depreciation cost</u> |
|--------------------------|----------------------------|-----------------------|-------------------|-----------------|-----------------------|---------------------------------|
| | | | ₹ | ₹ | | ₹ |
| Tractor (65 PS) | 0.012 | 0.0036 | 400,000 | 1,440. | 6 | 240 (14 hr) |
| Tiller 6-10 PS | 0.359 | 0.108 | 22,000 | 2,376 | 6 | 396 |
| Small pump | 0.443 | 0.133 | 5,000 | 665 | 15 | 44 |
| Sprayer | 0.55 | 0.166 | 1,000 | 166 | 5 | 33 |
| Cart | 0.25 | 0.075 | 1,000 | 75 | 9 | 8 |
| Sickle | 2.84 | 0.864 | 30 | 26 | 4 | 7 |
| Nife | 1.58 | 0.477 | 20 | 9 | 4 | 2 |
| Hand Hoe | 4.72 | 1.426 | 50 | 71 | 6 | 12 |
| Shovel | 0.81 | 0.245 | 100 | 24 | 5 | 5 |
| Spade | 1.19 | 0.36 | 100 | 36 | 6 | 6 |
| Small boat with Engine | 0.16 | 0.048 | 5,000 | 240 | 10 | 24 |
| Winnower with Engine | 0.442 | 0.133 | 500 | 66 | 7 | 9 |
| Total | | | | | | 786 |

Table 6-9 Agricultural Inputs for Paddy

| Unit | Wet Season | | Dry Season | | | |
|------------------------|------------|-----------|------------|-----------|-----|-----|
| | Rainfed | Irrigated | | Irrigated | | |
| | | A | B | | A | B |
| Present | | | | | | |
| Seed | 170 | 80 | 80 | 88 | 80 | 80 |
| Fertilizer | | | | | | |
| Ammo-hos | 15 | 30 | 50 | 100 | 140 | 140 |
| Urea | - | - | - | - | - | - |
| Future without Project | | | | | | |
| Seed | 120 | 60 | 60 | 60 | 60 | 60 |
| Fertilizer | | | | | | |
| Ammo-phos | 20 | 60 | 120 | 140 | 170 | 170 |
| Urea | - | - | - | - | - | - |
| Future with Project | | | | | | |
| Seed | - | 45 | 45 | 45 | 45 | 45 |
| Fertilizer | | | | | | |
| Ammo-phos | - | 150 | 200 | 220 | 240 | 240 |
| Urea | - | 30 | 60 | 60 | 60 | 60 |

APPENDIX 7

AGRICULTURAL SUPPORTING SERVICES

AGRICULTURAL SUPPORTING SERVICES

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AGRICULTURAL SUPPORTING SERVICES

7-1. General

The Ministry of Agriculture and Cooperatives (MOAC) consists of two major offices administering nine departments, ten divisions, and eight state enterprises (Fig. 5-1). The MOAC's principal agencies, which currently deal with services to farmers' groups concerned in the project, are:

- (a) Department of Agricultural Extension (DAE),
- (b) Department of Agriculture (DA)
- (c) Royal Irrigation Department (RID),
- (d) Department of Cooperative Promotions (DCP),
- (e) Land Development Department (LDD),
- (f) Agricultural Land Reform Office (ALRO),
- (g) Central Office for Land Consolidation (COLC),
- (h) Marketing Organization for Farmers (MOF), and
- (i) Bank for Agriculture and Agricultural Cooperatives (BAAC).

Besides the MOAC, the Community Development Department (CDD) and Accelerated Rural Development Department (ARDD), Ministry of Interior, provide their services for improving the socio-economic conditions as well as uplifting the living standard at the grass roots level.

In some districts there is a certain extent of overlapping in the agricultural supporting services being provided by the different organizations. Steps will be necessary to coordinate these activities in future.

7-2. Experimental stations

(1) General

The Kamphaeng Saen Project Area and its environs provide five experimental stations including two rice experimental stations and one each for upland cropping, sugarcane cropping and irrigated agriculture. In 1979, an agricultural college, the Kamphaeng Saen Branch of the Kasetsart University and their affiliated research and experimental institutes will be opened together with an extension & training center under the administration of the Department of Agriculture, MOAC (Figure 7-2).

(2) Experimental stations

Rice experimental stations

The Rice Division of the Department of Agriculture (DA) has been administering 21 rice experimental stations throughout the country, eight of which are located in the Central Plain.

In the Mae Klong river basin, to which the Kamphaeng Saen Project belongs, there are two rice experimental stations located, the one in Muang Ratchaburi and the other in Suphanburi, respectively. These experimental stations have been dealing mainly with fertilization tests for High Yielding Variety (HYV) of paddy, breeding and diffusion, and improvement of paddy farming techniques.

The Suphanburi rice experimental station provides a training center for government staffs engaged in the irrigated agriculture development project as well as farmers involved in the irrigated agriculture development program.

As a matter of fact, however, only the limited farmers living near the station sometimes visits there to buy recommended varieties or newly developed varieties of crops and no further use of the station is observed nor any effective system is established for giving technical guidance directly to the farmers concerned.

Upland crop experimental stations

The Utong upland crop experimental station is situated in the Project Area under the control of the DA, MOAC. The said station was inaugurated as cotton experimental station to meet the local requirement for improvement of cotton cropping which was then flourishing in the area. The recent diversification of upland crops has allowed the station to handle all kinds of upland crops.

The specialist staffs, however, are assigned only to Maize and Sorgham Unit, Cotton Unit, Economic Crops Unit (tobacco, sugarcane, etc.) and Fertilizer Unit. The other Units are not so active since they were concurrently covered by the above staffs.

Sugarcane experimental stations

The experimental station of sugar institute (MOI) is located in Bang Pla Cholburi, Kamphaeng Saen, providing 500-rai extension fields and multiplication fields for improved seedlings. The experiment items cover almost of all matters relating to sugarcane cropping with rainfed sugarcane culture as a mainstay of the experiments by 23 research and management staffs and about 60 permanent laborers.

The Breeding Section, one of the most important sections, is working for development of new varieties with high yield, disease resistance, etc., and in adaptability test for foreign varieties as well as conservation of exemplary varieties.

The Pathology Section and the Extension Sections play another important roles in the organization. The Extension Section is the most active section in steady services for propagation of recommendable seedlings grown in 500-rai extension fields so as to distribute them to the farmers concerned.

RID Experimental Station

There are six (6) irrigation water use research stations under the Operation Division, RID. The irrigation water use research

station is responsible for carrying out researches on consumptive use for crops, rotational irrigation system and experimental cropping of upland crops and vegetables. The Kamphaeng Saen station operates 226 rai of irrigated farms. Presently, however, only the dry season cropping is available due to shortage of irrigation water in that season.

(3) Educational system of agriculture

The Kasetsart University

The Kamphaeng Saen Branch of the Kasetsart University will be inaugurated in the second term in 1979 with the agricultural department, veterinary department, agro-economics course of the economic department and irrigation course of the engineering department. The buildings and facilities of the University are provided by the World Bank financial assistance, and other facilities like research institutes, green houses, training center, farm machines center are to be built by Japanese grant in aid. Besides the above, the Rockefeller Foundation (U.S.A.) plans to contribute some research institutes and facilities.

