REPORT

ON

THE FEASIBILITY STUDY PHASE I ON

THE COMPREHENSIVE STORAGE FACILITIES

DEVELOPMENT PROJECT

IN

THE KINGDOM OF THAILAND

VOLUME I
(MAIN REPORT)

September 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

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P R E F A C E

In response to the request of the Government of the Kingdom of Thailand, the Government of Japan decided to conduct a feasibility study Phase I on the Comprehensive Storage Facilities Development Project and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Thailand a survey team headed by Mr. K. Aida from February to March, 1984.

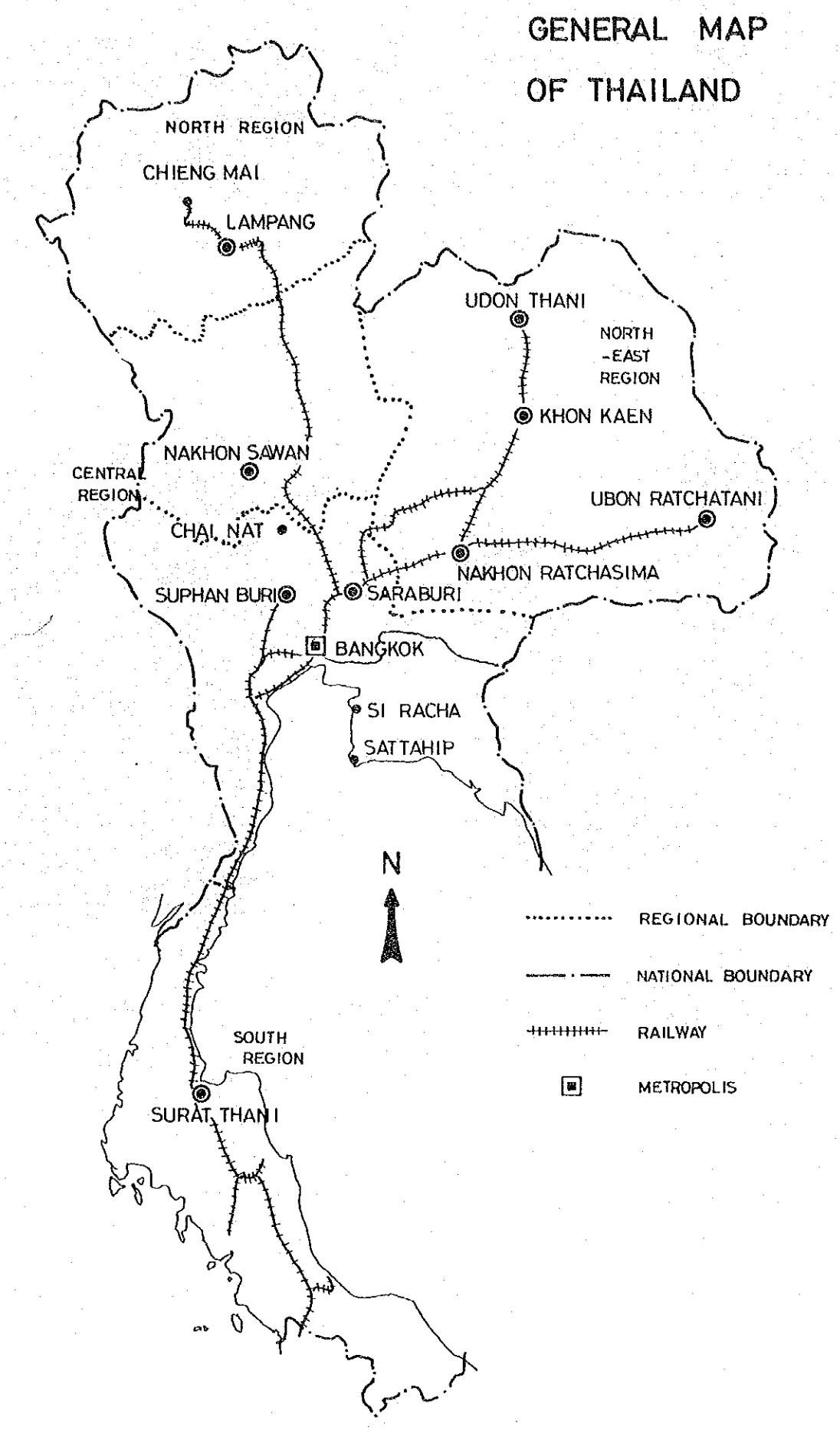
The team exchanged views with the officials concerned of the Government of the Kingdom of Thailand and conducted a field survey.
After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Kingdom of Thailand for their close cooperation extended to the team.

September, 1984

Keisuke Arita
President
Japan International Cooperation Agency


GENERAL MAP
OF THAILAND
NORTH REGION
CHIENG MAI
LAMPANG
UDON THANI
NORTH
-EAST
REGION
KHON KAEN
NAKHON SAWAN
CENTRAL
REGION
UBON RATCHATANI
CHAI NAT
NAKHON RATCHASIMA
SUPHAN BURI
SARABURI
BANGKOK
SI RACHA
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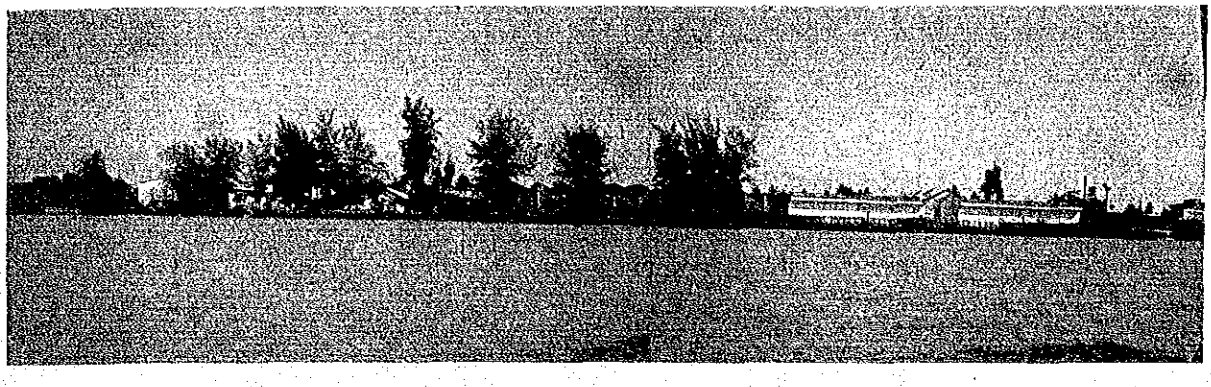
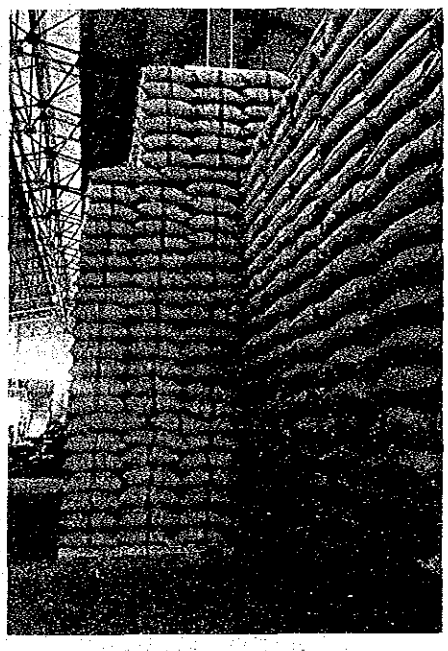
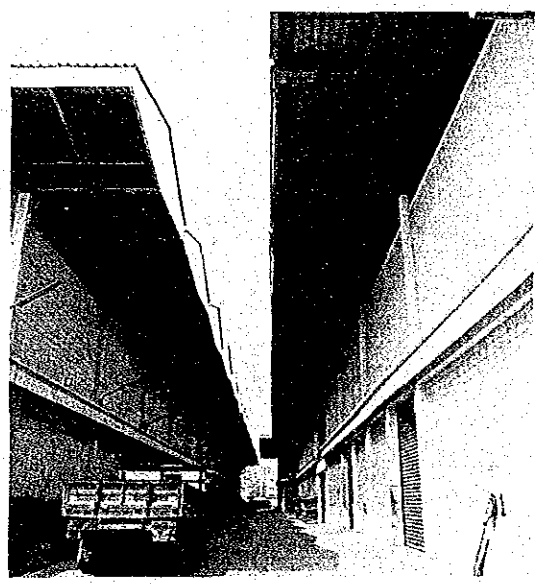
N
REGIONAL BOUNDARY
NATIONAL BOUNDARY
RAILWAY
METROPOLIS
SOUTH
REGION
SURAT THANI