The Ratchaburi Agricultural College

There is the Ratchaburi Agricultural College (5 year schooling system) in Ratchaburi of the Mae Klong river basin. This college is operated in the combined system of agricultural high school and college, and the qualification of admission to this college is given to those who are graduated from junior high schools in ages between 16 to 20 years old. The number of students currently attending is about 500 and two courses are provided with the crop husbandry and animal husbandry. However, only five percent of the graduates are engaged in agriculture.

7-3. Extension Services and Training

(1) Present extension services

The Department of Agricultural Extension involves nine (9)

Divisions responsible for technical and/or administrative services. The Department has six (6) Regional Offices over the country. The Project Area is under the jurisdiction of the Ratchaburi Regional Office, Department of Agricultural Extension. (Fig. 7-3)

The regional extension officer is responsible for certain specific services under the administration of the regional headquarters but has no direct supervisory responsibility over the provincial extension officers of the region in his charge. His staff consists of Subject-Matter Specialists who adequately and technically train and support provincial extension officers and plant protection staff who handles pest eradications programs, through their services.

In the Nakhon Pathom Provincial Office, there are seven extension and two administrative personnels. Provincial administrators occasionally become involved in extension matters, since major decisions on agricultural extension policy and financial matters are cleared by the Governor at the provincial level and District Administrator (Nai Amphoe) at the district level.

The District Extension Agents are directly responsible for field activities under supervision of Provincial Extension Officer, and four to five workers are presently assigned in each district level. The ratio of an extension worker to numbers of farmers at the level of district within the Project Area is as follows;

| <u>District</u> | <u>Agricultural Officer</u> | <u>The ratio</u> |
|---------------------|---------------------------------|------------------|
| Muang Nakhon Pathom | 4 | 1 : 4,660 |
| Nakhon Chaisi | 5 | 1 : 1,960 |
| Kamphaeng Saen | 4 | 1 : 2,620 |
| Bang Len | 4 | 1 : 3,510 |
| Don Tum | 4 | 1 : 1,135 |
| Total (average) | 21 | (1 : 2,740) |

Ordinarily, an extension agent has his duty to serve several villages, and the extension agents of some offices serve the farmers' groups in charge which are formed cropwise. And much pressure of their routine works has prevented them from frequent visit to the villages in charge, only several times available a year.

The existing bottlenecks in extension works are;

- (i) shortage in numbers of extension staff,
- (ii) shortage in numbers of materials and equipment for extension services (vehicles and others), and
- (iii) improper extension method.

Currently, the extension service development program is now executed under the financial aid of the World Bank. The Department of Agricultural Extension, however, has not tackled so positively the problems of water use and management, which are considered as the problems relating to the RID. The RID, therefore, covers the extension services including guidances for water use and water management.

Training for District Extension Officers and Extension Agents held at irregular intervals, are not always on technical subjects and takes often mainly extension methodology. The training may not directly meet the farmers' most urgent needs. Extension personnel are, therefore, insufficiently prepared to give topical information efficiently to the farmers.

The Irrigated Agriculture and Training Center (Chapter 4, Design Report (AF) 52-45, JICA) will provide education and training programs for those government employees (CLCO, RID, ALRO, DAE, ARD etc.) concerned with the irrigated agriculture development in the Greater Chao Phya and Mae Klong basins in the very near future. Main facilities for the education and training center were completed in the Suphanburi Rice Experimental Station in 1978. The Chao Phya pilot farm and Mae Klong pilot farm which are so designed as to play a

role as the sub-centers to the said training center are now under construction.

(2) National Agricultural Extension Project

To overcome the difficulty, the Government has been actively implementing the National Agricultural Extension Project in 33 provinces, including Nakhon Pathom province covering the Kamphaeng Saen Project Area, as the first phase with the financial assistance by the World Bank.

The project would establish an intensified and expanded extension service for most agricultural crops under the Department of Agricultural Extension (DAE). It would appoint the additional staff and the introduction or expansion of proper extension method with emphasis on regular farm visits and continuous training for extension officers and agents. The project would also involve the programs for construction of Regional Training Centers, Provincial and District Extension Centers and houses for Extension Agents, procurement of vehicles to support field operations, and equipment for training, field experimentation and demonstration. Consultants would be engaged in the services to assist DAE for efficient project execution and fellowship program included would assist in upgrading staff.

Under this project, "contact farmers" would be proposed, who would work on a part-time basis together with the well-trained full-time Extension Agents at the regular points of contact between the DAE extension service and the farmers' groups. Extension Agents would serve about 1,000 farms, and would be supervised by District and Provincial Extension Officers and technically helped by Subject Matter Specialists. Field extension work would initially concentrate on a few of the yield improvement of the major crops in the respective areas.

The project would provide i) three Regional Training Centers located at Nakhon Pathom, Rayong and Songkhla, ii) 29 Provincial Extension Centers, iii) 285 District Extension Centers, iv) 600 Extension Agent Houses; and v) Furnitures and operating equipment for the Centers.

DAE headquarters organization would be enforced to ensure smooth and effective operation. The Director General would be assisted by two Deputies responsible in the field of technology and extension services respectively, and a Senior Administrative Officer who would take initiative in administrative services. The administrative and technical line of command would flow from headquarters through the Regional and Provincial Extension Officers to the District Extension Officer who would supervise the Extension Agents stationed in the subdistricts. The Director General of DAE would have overall responsibility for project implementation, while the day-to-day direction of Extension implementation in the provinces would rest with the Chief of the Extension Division under the Deputy Director General, Extension Services.

(3) Proposed services and training'

The extension service offices are provided in the level of provinces and districts in the Central Plain. Insufficiency in staff, materials, equipment and budget has not allowed to carry out successful extension services. Only very few groups of farmers have been positively served in the Project Area, where the ratio of the extension officers and staffs to all the farms in number is 1 : 2,740.

Actually, however, one extension agent must cover about 4,000 to 5,000 farms because the number of extension agents who can devote themselves to servicing is very limited. The National Agricultural

Extension Project (NAEP) aims at improving such difficult situation in extension works.

The NAEP has been executed since 1977 by financial support of the World Bank, aiming at developing the agricultural extension system to cover 72 provinces throughout the country. The first stage of the NAEP has taken up 33 provinces including Nakhon Pathom province where the Kamphaeng Saen Project is located. The NAEP works were started in 1979 in the Nakhon Pathom province.

The Nakhon Pathom province, divided into six (6) districts, has 69,991 farms (surveyed as of 1978). The NAEP provides contact farmers of about 6,800 at the rate of one to ten farms so as to ensure smooth activities of the extension agents. The contact farmers, who are the representative farmers, attend the intensive course of guidance by the extension agents. One extension agent gives guidance to 100 contact farmers (number of farms: 1,000) in permanently stationing in a village.

In the Nakhon Pathom province 75 extension agents are assigned including 20 agents for 22 villages in the Project Area. (See Table 7-1 and -2, Figure 7-4).

Besides the above staffing plan, the NAEP plans to improve the extension method, train the agents and increase the equipment and materials for extension services.

The Kamphaeng Saen Project, aiming mainly at on-farm development with land consolidation, will encourage the farmers to make the best use of irrigation facilities as well as to improve farming practices.

In the irrigated agriculture in Thailand, operation and maintenance (O & M) of facilities and water management have been carried out by the RID water management staff of water masters and zonemen, while the on-farm level water control is made by extension staff of

DAE. The water control, however, has been not so smoothly performed as expected due to awkward manner of relaying between RID and DAE controls.

There is inadequacy in irrigation facilities, but, even if so, many water disputes have arisen in the Project Area. These disputes may be caused from the fact that the RID's zonemen do not have sufficient understanding on the way of water management and the DAE's extension staff do not have adequate knowledge of on-farm level water control nor arbitration of the farmers' disputes, either. In other words, the relation between water use and cropping pattern have not been completely clarified yet.

Commonly, a manageable number of farms by one extension agent is said to be below 500 farms. Actually, however, increase in number of the Agents is quite difficult to cope with the requirements. The NAEP has a final goal to provide the agents to deploy throughout the country by 1985 at the rate of one agent to 1,000 farms.

It is proposed that both the RID and the DAE should cooperate so closely each other as to establish the functional system of water utilization and transfer of knowledge of farming and water control to farmers for increasing the project effect of the NAEP, when the Kamphaeng Saen Project would be completed in on-farm level development.

The following are recommendations to accomplish the purpose.

- i) A committee, provisional called the Agricultural Development Coordinating Committee, should be established for coordinating among the RID, DAE and other agencies concerned and an organization should be established at both national level and site level for managing and operating the decisions made by the above Committee.
- ii) The RID's zonemen should be trained together with extension staff in provincial level training sessions.

iii) The extension staff should participate in the RID's training sessions on water management and utilization, which are to be held in RID's Regional Office (Kamphaeng Saen).

NB: The similar natured training sessions were planned to be held at Project Center in Suphanburi Rice Experimental Station under the Irrigated Agriculture Development Program.

iv) The training on water management and farming practices should be given to farmers (6,000 farms) in the Project Area through contact farmers at the Farmers' Training Center.

v) A sub-training center should desirably be provided for co-use by RID and DAE under the direct control of the Suphanburi Training Center.

This training center, the sub-center to the Suphanburi Center, should provide a different system from that of the Chao Phya, Mae Kong Pilot Farm (under construction) with emphasis on education of the farmers concerned. Field training should be given in the pilot farms or the farms of exemplary farmers.

The Kamphaeng Saen Irrigated Agriculture Development Project initiates the on-farm development with land consolidation in the Mae Klong river basin. The Project, therefore, requires to introduce new farm management, farming techniques, and new crop varieties to meet improved on-farm conditions.

For thoroughly effective land use after on-farm development, a variety of agri-supporting services will be indispensable. Particularly, a facility for training and study through familiar way of audio-visual equipment should be desirably provided so that the farmers can develop their positive attitude toward the farm management and learn the advanced farming practices.

The existing experimental station or the extension center can provide some spaces for farmers' training. The said facility should accommodate sufficient spaces for displaying various farming machines and equipment as well as panels showing systematically the crops and farming works.

Furthermore, audio-visual supports by educational movies or slides on advanced farming techniques should be prepared for itinerant screening at night at villages in the Project Area.

7-4. Agricultural Input Supply

(1) Seeds

The High Yield Varieties of paddy in Thailand are registered as RD series produced in the rice experimental stations. These varieties have strains of high production yield as well as superior quality specified as Thai Grain Standard Class-1 milled rice. The production of foundation seeds rests with the Department of Agriculture (DA) through its rice experimental stations. Some foundation seeds are sold directly by the stations to farmers, but the most are channeled through the DAE in order to multiply the seeds on the contract basis with individual farmers. However, since supervision for the contract growers is lax, some quality-guaranteed seeds are sold directly from the seed growers to farmers. The Seed Division, DA, handled the quality seeds in collecting from the seed growers and sending to the Processing Seed Centers, which are located in five regions, in order to improve the quality. Farmers can buy the quality seeds directly from the Seed Centers or from the MOF through Extension Offices. However, the seed buying through MOF sometimes takes a considerable time in delivery. Most of farmers obtain the seeds from their neighbors and the seed growers.

The rice strain produced by seed growers in Nakhon Pathom in the 1978 wet season was only the RD-11. The amount of 137.7 ton was produced from the fields of 180 rai in total cropping acreage.

The seed production in the 1978 - 1979 dry season can be tabulated as follows.

| | | |
|---------|----------------|------------------------|
| RD - 1 | 125 rai | (Amount 250 kg) |
| RD - 7 | 140 " | (" 280 ") |
| RD - 11 | 135 " | (" 270 ") |
| | <u>400 rai</u> | <u>(Amount 8-0 kg)</u> |

The demand of guaranteed seeds for HYV would increase in "With Project", in which the quantity required would be about 1,300 ton/year. The expansion of the existing seed supply system, therefore, will be essentially needed to meet the sharp increase in demand.

(2) Fertilizers

The fertilizers applied in 1978 in Thailand amounted to about 700,000 tons, including 600,000 tons of ammo-phos, 100,000 tons of ammonium sulfate and approximately 1 - 3 tons of urea. The domestic production of ammo-phos is about 360,000 tons, which are marketed by merchant dealers to the consumer farms. The imports reach about 240,000 tons (150,000 tons on the government basis and 90,000 tons on the commercial basis).

Approximately 80 percent of 150,000 tons by government import has been sold to the farmers through MOF via extension offices in provinces and districts, while the rest through cooperatives in provincial or district levels or to individual consumers through Agricultural Cooperative Federation of Thailand (ACFT). The ACFT has been handling some hundred thousand tons of imported ammo-phos on the commercial basis.

The farm economic survey made in the Project Area revealed that 50 farms out of 62 farms surveyed applied fertilizers, and the fertilized acreage in paddy cropping was 38 percent of the wet season cropping acreage (20 kg/rai on an average) and 85 percent of the dry season cropping acreage (35 kg/rai on an average), respectively. The fertilizer used commonly is ammonium phosphate (16-20-0, 20-2-00) which is recommended by DAE for paddy cropping.

The ammonium sulfate applied to vegetables and sugarcanes is totally imported at the amount of 50,000 to 100,000 tons per annum. The exporters of this item are U.S.A., Korea, the Netherlands, etc. About 10,000 tons of urea are produced annually in a factory in Chiang Mai which was constructed under the aid of W. Germany.

About 65 percent of total fertilizers has been distributed through the channel from major dealers in Bangkok to local dealers or other sub-dealers. The remaining 35 percent has been under the control of MOF or ACFT.

Under the Project, it is expected that urea will become the supplementing source of nitrogen, though the farm budgets assume that some ammonium phosphate will be continuously applied as a basal fertilizer. Application rates should increase to about 65 kgN/ha for HYV and 86 kgN/ha for sugarcane. The total demand for ammonium phosphate is expected to increase from 1,740 ton/yr to 6,190 ton/yr. and the demand for urea will increase to 1,670 ton/yr. Fertilizer is sold by a large number of private dealers, shopkeepers and, increasingly by cooperatives.

(3) Chemicals

All of chemicals used in Thailand are imported. The total import amount has reached about 800 million Baht in CIF Bangkok value, which includes some amount for chemicals of home consumption. Then, the net amount for agri-chemicals was estimated at about 700 million Baht, 70 to 75 percent of which are imported in finished forms and the rest, 25 to 30 percent, in intermediate form is finished in Thailand.

Such imported chemicals are used for paddy cropping by 25 percent (covering about 500,000 ha of the total acreage of the nation, mainly in the Central Plain), for vegetables by 50 percent, for cotton by 10 percent and for tobacco, sugarcane, etc. by 15 percent, respectively.

The government imports, accounting for only 10 percent of all imported chemicals, are distributed at free of charge to the farmers' groups participating in various projects through extension offices at provincial and district level via the channel of MOF. The commercial base imports account for 90 percent of the total, including 85 percent sold to individual farmers through major local dealers (4 to 5 dealers/province) and their agents (100 agents/province), and 5 percent sold through agricultural cooperatives.