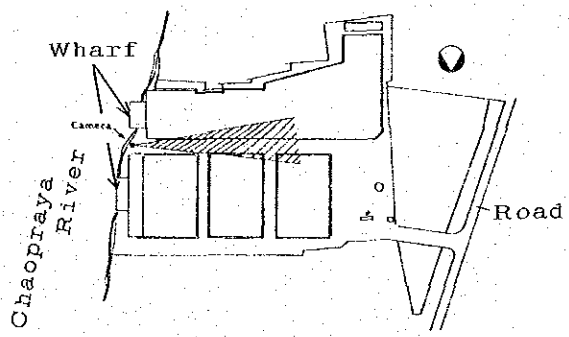


PWO Bangkrasor Warehouses, Northaburi,
viewed from the Chaopraya River

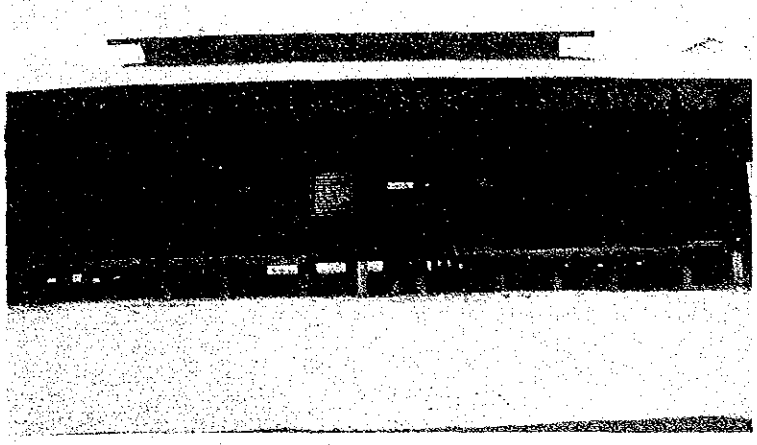


Typical rice
storage in
warehouse
(PWO Warehouse
at Rajburana)

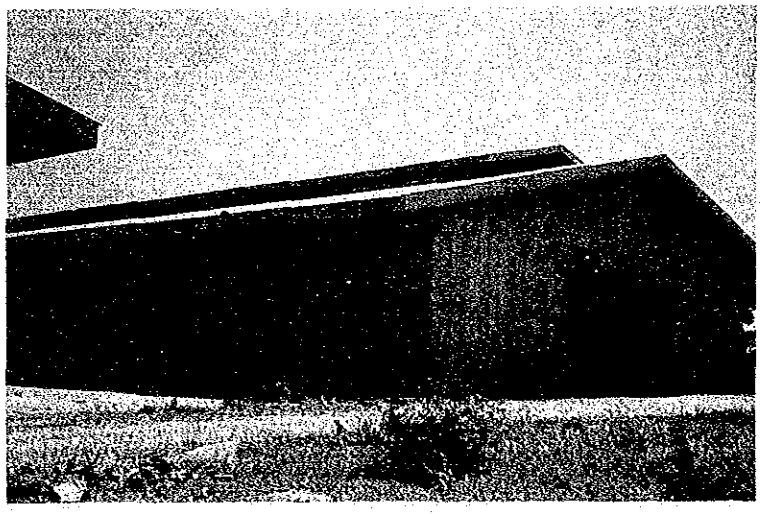




PWO Bukkalo Warehouse,
capacity 51,270 tons

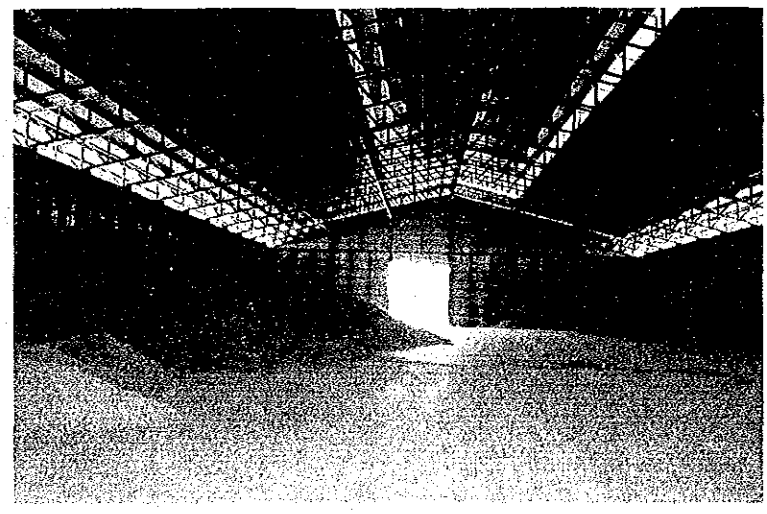


Traditional wooden warehouse owned by PWO (20 x 10 m) for bulk paddy storage, Ban Pai, Kohn Kaen