Insecticides occupy about 60 percent of all agri-chemicals, rodenticides about 15 percent and herbicides about 25 percent, respectively. The increase trend in application of agri-chemicals has become reluctant in general, except 2-4-D, herbicide, which has been recently increased in amount of application by 20 to 25 percent (1978).

7-5, Agricultural Credit and Marketing

(1) Credit

Financing to farmers by the Bank for Agriculture and Agricultural Cooperatives (BAAC) has been made through two channels; direct financing to individuals and through extension offices or cooperatives, and the debtors includes two kinds, the group of farmers and individual farmers.

Crediting is specified by three types; a short-term credit (for repayment within one year), a medium-term credit (for repayment within three years) and a long-term credit (for repayment within ten years). And another special credit is provided for the new comers in farming with a long-term (for repayment within five to fifteen years with grace period of one or two years).

The credits specified by mortgages are as follows:

i) Lands

When the lands are mortgaged, a credit can be given at the amount upto 50 percent of the assessment at the ceiling of 100,000 Baht.

ii) Mutual security

Under the mutual security among more than ten farmers, about 12,000 Baht per person at maximum can be credited.

iii) General security

One million Baht at maximum can be credited for the development of new farm management with securities by lands, signing of group farmers and tackling the said new farm management program.

iv) Lands to be purchased

When farmers plan to purchase lands, the lands can be mortgaged to have credits within a range of amount from 50 to 80 percent of assessment.

During a period of fiscal 1978, the BAAC gave credits to the farmers in Nakhon Pathom as follows;

- a) Mortgage items i) and ii) --- 75 million Baht
- b) " iii) --- 4 million Baht
- c) " iv) --- 5 million Baht

Besides the above, 17 million Baht was financed through cooperatives and 20 million Baht through extension offices.

The numbers using these credits are show as follows;

| | |
|--------------------|-------------|
| Thru. BAAC | 8,100 farms |
| Thru. Cooperatives | 8,300 " |
| Thru. Ext. Offices | 9,100 " |

The above figures are tabulated districtwise as follows.

(Unit: farms)

| | Don Tum | N. Chaisi | Ban Len | Kamphaeng | | Total |
|-----------|---------|-----------|---------|-----------|----------------|-------|
| | | | | Saen | Muang Samphran | |
| BAAC | 600 | 1,500 | 1,500 | 2,000 | 1,500 | 8,100 |
| Coop.s | | | | | | 8,300 |
| Extension | - | 2,000 | 4,100 | - | 1,700 | 9,100 |

As a result of survey conducted in the Mae Klong river basin, the creditors to farmers are classified into relatives, merchants, neighbors, farmers' group (extension offices), cooperatives, banks, and others. The details of the above are shown as below.

| | <u>Merchant</u> | <u>Rela- tives</u> | <u>Neigh- bors</u> | <u>Coopera- tives</u> | <u>Farmers' group</u> | <u>Banks</u> | <u>Others</u> |
|-----------|-----------------|------------------------|------------------------|---------------------------|---------------------------|--------------|---------------|
| Total (%) | 17.99 | 32.02 | 15.87 | 10.32 | 13.49 | 9.52 | 0.79 |
| Region 1 | 16.92 | 35.38 | 9.23 | 16.92 | 18.46 | 3.08 | 0 |
| Region 2 | 11.32 | 24.53 | 16.98 | 13.21 | 20.75 | 15.90 | 0 |
| Region 3 | 13.33 | 31.21 | 27.27 | 9.05 | 14.14 | 15.15 | 0 |
| Region 4 | 13.21 | 43.40 | 16.98 | 3.77 | 5.66 | 15.09 | 1.89 |
| Region 5 | 28.97 | 38.32 | 8.41 | 9.35 | 10.28 | 2.80 | 1.87 |

(as of 1976)

Sources: Mae Klong Integrated Rural Development Project

NB: Regions: The above classification of the regions was adopted in the Mae Klong Integrated Rural Development, and the Kamphaeng Saen Project Area is included in Region 2 and a part of Region 5.

The farmers tend to have credits more often from relatives, merchants and neighbors than from banks. Total percentage of credit by these three creditors reaches about 66 percent, while about 33 percent only from banks, cooperatives and extension offices.

It is more desirable, however, for farmers to borrow the funds of farm management from BAAC, cooperatives and extension offices, than to borrow from merchants or other individual creditors.

The two paddy cropping a year for target yields essentially requires introduction of HYV and adequate fertilization.

With on-farm development completed, the target yield of paddy in the Project Area was set up at 4.30 ton/ha, based on which the fertilizer requirements was estimated at 38-65N kg/ha. The calculation is made on the data of unit fertilizer requirement, objective area of 15,180 ha, and unit cost of fertilizer - ฿5,140/ton for ammo-phos and ฿4,840/ton for urea. Necessary amount in the Project Area would total about 39.9 million Baht.

Assuming that about 80 percent of farmers in the Project Area will be in need for receiving the loan to cover about 90% of the said cost for fertilization, the necessary amount for the fund is estimated at about 28.7 million Baht.

(2) Marketing

Chemical Fertilizers

According to the results of survey carried out by the Kasetsart University in 1975, the marketing channels through which chemical fertilizers were sold in Thailand are as shown in the following chart in percentages shared by each channel.

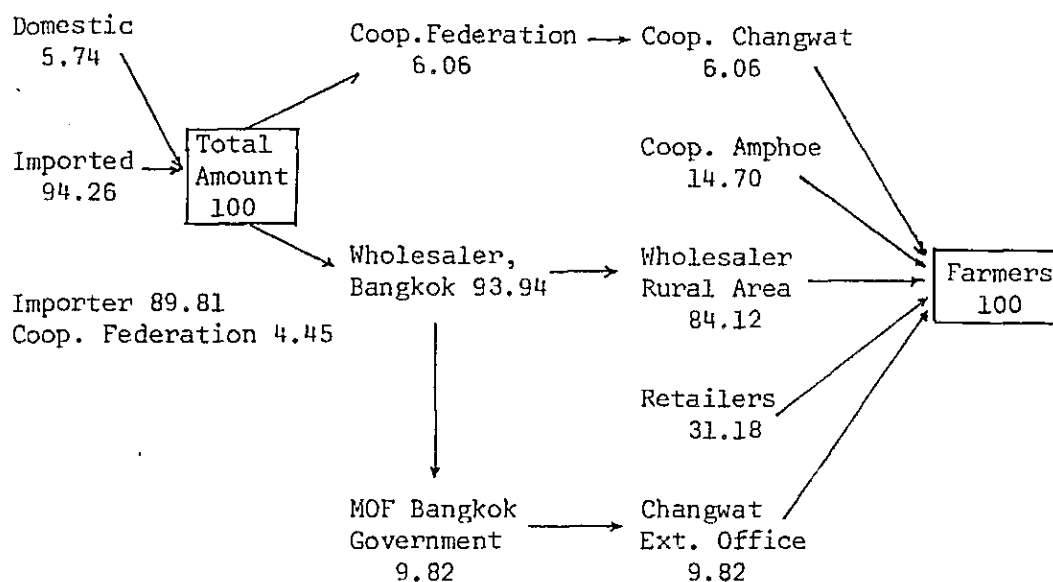
From the chart, there are three characteristics learned, as follows:

- i) More than 90 percent of chemical fertilizers is imported from abroad.
- ii) More than 90 percent of imports is handled by private trading firms.
- iii) Before distributing the fertilizers to farmers, more than 90 percent is channelled through wholesalers in Bangkok.

After wholesaled in Bangkok, about 90 percent is channelled through local wholesalers. The marketing system in rural areas provides the following three channels.

- i) Wholesaler farmers
- ii) Retailer farmers
- iii) Amphoe Coop. farmers

Marketing Channels for Chemical Fertilizers



Rice

The Agro-economic Division, MOAC, conducted a survey on the marketing channels for rice in 1969. The survey covered eight Changwat in the Central Plain, taking a period from June 1968 to May 1969. The survey result is shown in the following chart. The figures in the chart indicate the percentages of paddy or milled rice which passed each channel.

- i) Out of the total amount of paddy forwarded by farmers about 60 percent was sold to merchants, and about 40 percent to rice millers.

ii) In addition to direct purchasing of paddy from farms, rice millers buy about 50 percent of paddy through merchants (collectors and middlemen). Therefore, it can be said that about 90 percent paddy for marketing is sold to wholesalers, retailers, consumers and exporters through rice millers.

iii) The shortest marketing channel (milled rice) is either case a) or b) shown below and the amount of paddy passing through these channels shares about 10 percent of the total paddy amount for marketing.

a) planters → rice millers → consumers (planters)

b) planters → rice millers → planters → retailers
→ consumers

iv) Usually, one or two merchants are involved between planters and rice millers for marketing of paddy, and another one or two between rice millers for marketing of milled rice. The said marketing pattern occupies about 85 percent of total consumption of rice except for export.

v) Only 36.4 percent of the share by retailers indicates the fact that a quite big volume of vegetables is sold to retailers not through the wholesale market.

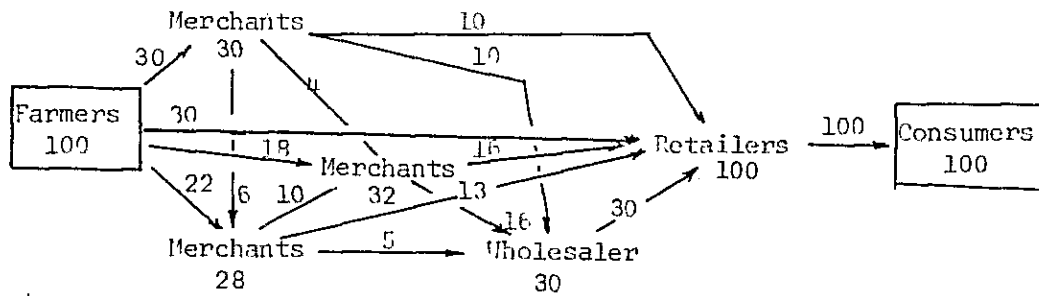
As for vegetable production, tomato, string beans and sweet potatoes are major crops in the Project Area and Bangkok merchants come to purchase vegetables there and transport them by trucks.

Swine

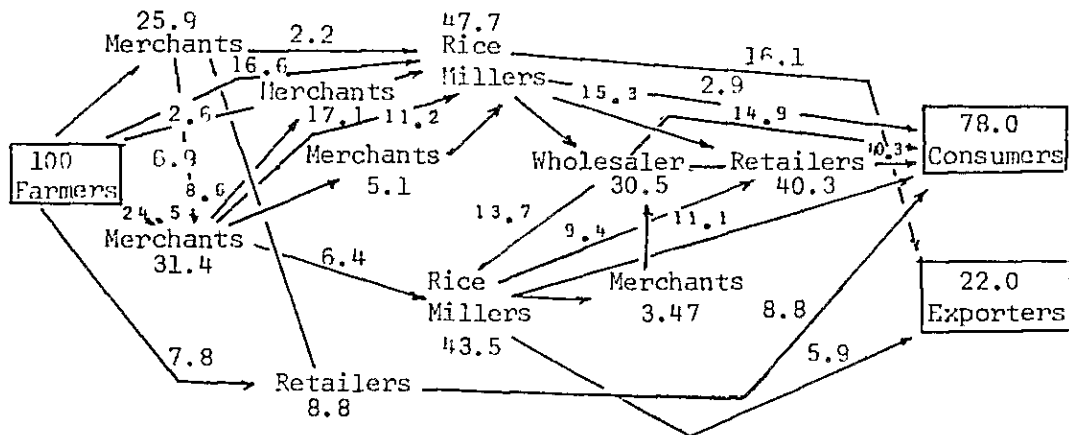
The survey conducted by the Agro-economic Division, MOAC in 1969 included a survey on marketing channels for swines. The result is as shown in the following chart.

The chart illustrates that 30 percent out of the total for marketing is directly purchased by merchants and 82 percent is delivered to retailers through middlemen. The amount which is handled by wholesaler before delivering to retailers is only 30 percent.

Marketing Channels for Swine



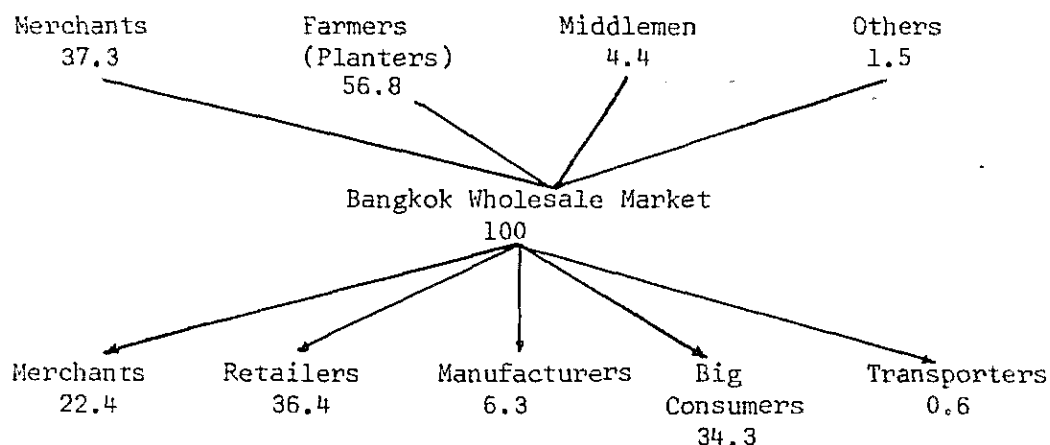
Marketing Channels of Paddy and Milled Rice in Central Plain, Thailand



Vegetables

According to the survey conducted by MOAC in 1971, marketing of vegetables at the Bangkok Vegetables Wholesale Market is as follows;

Record on Marketing of Vegetables at Bangkok
Vegetables Wholesale Market 1971



NOTE: The chart shows that 56.8 percent is brought in by farmers themselves. Thus, there is a considerable possibility found in expanding the shares of collective marketing through agricultural cooperatives.

In the Project Area

Most of the farm products harvested in the Project Area have been handled by middlemen or merchants. Interview with 23 farmers belonging to farmers' groups found that many of them sell paddy directly to local rice millers and other products to middlemen.