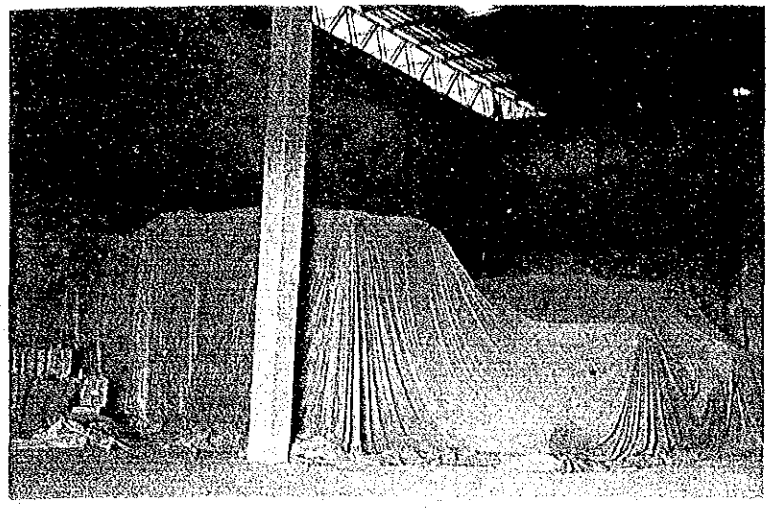


Exterior

One of the steel structure warehouses in a rural area

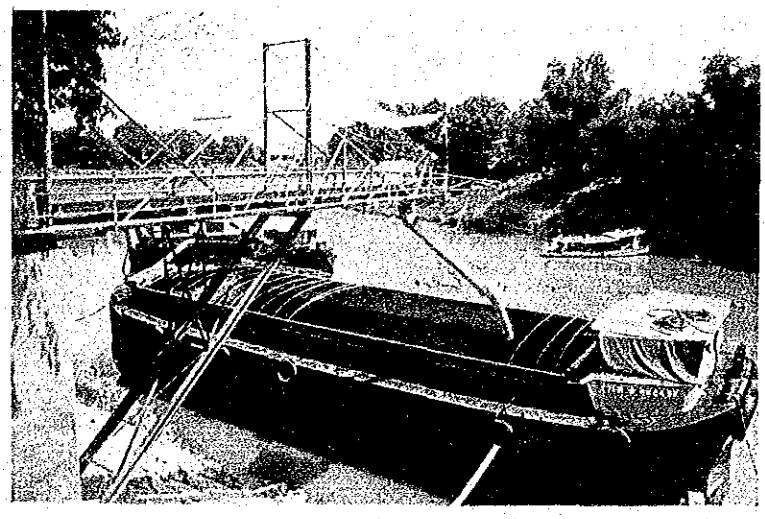


Interior

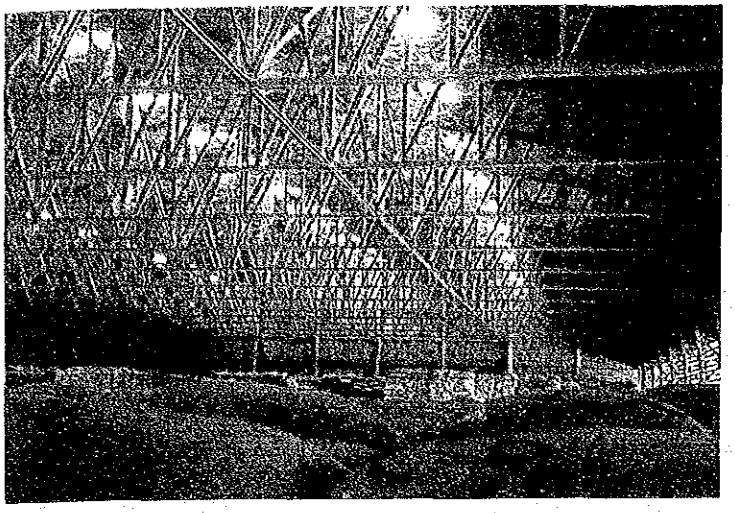


Fumigating by applying methylbromide

Manual mixing, weighing and bagging operations for export rice at a port warehouse

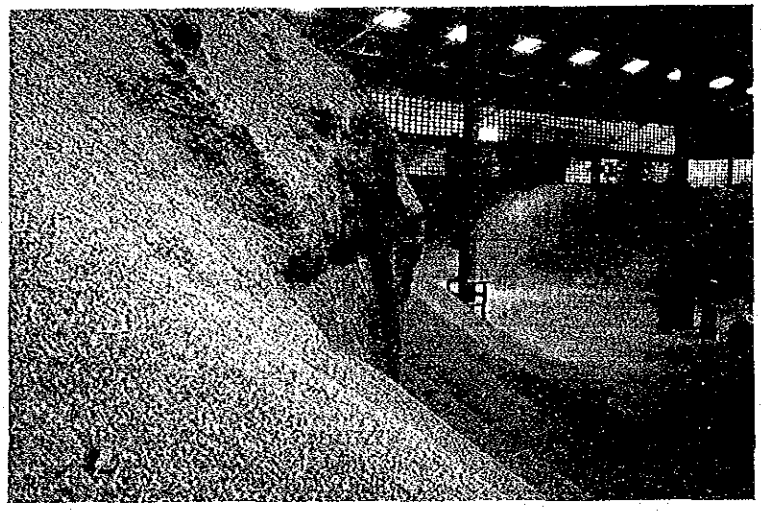


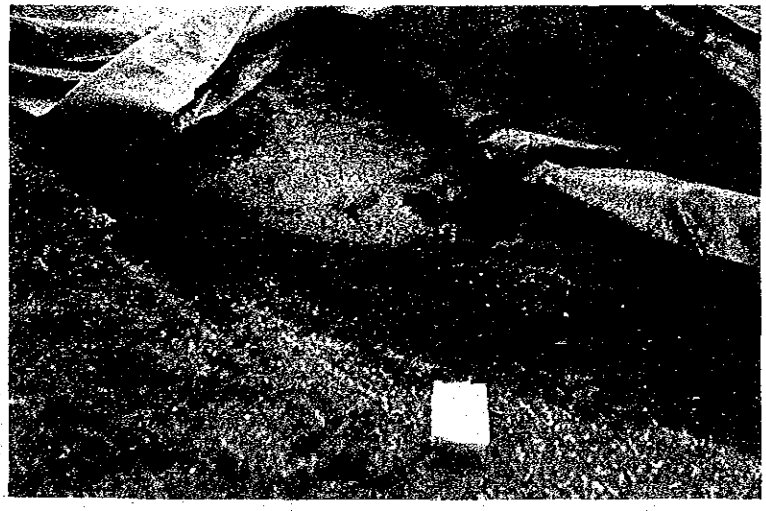
Barge loading equipment for bulk grain in Tarua Port



Typical condition of upper part of warehouse: many cobwebs are visible between the steel trusses

Paddy damaged by sweating and heat in bulk storage due to high moisture





Example of floor condition in traditional warehouse after removal of rice: moisture passing from the ground through the husks and sheeting has caused heavy damage to the stored rice

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ABBREVIATION

ACFT	Agricultural Cooperatives Federation of Thailand
Amphoe	District
BAAC	Bank for Agriculture and Agricultural Cooperatives
BOT	Board of Trade of Thailand
Changwat	Province
CPD	Cooperatives Promotion Department
EC	European Community
EDB	Ethylene Dibromide
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
MOF	Marketing Organization for Farmers
NESDB	National Economic and Social Development Board
OMIC	Overseas Merchandise Inspection Co., Ltd.
PWO	Public Warehouse Organization
SANYU	Sanyu Consultants Inc.

INTRODUCTION

In June, 1982, the Government of Thailand proposed a project to the Government of Japan under the title of "Development of Storage Facilities and State Trading Services of Agricultural Products", to request financial and technical assistance required for the extensive improvement of Thailand's warehouse facilities.

In the response to the request, the Government of Japan dispatched a Preliminary Survey Team to Thailand in December, 1983. The Scope of Work for the feasibility study Phase I, "Comprehensive Storage Facilities Development Project", was agreed and signed between Dr. Savaraj Sachchamarga, Managing Director, the PWO as a counterpart agency and Mr. Haruo Tsuchiya, Leader of the Team.

The feasibility study Phase I aimed at analysing general conditions regarding the storage facilities of agricultural products, and identifying plans for the solution of the problems to be implemented by the PWO. The study was conducted by a JICA Study Team consisted of six members, headed by Mr. Kaichiro Aida on the field survey in Thailand and home office work in Japan.

The field survey was carried out in close cooperation with the PWO, for 45 days from February 15 to March 31, 1984 in order to collect and analyse the necessary data and information. Practical discussions were held many times with the PWO officials, with a special focus on every aspect of market intervention operation in the past and present. The study was conducted on the roles and functions of the PWO, as well as such concerned agencies as Cooperatives Promotion Division, Agricultural Cooperatives Federation of Thailand, Bank for Agriculture and Agricultural Cooperatives, Marketing Organization for Farmers and major non-governmental organization concerning with the marketing of agricultural products in Thailand.

The field reconnaissances were conducted over a wide area in the country to acquire the first-hand knowledge of the existing conditions of warehouses. In this course, the emphasis was placed on the PWO's local activities and the conditions of warehouses owned and rented by the PWO.

The careful review and additional detailed study of the data, statistics, information and analysis results, collected and prepared from the field survey, were conducted in the home office from May 23 to July 6, 1984 and the basic direction and concept of the components of the Project was concluded.

This report has been prepared to formulate a basic and practical plan which would be studied further in the course of Phase II.

ITINERARY

Date	Particulars	Lodging
Feb. 15 (Wed)	Arrival of the Team (4 experts)	Bangkok
Feb. 16 (Thr)	Preparation for the study	Bangkok
Feb. 17 (Fri)	Courtesy visit to Japanese Embassy, JICA and PWO	Bangkok
Feb. 18 (Sat)	Preparation for Agenda of the study	Bangkok
Feb. 19 (Sun)	Preparation for Agenda of the study	Bangkok
Feb. 20 (Mon)	Agenda submitted to PWO, Discussion with PWO Co-ordinating Committee	Bangkok
Feb. 21 (Tue)	Discussion with PWO Officials	Bangkok
Feb. 22 (Wed)	Discussion on the policy of price intervention and functions of PWO	Bangkok
Feb. 23 (Thr)	Data collection, Discussion among the Team Members	Bangkok
Feb. 24 (Fri)	Courtesy visit to Minister of Commerce, Reporting to JICA and Japanese Embassy	Bangkok
Feb. 25 (Sat)	Discussion among the Team Members, Preparation for survey sheets	Bangkok
Feb. 26 (Sun)	Discussion among the Team Members, Arrival of the Team (2 Experts)	Bangkok
Feb. 27 (Mon)	Field observation in Bangkok Area	Bangkok
Feb. 28 (Tue)	Field observation in Saraburi and Nakhon Rajchasima	Nakhon Rajchasima
Feb. 29 (Wed)	Field observation in Ban Pai, Bua Yai, Nakhon Rajchasima and Udon Thani	Khon Kaen
Mar. 1 (Thr)	Field observation in Yasothon and Ubon Ratchathani	Ubon Ratchathani
Mar. 2 (Fri)	Field observation in Si Sa Ket, Srin and Buriram	Nakhon Rajchasima
Mar. 3 (Sat)	Field observation in Tha Rua and Ayuttaya	Bangkok
Mar. 4 (Sun)	Summing-up of Data	Bangkok
Mar. 5 (Mon)	Discussion among the Team Members	Bangkok
Mar. 6 (Tue)	Visit to MOF, Discussion on the study	Bangkok
Mar. 7 (Wed)	Visit to CPD, Field observation in Pathum Thani and Ayuttaya	Bangkok
Mar. 8 (Thr)	Visit to BAAC, Field observation in port warehouses	Bangkok
Mar. 9 (Fri)	Visit to ACFT, Discussion on the study	Bangkok
Mar. 10 (Sat)	Summing-up of data	Bangkok
Mar. 11 (Sun)	Holiday	Bangkok
Mar. 12 (Mon)	Discussion on the Progress Report	Bangkok
Mar. 13 (Tue)	Field observation in Bangkrasor, Discussion on the Progress Report	Bangkok
Mar. 14 (Wed)	Survey on the present wharf warehouses situations	Bangkok
Mar. 15 (Thr)	Preparation for Progress Report, Field observation in Suphan Buri	Bangkok

Date	Particulars	Lodging
Mar. 16 (Fri)	Discussion on the Progress Report, Field observation in Bangkok Area	Bangkok
Mar. 17 (Sat)	Discussion on the Progress Report, Field observation trip to Surat Thani	Bangkok/ Surat Thani
Mar. 18 (Sun)	Field observation in Surat Thani	Bangkok/ Ranong
Mar. 19 (Mon)	Discussion on the Progress Report with PWO, Field observation trip to Bangkok	Bangkok
Mar. 20 (Tue)	Discussion on the Progress Report with PWO	Bangkok
Mar. 21 (Wed)	Discussion on the Progress Report with PWO	Bangkok
Mar. 22 (Thr)	Amendment to the Progress Report, Arrival of Advisory Committee, Field observation in Phitsanulok	Bangkok/ Phitsanulok
Mar. 23 (Fri)	Advisory Committee's courtesy visit to Japanese Embassy, JICA, Discussion with the Advisory Committee, Field observation in Lampang	Bangkok
Mar. 24 (Sat)	Discussion with the Advisory Committee, Field observation in Nakhon Sawan	Nakhon Sawan
Mar. 25 (Sun)	Discussion with the Advisory Committee, Field observation in Nakhon Sawan	Bangkok
Mar. 26 (Mon)	Preparation for Progress Report, Summing-up of data	Bangkok
Mar. 27 (Tue)	Preparation for Progress Report, Summing-up of data	Bangkok
Mar. 28 (Wed)	Progress Report submitted to PWO, Reporting to Japanese Embassy, JICA	Bangkok
Mar. 29 (Thr)	Collection and summing-up of data	Bangkok
Mar. 30 (Fri)	Collection and summing-up of data	Bangkok
Mar. 31 (Sat)	Departure of the Team (6 Experts)	

PERSON CONCERNED

Members of Advisory Committee

	Assignment	Name	Position
1.	Chairman	Mr. Mitsuho MORIMOTO	Director, Purchase Division, Operation Department, Food Agency, Ministry of Agriculture, Forestry and Fisheries (MAFF)
2.	Facilities	Mr. Akira AOKI	Senior Officer, Purchase Division, Operation Department, Food Agency, MAFF
3.	Marketing	Mr. Kojiro SEKI	Senior Officer, Purchase Division, Operation Department, Food Agency, MAFF
4.	Storage	Mr. Toshiro NONOMURA	Chief, Planning of Feed Industry Structure Section, Commercial Feed Division, Livestock Industry Bureau, MAFF
5.	Economic Evaluation	Mr. Toshio FUJINUMA	Assistant Manager, 1st Division, Loan Department I, The Overseas Economic Cooperation Fund

Members of the Study Team

	Assignment	Name	Position
1.	Team Leader	Mr. Kaichiro AIDA	Counselor (Former President) Overseas Merchandise Inspection Co., Ltd. (OMIC)
2.	Sub-Leader, Agro-Economy	Mr. Heijiro YOSHIHARA	Executive Director, Sanyu Consultants Inc. (SANYU)
3.	Marketing	Mr. Makoto YAMADA	Manager, Consultants Dept., OMIC
4.	Machinery and Facilities	Mr. Isamu YAMAZAKI	Sub-Manager, Consultants Dept., OMIC
5.	Storage and Architectural Structure	Dr. Isamu YAMASHITA	Technical Advisor, OMIC
6.	Civil and Foundation	Mr. Michio GOTO	Technical Staff, Tokyo Branch, SANYU
7.	Statistics	Mr. Masatoshi KONO	Consultants Dept., OMIC *

Note: * Home work only.

SUMMARY

1. Agriculture is the largest and most important sector of the Thai economy. Agricultural production has increased remarkably in the recent years at an annual average rate of five percent.

   Export of agricultural products have always been the major source of the foreign exchange earnings and they have about 70 percent of the total export income in 1981.

   With the steady progress of agricultural production, Thailand became the most advanced agricultural country in the Southeast Asia.

   In 1960, total export of agricultural products from Bangkok port was about 2.6 million tons, out of which milled rice was 1.3 million tons. After 20 years, the export of these products reached about 12.5 million tons including 3 million tons of milled rice.

   The income of Thai farmers, however, has been limited and their living standard is still low. In the Fifth Five-Year National Economic and Social Development Plan, special emphasis has been placed on the encouragement of farmers to develop their social and economic status.

2. Thailand's agricultural exports increased substantially in the past decade. However at the present they have to face the keen competition in the quality oriented international market. It is indeed difficult for Thailand to find new foreign buyers of Thai products as well as maintaining her traditional overseas market. It is, therefore, a matter of vital importance to improve the quality of Thai agricultural products for export and also to develop the related systems and facilities in order to facilitate the application of the appropriate technology.

3. In the domestic marketing of agricultural commodities, traders, in general, can take advantage over farmers since farmers have little knowledge about marketing, especially pricing mechanism. Thai farmers are not an exception in this case.

   If the farm gate price of agricultural products could not satisfy the farmer's minimum requirement, it would be impossible to ask the farmers to improve the quality of their products. In addition to the proper incentive to be given to the farmers, it is also necessary to develop the post-harvest facilities, such as storage, transport, processing, handling and so forth.

4. According to the survey conducted by the Bank of Thailand in 1979, total capacity of storage of various commodities in Thailand was about 14.4 million tons. Most of these storage facilities are simple shelters to protect the commodities from rain or theft.

   Many of the storages used for rice stock in the country are built mainly to store paddy so that they are not suitable to store milled rice safely under the severe climatic conditions in the tropics. Furthermore, insufficient knowledge on the storage technology caused much inconvenience and losses. Insect pests and rodents damages to the stored rice and other products are estimated to be enormous.