As enquires on the sales channels of the farm products was answered as follows;

| | | <u>No. of farm</u> | <u>percentage</u> |
|-----------------|---------------------------------|------------------------|-------------------|
| Processors | Local processor or Rice mill | 13 | 56 |
| Middlemen | Buyer who comes in the village | 11 | 48 |
| Local Merchants | Merchant in the nearest village | 3 | 13 |
| Market | At market | 3 | 13 |
| Quarterman | Quotaman (Sugarcane) | 2 | 9 |
| Cooperatives | Marketing Cooperatives | 1 | 4 |
| | Total | <u>23</u> | |

The reason why the cooperatives are not so often utilized as expected is that most of the cooperatives do not handle the sales of farm products but paddy and sugarcane. Contrarily, the local merchants are more often utilized as sales channels because they buy the products at comparatively high price with down-payment, and come directly to the farm gates to collect and transport the products by themselves.

The above fact shows that most farmers (about 78%) have transacted the sales of their products in the villages, and a few of them (about 22%) have visited processors (sugarcane factories or rice mills) and markets to sell the products.

With on-farm development, the purchase of agri-input materials will be increased by intensified paddy cropping, and introduction of two paddy cropping a year with HYV will increase the amount of crops to be handled. Such activated farming will require the farmers to deal with their products not through the rice millers or merchants but through farmers' groups or cooperatives on more advantageous conditions in bulk.

7-6. Farmers' Groups and Cooperatives

(1) Farmers' groups

In the Project Area, the entry rate of membership of the farmers' organizations is considerably low, and most of farmers enter the membership only to receive loans from the organization or others.

° Group under DAE

In this organization, 20 to 30 farms compose a cropwise group in every village. The members of this group can have favors of financing by group security system for purchasing lands, farming equipments, animals, and other necessary fund for farm management, of supply with agri-input materials through group channels and of preferential technical guidance by extension staff. The entry rate is about 10 percent.

° Groups under cooperatives

The group is formed with a major purpose for financing of necessary funds for farm management, and such financial support is utilized in purchasing agri-input materials. Sales of paddy and sugarcane are involved as a part of the business transaction. The entry rate is about 15 percent.

° People's Irrigation Association

The association is organized for improving the irrigation technology and developing socio-economic status of the farmers, being operated by their monthly fees and water charges. This organization, established in 1965 under the administration of the Ministry of Interior, could use the fund of Farmers' Aid Committee (FAC) for its operation in its early stage. Alternation of policy in 1973, however, has weakened its activity. As a result, only one association is in active along the Nakhon Chaisi river.

° Water User's Associations

The association was proposed in 1962 when the RID's "Ditches and Dikes Act" was enforced, and formed in 1967 in the Northeast. Recently, a plan has been made to form the associations for controlling the terminal irrigation facilities by farmers themselves. This is, however, not a lawful organization, which has been inactively function at the moment. There exists no organization of the association found around the Mae Klong basin.

(2) Problems

The farmers' groups under DAE, having almost the same target as that of the cooperatives, could be transformed to the cooperative organization with agreement at the general meeting, although different in the entry numbers (below 30 members) from that of the cooperatives. This farmers' group is in free entry by farmers' own will and formed in the unit on the village basis. The large-scaled farms may accomplish the target, and actually very limited number of farmers has participated in the organization to have much guidance

and benefit therefrom. Most farmers, however, are standers-by of such activities due to differences in their farm management scales and in their conservative attitude to the guidance. If collective guidance can be given to the total farmers in one area, the program will be effectively realized; the villagewise or irrigation blockwise guidance will produce more favorable effects for improving farm economy and developing production technology. For instance, the guidances, being on the basis of one irrigation block, will be most effective on water management, farm management, cooperative activities (collective sales, purchase etc.) and financing according to one cropping pattern. The program for production increase should be aimed at not individual increase but increase in average yield of the area.

The agricultural cooperatives are found on the district basis of united farmers' groups which have their own backgrounds. These backgrounds substantially affects the cooperatives activities in various aspects, favorably or unfavorably.

The number of entries to the cooperatives, however, occupies only 12 percent of the total farms, which suggest that the cooperative activities are not always based on the intention of the whole farmers.

The long old economic regime cannot be improved abruptly, and some adverse effects may be expected if drastical change takes place. In due consideration on the facts, the cooperative activities should be strengthened to turn back the farmer-oriented economy.

First of all, most of the farmers should become members of the cooperatives to meet the requirements, although compulsory membership cannot be admitted from the basic idea of free entry. Thus, an attractive measure should be taken to increase the members of the cooperatives, and it is considered that, if entry to membership brings about any advantages to them, many farmers will not hesitate to do so.

Such movement or campaign, if necessary, should be executed to strengthen and activate the cooperative works, even if many troubles and frictions take place against the old economic regime, which can be overcome by union of the farmers along with the national guideline.

There is a problem for promotion of the Project works that no water-users groups exist independently from the cooperatives.

The purpose of the water-users groups, different from that of other farmers groups, is to utilize water more effectively and equally. It is essentially required for farmers to cooperate and assist mutually for realizing the purpose. Such devotional activities of farmers will be a strong support for the success of the Project.

(3) Farmers' groups expansion

Farmers' groups are never composed of certain special people, but any farmers can participate in them to cooperate with each other. The groups which have desire to obtain much benefit will never succeed. The agricultural cooperatives and the farmers groups themselves have no problem at all, but the number of entry will be very restricted if the present operation system is maintained in future. Then, a problem in future exists in how to increase the number of groups.

A plan of water users' group in the Project was proposed to be organized by every irrigation unit and unit irrigation service area. The membership will be compulsory with approval of more than two thirds of the farmers in the unit area. (See Appendix 8)

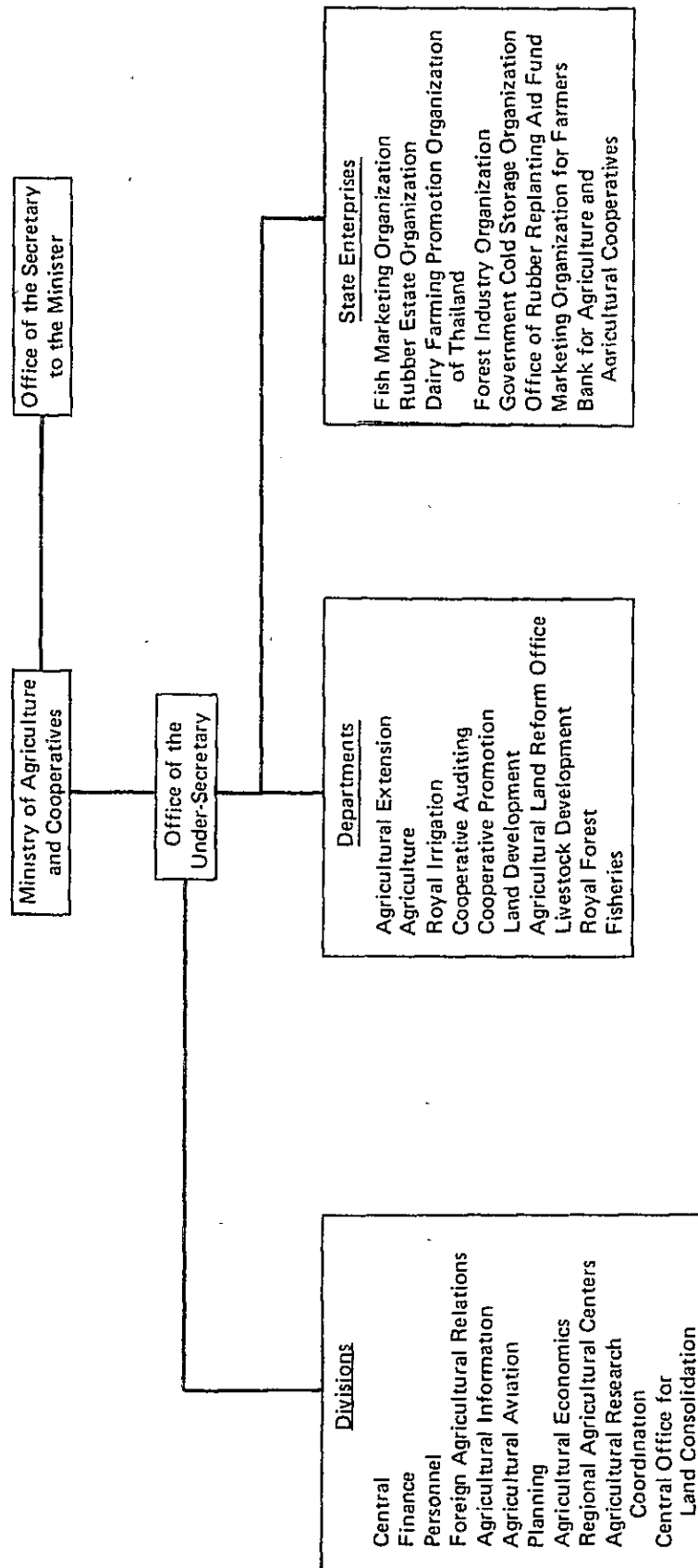
This is the group which is responsible for water management as well as a unit for agri-extension services.