5. In Thailand, various equipment and facilities, including processing, storage and ship loading, for cassava products, maize and sugar for export have been improved rapidly in line with their remarkable increase of exports in the past two decades.

   However, as far as the transport and loading facilities of rice are concerned, very little change has been made to improve the efficiency of the necessary works. Most of the ship loading facilities are remained unchanged as they were in 1960s when the rice exports were 1.5 million tons, while the rice exports have already reached 3.7 million tons in 1983.

6. The Public Warehouse Organization (PWO), being a state enterprise attached to the Ministry of Commerce, has been assigned by the Thai Government to alleviate the hardship of low-income people and is instructed to offer its relevant service to stabilize the prices of certain agricultural products through its procurement and distribution of these commodities.

   Among several agricultural products with which the PWO has been dealing, rice is the most important item in view of its significant effect on the national economy.

   In the past, the PWO performed its duty in compliance with the instructions given by the Government to stabilize the price of rice regardless of the unfavorable market conditions. As a consequence of this difficult operation, the marketing strategy of the PWO resulted in a considerable deficit of its account.

7. Some of the causes attributed to the unfavorable result of rice marketing operation of the PWO is reported that storage facilities of rice at the desired places are short in numbers and far below the acceptable standard.

   In fact, the PWO was obliged to rent a great many privately owned warehouses to stock rice. Unfortunately, most of these warehouses were low-standard and not suitable to store milled rice for a long period of time.

   Under these circumstances, losses and wastages of stored rice under the PWO's operation were far beyond normal expectations.

8. When the study team assigned by JICA visited Bangkok, H. E. Kosol Krairiksh, the Minister for Commerce, the Government of Thailand, personally told the team members that the Thai Government intended to allow the PWO to intervene in the market of agricultural products and the target of procurement by the PWO would be about 10 percent of the marketable surplus of the commodities under the program agreed by the Government.

9. In view of these significant points to improve the technical and economical functions of the PWO, it is considered that the Comprehensive Storage Facilities Development Project of the PWO would be undoubtedly of great help to improve it's functions to meet the national requirements.

The primary objectives of this project would be as follows:

1) to increase farmers' income and improve their living standard.
2) to secure and develop overseas markets through improvement of quality and efficiency of loading capacity at port.
3) to facilitate government programs such as paddy price support and rice price stabilization.
4) to reduce post-harvest losses and wastages.

10. Based on the findings of the Feasibility Study Phase-I, it is concluded that the project to improve the storage facilities of the PWO would be urgently necessary and it is recommended that further study should be taken as soon as possible to promote and to justify the project.

The basic concept to approach the project would be as follows:

1) Regional Warehouses

Under the project, new warehouses with total storage capacity of 180,000 tons would be constructed at the selected places. This estimation of storage capacity is made based on the following factors:

i) The PWO will procure about 450,000 tons of milled rice annually.

ii) The existing warehouses of the PWO were taken into account in terms of storage capacity, location and technical standard.

2) Central Shipping Complex

New shipping complex with a storage capacity of 35,000 tons will be required for smooth, efficient operation of receiving milled rice from regional warehouses, mixing, regrading, remilling and repacking. Advanced equipment for fumigation and loading of rice will be included as well.

3) Storage Technology Development Facilities

Appropriate technology of storage of agricultural products, including field works regarding storage, handling, pest control and ship loading as well as managerial control such as stock control, is essential to achieve the PWO's objectives.

In this connection, it would be necessary to have the staff training course and the relevant facilities attached to the PWO.

This report on the Comprehensive Storage Facilities Development Project has been prepared based on the study carried out in the Feasibility Study Phase-I with generouse guidance and cooperation extended by the PWO and other authorities concerned in Thailand. Since the Studv Phase-I is confined to find out the facts related to the problems of storage and marketing of the PWO and to formulate the basic concept to approach the realistic way how to improve the PWO's function, it would be necessary to make a further study on the technical & economical evaluation possibly with adjustments and alternatives, so that the project could be fully justified to obtain external financing assistance and technical cooperation.

CHAPTER I AGRICULTURE IN THE THAI ECONOMY

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1-1 Agriculture in the Thai Economy

Basically, Thailand is an agricultural country. Although other sectors of the economy have been rapidly gaining in importance, economic activity centers largely upon producing, marketing and processing farm commodities, and will remain so for years to come.

Agriculture's share of the Gross Domestic Product (GDP) has fallen significantly over the last twenty years, but still contributes 24% of total GDP. More importantly, agriculture provides employment for about three-fourths of the Thai labor force and accounts for 70% of total exports in the year of 1981.

Table I-1 Percentage share of Agriculture in the Thai Economy

(Unit: Percent)

	1972	1977	1979	1981
Gross Domestic Product	30	28	26	24
Total Exports	72	73	68	47
Employment	72	73	74	70

Source: NESDB, Agricultural Productivity and Land Use Planning Committee, Agricultural Development Plan 1982 - 1986

1-1-1 GDP Share of Agriculture

In 1980, the share of agriculture in the GDP was officially estimated at 25.8% (including forestry and fisheries, which together account for about 7% of GDP)(Appendix O-1). However, it is generally said that Thai national account data does not adequately reflect the overall importance of agriculture in the economy, partly because of a lower domestic price for rice than international price, which is by far the major agricultural product.

1-1-2 Growth Rates of GDP Originated from Agriculture

The rate of growth of Thai agriculture is high. The annual increase in total farm production averaged 5.5% in the 1960 - 70 period, 5.1% in 1970 - 76 and 3.9% in 1977 - 1981, as compared with 9.2%, 7.1% and 8.6% for the non-agriculture sector in these periods. It seems that the non-agriculture sector of the economy has grown much faster than agriculture, therefore the importance of the farm production in the GDP has been declining. This share was declining from 38.9% in 1960, to 28.5% in 1970 and 25.8% in 1980. (Appendix O-2)

During the third Economic and Social Development Plan (1972 - 1976), GDP originating from the agriculture sector at constant prices increased at the rate of 5.1% per year. However due to the declining rates of growth for production in the non-agricultural products during the fourth plan, the rate of growth of total production during this period was only 3.9% per year. Crops represented the biggest share in agriculture production. (Table I-2)

Table I-2 Growth rates of Agricultural Products in Constant Prices

(Unit: Percent)

	Agriculture	Food Crops	Livestock	Fisheries	Forestry
1972 - 76	5.1	6.0	7.3	-1.9	3.0
1977 - 81	3.9	5.3	4.1	-5.5	0.8

(Derived from GDP statistics, Monthly Bulletin of Bank of Thailand)

During the Fourth and Fifth Economic and Social Development Plans, about 74% of the value added in agriculture was food crops. Value added originating from Livestock, Forestry and Fisheries was 11.4%, 4.6% and 9.9% respectively. Since most of the planted areas are in rain-fed zones so that the production has been most likely to be affected by weather, especially rainfall. This has been the main cause of the fluctuating annual growth rates of GDP of agriculture (10.6% in 1978 and -1.5% in 1979, for example). (Appendix O-2)

The increase of agricultural products during the period of the Third and Fourth Plans were resulted from the extension of planted areas. During this period, while, planted areas increased not less than 4% per annum, e.g. planted area of field crops, oil bearing crops, perenial trees and paddy (including second rice crop) increased at the rates of 15.3%, 4.0%, 16.2% and 3.4% (2.1% for major rice crop) per annum respectively yield per rai of aggregate crop products mixed increased only by 0.5% per annum.

1-1-3 Diversification of Agriculture

Thai agriculture consists primarily of food crop production. Rice has been the most important crop not only for domestic consumption, but also for the country's export. The importance of the rice has been so dominant that until the mid-1950's, the amount of new agricultural products which appeared in the export market early in the mid 1950s were very small. Since the mid-1950's, astonishing progress has been made in the diversification of crop production; Thailand is now also a large producer and exporter of maize, kenaf, cassave products, sugar and molasses, together with rubber which has been traditional export item from the prewar days.

1) Parameters of diversification of crops

There are representative 10 crops, the added value of which exceeded 1 billion Bahts. The total added value of these crops represented more than 80% of total crops in recent years.

Although paddy still remains as the most important crop, the trends point out that its share in the added value of total crops is decreasing (Table I-4), at the same time the shares other products are increasing, especially cassava, maize, rubber and vegetables.

Table I-3. Value of Major Crops in 1979

Crops	1,000 millions of Baht
Paddy	40.6
Fruits	17.9
Cassave	8.9
Rubber	7.2
Maize and Sorghum	6.6
Vegetables	5.5
Sugar cane	4.3
Tobacco	4.3
Ground-nuts	2.0
Soy bean	1.7

Source: NESDB, Agricultural Productivity and Land Use Planning Committee, Agricultural Development Plan 1982 - 1986

Table I-4 Shares of Value to GDP of Major Crops

(%)

	1972	1977	1979
Paddy	43	38	37
Vegetables	3	4	5
Cassava	4	7	8
Sugar cane	4	6	4
Maize and Sorghum	4	3	6
Rubber	4	6	7
Fruit	15	17	16
Tobacco	2	4	4
Other	21	15	13
Total	100	100	100

Source: NESDB, Agricultural Productivity and Land Use Planning Committee, Agricultural Development Plan 1982 - 1986

2) Parameters of diversification of major crops by region

The Central Region, which are relating fertile, has a considerably larger share in agricultural products produced in the country. The Central Region produced 35% of total output of agricultural products during the period of 1975 - 1979, and it was achieved by 20% of all farming households in the country (This ratio is in 1980). The output of agricultural products of North Eastern, Northern and Southern regions accounted for 26%, 25% and 14% respectively, and the ratios of farming households were 44%, 26%, and 14%.

As for the origins of major crops, non-glutenous rice, sugar cane and cassava are mostly planted in the Central region; glutenous rice and kenaf are dominant in the North Eastern; the Northern is the main source of rice and maize; rubber plantations are almost totally located in the South. (Table I-5)

Table I-5 Share of Production of Major Crops by Regions between 1975 - 1979

(Unit: Percent)

	Central	N.Eastern	Northern	Southern
Non-glutenous rice	49.3	16.8	25.6	8.3
Glutenous rice	0.2	63.6	35.3	0.9
Maize	31.1	14.7	54.2	-
Sugar cane	88.4	3.6	8.0	-
Kenaf	2.9	92.7	4.4	-
Cassava	69.6	19.1	7.7	3.6
Rubber	4.9	-	-	95.1

Source: NESDB, Agricultural Productivity and Land Use Planning Committee, Agricultural Development Plan 1982 - 1986, refering to data, processed in the Office of Agricultural Economics, Ministry of Agriculture and Cooperatives

The rates of growth of agricultural products by region are also quite different in the period of 1972 - 1979. The growth rates in the North Eastern and the Northern regions are far behind, almost half of that of the Central region. (Table I-6)

Table I-6 Rates of Growth of Agricultural Products in Different Regions at Constant Value

(Unit: Percent)

	Central	N.Eastern	Northern	Southern
1972 - 1976	8.2	4.4	3.3	6.0
1976 - 1979	5.1	1.5	4.2	6.0
1972 - 1979	7.0	3.3	3.6	6.0

Source: NESDB, Agricultural Productivity and Land Use Planning Committee, Agricultural Development Plan 1982 - 1986

The North Eastern region with less productivity per farming household (44% of country wide total farming households produces 26% of total agricultural output in the North Eastern region, while 20% of total farming household produces 35% of total output in the Central region; the productivity per farming household in North Eastern region is 33.8% or one third of that in the central region.) has lower growth rate of agricultural output. The gap of productivity per farming household is presumed to be even wider in the future.

1-2 Agriculture in National Economic and Social Development Plan

The fundamental role of agriculture in development of the country's economy was fully recognized in the First National Economic and Social Development Plan (1961 - 1966) and re-emphasized again and again from the Second Development Plan (1967 - 1971) up to the Fifth National Economic and Social Development Plan (1982 - 1986).

Main objectives of the agricultural policy of Thailand, as stated in the preceding Plans and the Fifth Plan as well, are:

1. to expand and diversify agricultural production
2. to increase the real income of farmers by ensuring their higher production
3. to improve their socio-economic conditions

However, according to the past 20 years of development, an increase in the agricultural production has resulted from extension of farming land rather than improvement of production efficiency. One major change as pointed out in the Fifth Development Plan is that even if extension of planted areas is less, there are more opportunities to increase yield per rai.

Therefore, the main target of agricultural development in the course of the Fifth Development Plan is to promote the capability of farmers' productivity or production efficiency instead of extension of farming land (Refer to 1. in the above main objectives.).

Based upon the past experiences of unbalanced economic growth which created both income-gap between people who are engaged in agriculture and other sectors of economy and also the imbalance among regions, the emphasis is placed upon the problem to solve poverty and effectiveness of actual implementation of Government policy for depressed areas. (This is not a changed policy as stated in the preceding Development Plan, (Refer to 3. in the above main objectives.) but more emphasis is put on the so-called "eradication of poverty".)

Both expansion of production in volume and eradication of imbalance among farming people have been the two main aims from the inauguration of the First National Economic and Social Development Plan and are emphasized in the Fifth Development Plan with a high tone.

In order to achieve the above mentioned goals, Thai government has adopted a more specific agricultural policy in which various measures are

sought through in the Fifth Development Plan (Appendix O-3, Appendix O-4), which include:

1. Improvement of the infrastructure, particularly irrigation and transportation
2. Provision of greater and improved inputs
3. Strengthening of research work and experimentation
4. Strengthening of agricultural institutions and/or organizations
5. Improvement of the marketing system and grading of farm products
6. Provision of more governmental services to farmers, particularly in extension, rural credit and price support of the major farm commodities

In addition to the general measures for achievement of agricultural development, the Government has started several regional programs in the disadvantaged areas, while continuing to promote development through general measures.

The accelerated rural development program has been designed to concentrate and intensify development activities in selected areas. Since 1965, this program coordinated several activities which included education, public health, public administration and public works in addition to all development program of agriculture. Agricultural development in such areas has been attached to different principles and objectives of different lines of rural development, and was assimilated to a "poverty eradication program" in the Fifth Development Plan.

1-3 Agriculture Supporting Thai Exports

1-3-1 Share of Agricultural Products in Exports

Thailand has been and still is basically agricultural country. Four export items, that is to say, rice, rubber, tin and teak, have been traditionally principal exports until the mid-1950s before agriculture diversification was rapidly implemented. Four traditional export items have occupied more than 80% of Thailand's export earnings. Since the mid-1950 astonishing progress has been made in the diversification of

crop production; Thailand became a large producer and exporter of upland-crops and their processed goods, such as maize, cassava products, sugar (Thailand was formerly a sugar importer.), molasses, oil-bearing seeds including caster bean. These new products were however, produced in negligible scale before finding their appropriate marketing channels in foreign trade,

Traditional export items have lost their importance in the share of export and new products have taken the place of the traditional ones. (Appendix 0-5) However, agricultural products still remain dominant in exports. Almost two third of exports now originate from agricultural products and their processed goods (for example, cassava pellets, sugar, molasses, fruits in air-tight containers, feed, etc.). (Appendix 0-6) Rice now shares approximately 15% in total value of exports as compared with about 45% in the period before agricultural diversification was implemented.

The economy of Thailand as a whole has also been stimulated by other factors, such as the rapid expansion of tin, the growth of tourism, export orientated industrialization which made an opportunity available for industrial goods exports to some extent. (textile, cement, etc.) However, agriculture will still certainly play an important role in Thailand's exports in the future.