A farmer should be selected in the group as contact farmer under NAEP, representing its group for extension services. The contact

farmers, thus selected, will be distributed equally in the Project Area because the group is formed on the territorial principle.

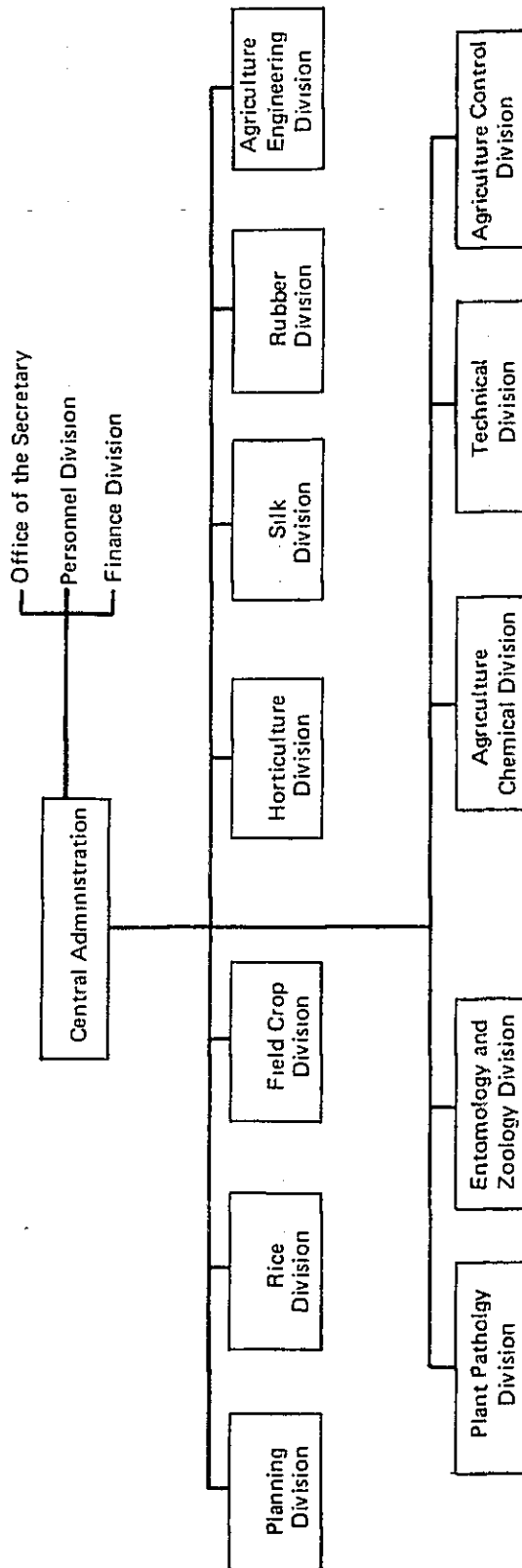
Furthermore; registration of the group, if available, as sub-organization of the cooperation will reinforce the power of the co-operatives themselves.

Fig. 7-1. Ministry of Agriculture and Cooperatives Organization Chart



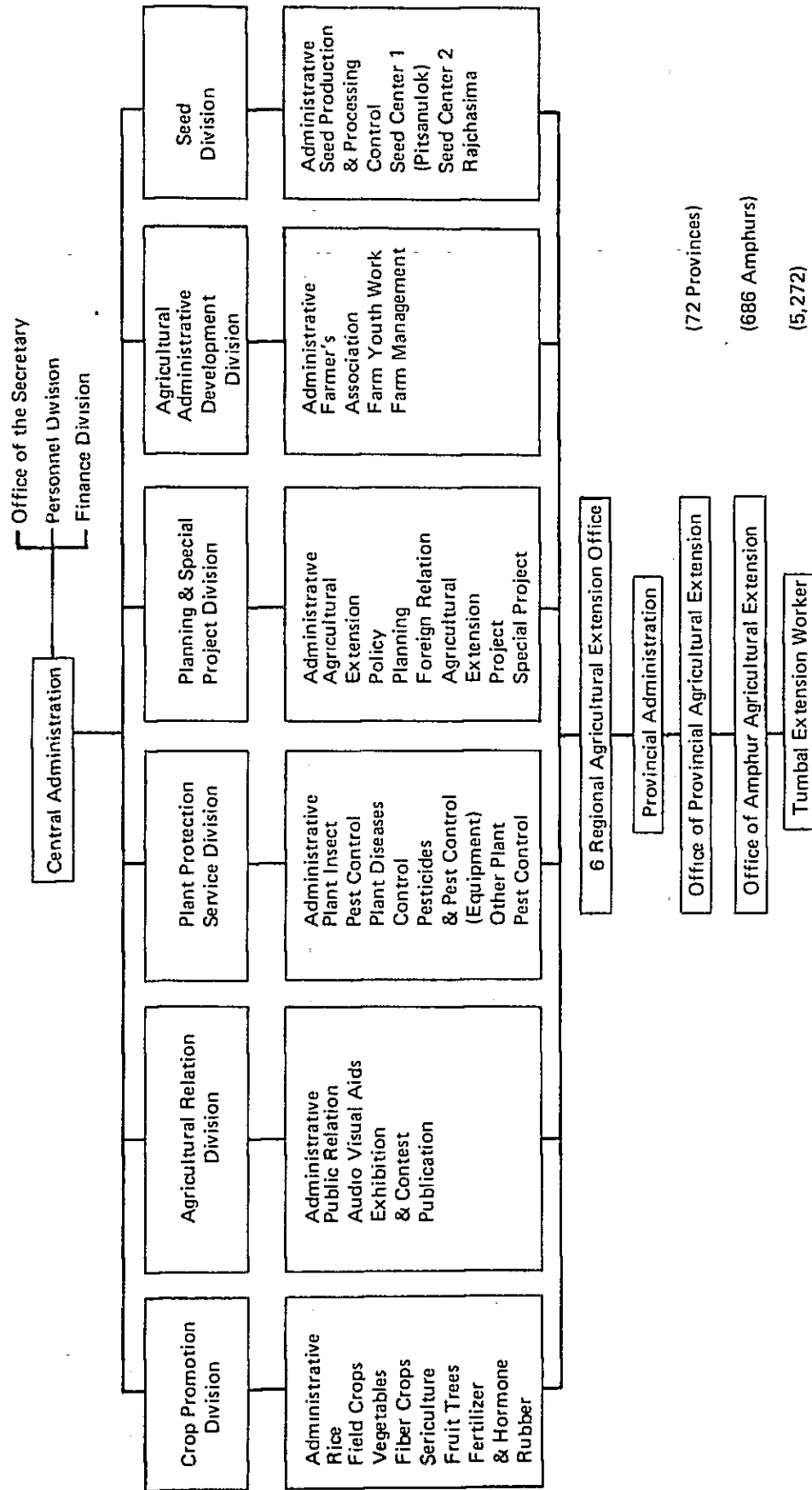
Source: National Institute of Development Administration 1979.