1-3-2 Specific Feature of Export of Thai Agricultural Products

Thai farmers have sold rice commercially for more than a century, and a large proportion of farmers also grow some other crops for the market. Most of the farm production except rice have been marketed domestically and virtually all farm exports other than rubber have been handled from Bangkok. Through the improvement and extension of transport facilities, particularly since the mid-1950s, Bangkok has been connected with the more remote areas of the country where farmers had usually cultivated crops for their own subsistence. While some of the newer crops -- for example, sugar cane and cotton -- are marketed for domestic consumption in the early stage of agricultural diversification, the development of the production became closely linked to the export trade.

The export trade of Thailand first stimulated the partial commercialization of rice; then, soon after the war, it gave impetus to the production of rubber. Since the mid-1950's, the trade has encouraged planting of the newer crops such as maize, cassava, kenaf, sugar cane and castor seed. The fact that Thailand's exports depend mostly upon agriculture, implies that Thai crops rely largely or almost entirely on foreign markets for commercial outlets. Even now, almost 30% of rice production is dependent on foreign markets for outlets, in comparison with 50% in the 1930s in the prewar days. In case of other newer crops such as maize and cassava, ratios of exports against production indicate much higher levels than in the case of rice; almost 95% for maize in the 1960s and for cassava in first half of the 1970s. Since the exports of the Thai agricultural products is not always stable, a large share of Thai foreign trade earnings and cash income of many Thai farmers depends on the current trends of world markets and competition. And at the same time, poor harvests will give remarkable declining record in the export trade of the country. This trend can easily be found out in the export records in the years of 1973 and 1978 where previous years had poor harvests because of draught.

CHAPTER II DEVELOPMENT OF AGRICULTURE AND AGRICULTURAL PRODUCTS

CHAPTER II DEVELOPMENT OF AGRICULTURE AND AGRICULTURAL PRODUCTS

2-1 Macro-Economic Overview

Thailand, a nation of population over 46 million, (estimated population at mid-year, 46.5 million in 1980 and 48.5 million in 1982) remains essentially rural and agricultural in character. Although the metropolis of Bangkok- a modern city of over 5 million (5,150 thousands in 1980) is an exception, but nevertheless it is very important given its central and political and economic power and its demand for the production in the hinterland. The main feature of Thai economy is heavily dependance on agricultural output, because agriculture has been and still is the major source of both employment and income from exports. The agricultural strength of Thailand centered especially in the fertile delta-like Central Plain, north of Bangkok, has been historically prodigious, (rapid expansion of rice cultivation in prewar days and remarkable introduction of second rice crop cultivation after 1972) and has also been the principal force for growth to the Thai economic development. Thailand has been and is one of the leading rice exporters in the world, and in recent years has also participated in exporting upland crops and processed goods (maize, cassava pellets, sugar, molasses, etc.). Such export diversification of upland crops in the foreign market is quite an exceptional case in the South East Asian countries.

Leading by a dynamic private sector, the pace of Thai economic development has been rapid, but has also fostered some economic "dualism" since the Metropolis of Bangkok together with the Central Plain progressed faster than the other regions. Per capita income in the Bangkok Metropolis has been six to seven times greater than that of the northeast (with approximately one-third of the country's population).

During the 1960s and 1970s, Thailand achieved high aggregated growth averaging 7.5% annually, with real per capita income growing at 4.4% per annum. One of the main factors effected the growth of average per capita income in the 1970s was a remarkable decline in population growth from an

annual rate of over 3% in the 1960s to a level of not more than 2.1% in 1981 which is the ending year of the Fourth National Economic and Social Development Plan.

Over most of the period of the two decades before mid 1970s, domestic prices in Thailand were remarkably stable, growing at 2.2% annually. While the country has maintained high economic growth rates averaging about 8.2% in the second half of the 1970s, this growth has been accompanied by accelerating inflation (20% in 1980, vs. 4.2% in 1976).

2-2 Analysis of Agricultural Development

This chapter analyses the progress of agricultural diversification and rapid expansion of foreign trade of agricultural products of Thailand after the mid-1950s. However, a brief examination of the general trend of agriculture before 1950 cannot be omitted. Since rice has always been the most important crop in the development of Thailand, it is anticipated to play a continuing important role in the development of the country's economy.

When Thailand opened its doors to Western countries in 1855 with the signing of the Bowring Treaty, rice was not then a major export sharing only 2.7% in total exports in value. Sugar, then, amounted to 12.7% and was the biggest export item from Thailand (Appendix O-7). The literature on the subject of rice export seems to justify the conclusion that rice was a common item of Thailand's exports in the mid-1850s, but that the volume of export was erratic, depending on conditions in Thailand as well as on the nature of foreign demand. Rice exports reached 670 thousand tons at the beginning of the 20th century.

The growth rate of the population of Thailand is estimated at 0.83% per annum during the period from the mid-19th century, when total estimated population was at least 5.0 million, to 1911 when the first population census registered 8.3 million. On the other hand, the growth rate of paddy planted area is estimated at 1.82% nation-wide, from roughly estimated 4.2 to 12.4 million rais during the same period. In the Central Plain, in particular the growth rate of paddy planted area

marked 2.60% per annum. Accordingly, production increased from an estimated 20 to 56 million piculs, and particularly in the Central Plain, paddy production is estimated to have increased from about 8.0 million piculs to 36.0 million piculs during the same period.

Steady progress of paddy production in the Central Plain (2.60% annual growth rate of paddy planted area with 0.83 annual growth rate of population) has been one of the main factors for the rapid expansion of rice export from Bangkok and rice established itself as the leading and predominant export item in the history of Thailand's foreign trade.

Table II-1 Pattern of Thailand's Prewar Exports

(Unit : Million Bahts)

	Export Total Mil. B.	Total of four traditional items %	Rice %	Teak %	Tin %	Rubber %
Mid-1850	5.58	7.2	2.7	-	4.5	-
1913-14	115.52	90.0	85.4	4.5	-	0.1
1927-28	276.27	86.8	72.3	3.6	8.1	2.3
1931-32	134.21	71.9	57.8	3.7	10.0	0.4
1935-36	158.22	83.7	52.4	3.2	14.8	8.3
1950	3,472	80.5	48.2	4.1	7.4	20.8

Source: Mid-1850, D. E. Mallochi Siam, Some General Remarks on its Production 1953,other year Statistical Yearbook No.18, No.20, No.22

Statistical Yearbooks in the prewar days listed planted areas of only ten major crops. According to these statistical books, paddy planted areas always had more than a 95% share. However, share of paddy planted area may have actually accounted for about 90% because fruit trees and other common crops including vegetables were not included in these statistical records.

The agricultural development of Thailand has undergone tremendous change since 1950. Specifically, this change can be characterized by these three major factors:

1 Rapid progress of upland-crops planting

2 Negligible expansion of planted area of wet-season rice in the Central Plain

3 Significant development of second rice cropping in the Central Plain

The supporting conditions of this development of agriculture after 1950, in addition to various technical and institutional changes, are described in the following, from the viewpoint of overall socio-economic environment.

1) Limits of good wet land

The Chao Phraya basin, known as the "Good Wet Land" is suitable for commercial paddy planting. This area is seasonally flooded every year and limited in size by natural conditions. (about 28 thousand Km^2 or 17 - 18 million rais) This fertile rice producing-area had been entirely used for rice-planting by the mid-1950s. Therefore, the paddy-planting area in the wet-season of the Central Plain increased negligibly after the mid-1950s. Paddy planting area, then, increased mostly in the other regions, especially in the Northeastern region. The following table indicates this change.