Fig. 7 - 2. Department of Agriculture M.O.A.C. Organization Chart



Source: National Institute of Development Administration 1979.

Fig. 7-3. Department of Agriculture Extension, M.O.A.C. Thailand Organization Chart



Source: National Institute of Development Administration 1976.

Table 7-1. Extension Agent Plan for National Agricultural
Extension Project (N.A.E.P.)

Nakorn Pathom Province 1979

| | <u>Amphor Name</u> | <u>Tambon No.</u> | <u>Muban No.</u> | <u>Total farm Area(Rai)</u> | <u>Farm Family</u> | <u>Contact Farmer</u> | <u>Extension Agent</u> |
|-------------|-----------------------|-----------------------|----------------------|---------------------------------|------------------------|---------------------------|----------------------------|
| Group I | Muang Nakornpathom | 25 | 198 | 143,184 | 18,643 | 1,864 | 20 |
| | Nakorn Chaisi | 27 | 121 | 176,639 | 9,818 | 982 | 10 |
| | Kamphaeng Saen | 9 | 120 | 210,121 | 10,496 | 1,050 | 11 |
| Group II | Banglen | 15 | 165 | 289,338 | 14,035 | 1,404 | 17 |
| | Don Tum | 7 | 55 | 114,679 | 4,540 | 454 | 5 |
| | (Samphran)* | 16 | 122 | 119,133 | 10,459 | 1,046 | 12 |
| | Total | <u>99</u> | <u>781</u> | <u>1,053,094</u> | <u>67,991</u> | <u>6,800</u> | <u>75</u> |

Source: Province Extension in Nakhon Pathom

* Out of project area

Table 7-2. Extension Agent Plan (N.A.E.P.)
(continued)

Kamphaeng Saen District

| <u>Tambon Name</u> | <u>Muban No.</u> | <u>Tambon Area (rai)</u> | <u>Farm Family</u> | <u>Contact Farmer</u> | <u>Extension Agent</u> |
|---------------------|------------------|--------------------------|--------------------|-----------------------|------------------------|
| Tungkra Punghone | 16 | 25,848 | 2,319 | 232 | 2 |
| Huai Kuang | 13 | 16,410 | 1,001 | 100 | 1 |
| Sub-total (Covered) | <u>29</u> | <u>42,258</u> | <u>3,320</u> | <u>332</u> | <u>3</u> |
| Other | 91 | 167,863 | 7,176 | 718 | 8 |
| Total | <u>120</u> | <u>210,121</u> | <u>10,496</u> | <u>1,050</u> | <u>11</u> |

Muang Nakorn Pathom District

| | | | | | |
|---------------------|------------|----------------|---------------|--------------|-----------------|
| Mapkhae | 9 | 5,547 | 743 | 74 | 1 |
| Tungnoi | 7 | 2,506 | 488 | 49 | 1 (2 Tambon) |
| Takong | 10 | 7,640 | 632 | 63 | 1 |
| Tuplong | 10 | 6,334 | 912 | 91 | 1 |
| Sub-total (Covered) | <u>36</u> | <u>22,027</u> | <u>2,775</u> | <u>277</u> | <u>4</u> |
| Other | 162 | 121,157 | 15,868 | 1,587 | 16 |
| Total | <u>198</u> | <u>143,184</u> | <u>18,643</u> | <u>1,864</u> | <u>20</u> |

Nakorn Chaisi District

| | | | | | |
|---------------------|------------|----------------|--------------|------------|-----------------|
| Bangkaewfa | 5 | 9,811 | 365 | 37 | 1 (3 Tambon) |
| Bangphra | 4 | 6,736 | 284 | 28 | |
| Watlamud | 5 | 7,521 | 508 | 51 | 1 |
| Srimahapho | 4 | 5,367 | 371 | 37 | |
| Sub-total (Covered) | 18 | 29,435 | 1,528 | 153 | 2 |
| Other | 103 | 147,204 | 8,290 | 829 | 8 |
| Total | <u>121</u> | <u>176,639</u> | <u>9,818</u> | <u>982</u> | <u>10</u> |

Source: Province Extension in Nakhon Pathom (Amphoe)

Note: (Covered) means District covered the Kamphaeng Saen Project Area.

Table 7-2. Extension Agent Plan (N.A.E.P.)

| <u>Dontum District</u> | | | | | |
|--------------------------|------------------|--------------------------|--------------------|-----------------------|------------------------|
| <u>Tombon Name</u> | <u>Muban No.</u> | <u>Tambon Area (rai)</u> | <u>Farm Family</u> | <u>Contact Farmer</u> | <u>Extension Agent</u> |
| Huai phra | 6 | 14,954 | 592 | 59 | |
| Don phutsa | 7 | 10,963 | 434 | 43 | 1 |
| Banglang | 5 | 10,432 | 413 | 41 | |
| Donruak | 5 | 10,230 | 405 | 41 | 1 |
| Huaiduan | 6 | 10,685 | 423 | 42 | 1 |
| Samngam | 15 | 35,060 | 1,388 | 139 | 1 |
| Lunhoei | 11 | 22,355 | 885 | 89 | 1 |
| Total (Covered) | <u>55</u> | <u>114,679</u> | <u>4,540</u> | <u>454</u> | <u>5</u> |
| <u>Bang Len District</u> | | | | | |
| Bangragun | 15 | 19,200 | 715 | 12 | 1 |
| Lamphya | 11 | 15,287 | 522 | 52 | 1 |
| Khlung Nokkratung | 10 | 17,400 | 538 | 54 | 1 |
| Bangpla | 12 | 12,298 | 2,049 | 205 | 2 |
| Dontoom | 8 | 5,792 | 600 | 60 | 1 |
| Sub-total (covered) | <u>56</u> | <u>69,977</u> | <u>4,424</u> | <u>383</u> | <u>6</u> |
| Other | 104 | 219,361 | 9,611 | 1,021 | 11 |
| Total | <u>160</u> | <u>289,338</u> | <u>14,035</u> | <u>1,404</u> | <u>17</u> |
| <u>Ground Total</u> | | | | | |
| Sub-total | 194 | 278,376 | 16,587 | 1,599 | 20 |
| Others | 460 | 655,585 | 40,945 | 4,155 | 43 |
| Total | <u>654</u> | <u>933,961</u> | <u>57,532</u> | <u>5,754</u> | <u>53</u> |

Source: Province Extension in Nakhon Pathom (Amphoe)

Fig. 7-4. Agricultural Extension in Changwat Nakhonpathom NAEP