Table II-2 Change of Paddy Planting Areas by Region

(Unit : million rais)

	Whole Kingdom	Central	Other Regions	N.Eastern	Percentage of Area against Whole Kingdom	
					Central	N.Eastern
1920-24	16.3	9.6	6.7	3.9	58.9	23.9
1930-34	20.1	11.8	8.3	5.1	65.2	25.4
1940-44	25.5	14.1	11.4	7.3	55.3	28.6
1950-54	35.7	17.0	18.7	13.5	47.6	37.8
1960-64	39.8	18.1	21.7	15.9	45.5	39.9
1973	50.2	21.8	28.4	22.1	43.4	44.0
1975	53.2	21.9	31.3	25.0	41.1	47.0
1977	53.4	20.7	32.7	24.7	38.8	46.4
1979	56.8	20.5	36.3	27.1	36.1	47.7
1980	56.9	20.7	36.2	28.2	36.4	49.6
1981	56.4	20.3	36.1	28.0	36.0	49.6

Source: up to 1950 - 54, Statistical Yearbooks No. 18, 20 & 22
after 1960 Agricultural Statistics of Thailand Series
(from 1955 issue to 1981/82 issue)

Central is old division including present Lower North.

2) Growth of labor force

The labor force engaged in agriculture increased sharply, based upon the high growth rate of the population at the rate more than 3% per year during two decades 1950 - 1970. The number of agricultural households increased remarkably during this period. In the case of agricultural diversification could not be made successfully, only traditional farming land, that is to say, paddy land was not able to accomodate such increasing population adequately. The average farm land per agricultural household thus declined from 27.80 rais in 1950 to 21.68 rais in 1962 when the agricultural census was conducted. Agricultural diversification was still immature during the early part of those years.

In the later part of these two decades, a considerable number of the farming labor force moved to upland-crops-planting area which served as the new agricultural frontier for expanding farming land. The farming area increased then from 69.7 million rais in 1962 to 109.4 million rais in 1973, at an annual growth rate of 4.18%. During the same period the annual growth rate of agricultural household increased at the rate of 1.8 per annum, from 3.2 million in 1962 to 3.9 million in 1973. Land in farm per agricultural household, therefore, increased from 21.68 rais to 27.97 rais during this period. Expansion of farming land to the upland-crops area beyond paddy fields gave impetus to the production of upland-crops.

3) Stabilized demand from foreign market

Thailand was favorably bestowed with the opportunity to find sizable outlets for upland crops and their processed goods, which had been previously planted for subsistence for a long time, in the foreign market through trade channels. The first of these upland crops was maize, followed by cassava products, sugar, etc. The planted area grew beyond one million rais for maize in 1959, for kenaf in 1964, for mungbean, cassava and sugar cane in 1964 and lastly for sorghum in 1974. All these upland crops were new cash crops which were introduced after agricultural diversification in large scale.

Thai-Japan maize trade agreement made in 1959, for example, stabilized both quantity and quality of maize export and helped the further development of maize trade. Sizable demand for cassava products from EC was also an important factor for the development of cassava planting.

2-2-1 Development of Upland Crops Planting

Development of upland crops has remarkably progressed since the mid-1950s --- after inauguration of agricultural diversification in Thailand. Development can be identified by the growth in both the planted area and the production.

1) Growth of planted area of upland crops

Growth of the upland crops area was slow in the early stages up to 1962 when the agricultural census was conducted and disclosed the actual acreage of upland crops planting. The growth rate of upland crops fields during the period from the mid-1950s to 1962 was not so different compared with that of rice fields. (2.19% vs. 2.33% in terms of average annual growth rate.) Since then, the growth rate registered an astonishingly high in the succeeding period from 1962 to 1973.

Table II-3 Growth of Upland Crops' Planted Acreage

	Upland crops acreage	Paddy planted acreage (wet season)
	(1,000 rais)	(1,000 rais)
Mid-1950s *	5,165	34,625
1962 **	6,144	41,618
1973 ***	20,738	50,232
1980 ***	26,071	56,882

Source: * Statistical Review of Thai Agriculture, figures in 1954
** Agricultural Census Report, 1963
*** Agricultural Statistics of Thailand

Table II-4 Average Annual Growth Rate of Upland Crops Acreage

	Upland crops acreage (%)	Paddy planted acreage (wet season) (%)
Mid-1950s -- 1962	2.19	2.33
1962-1973	14.59	1.72
1973-1980	3.18	1.78

(derived from data in table II-3)

However the aggregate planted acreage may be a little larger than the upland crops acreage, because the upland crops acreage could be under crops more than once, from time to time. The aggregate paddy planted acreage was also larger than the paddy planted acreage in the wet season, if taken the second crop of paddy planting into consideration.

The development of the planted acreage of major individual upland crops after 1950 is shown in the following table: (Appendix 15-8)

Table II-5 Growth of Planted Acreage of Major Upland Crops After 1950

(Unit : 1,000 rais)

	Maize	Mung Bean	Cassava	Sugar cane	Kenaf	Sorghum
1939-46 av.	67	33	-	124	-	-
1950	226	253	85	377	31	-
1955	347	216	86	647	53	-
1960	1,785	327	447	986	877	-
1965	3,605	753	637	833	2,401	-
1970	5,183	1,493	1,403	1,285	2,631	254
1975	8,200	1,022	3,715	2,444	2,038	1,226
1980	8,960	2,796	7,250	2,927	1,063	1,546

Source: Agricultural Statistic of Thailand Series (from 1955 issue to 1981/82 issue)

2) Growth of upland crops production

The production of upland crops started from an almost negligible amount in 1950 and has attained a tremendous rapid growth rate within 30 years. During this period, rice production has increased 2.5 times including the second crop planting.

Growth of selected major upland crops after 1950 comparing with rice production is shown in the following table. (Appendix O-9)

Table II-6 Growth of Major Upland Crops Production After 1950

(Unit : 1,000 tons
Rice : including 2nd crop)

	Rice	Maize	Mung Bean	Cassava	Sugar cane	Kenaf	Sorghum
1950	6,782	27	32	256	837	5	-
1955	7,334	68	34	256	2,699	10	-
1960	7,834	544	60	1,222	5,382	181	-
1965	9,218	1,021	125	1,475	3,045	529	-
1970	13,570	1,938	151	3,431	6,586	381	69
1975	15,300	2,863	121	8,100	19,910	307	231
1980	17,368	2,999	261	16,540	19,854	211	237

Source: Agricultural Statistic of Thailand Series (from 1955 issue to 1981/82 issue)

2-2-2 Development of Second Rice Crop

Thailand has two seasons, rainy and dry. Since 80 - 85% of rainfall concentrates in the rainy season so the normal agricultural season is only limited to the rainy season. The second rice crop planting is usually practiced exclusively in the favorable irrigated areas. Most of the paddy fields without the appropriate irrigation facilities can not be used for the second rice crop cultivation.

The official record of the second rice crop was not available prior to 1950. The first record on the second rice crop in 1955/56 agricultural season indicates that 50% of planted area was concentrated

in the Northern region, especially in the Chieng Mai valley, where farmers' irrigation system had already been developed, making the second rice cropping available with an average yield per rais of 300 kgs.

After 1950 the second rice crop cultivation in a sizable scale had developed especially in the Central Plain with great support by the Government. The main effort of the Government was made in two directions, irrigation and improved varieties. Construction of efficient irrigation systems had made available for a stabilized supply of irrigation water for the second rice cropping in the dry season and new improved non-photosensitive paddy varieties with higher yields has brought about good harvest of the second rice crop planting. Second rice crop is at the present, in 1980/81 agricultural season, yielding more than 2 million tons of paddy. (Appendix 0-10)

1) Irrigation system contributed to second rice crop

i) Chainart Diversion Dam

The construction of the Cainart Diversion Dam had started as early as in 1952 and was completed in 1956, and the construction of two main canals was followed. Two main canals on both sides of the Chao Phraya river completed in 1961 may be regarded as the initial stage of the irrigation system in the vast Central Plain. By and by, with the development of carefully designed irrigation net-work system in the Plain, the second rice crop planted area has steadily extended in the following years.

ii) Phumipol Dam

The Phumipol Dam was constructed across the Ping river in 1964. Water supply for the dry season had improved by after the completion of this Dam. However, the planted area of the second rice crop could not be extended greater than one million rais in the Central Plain.

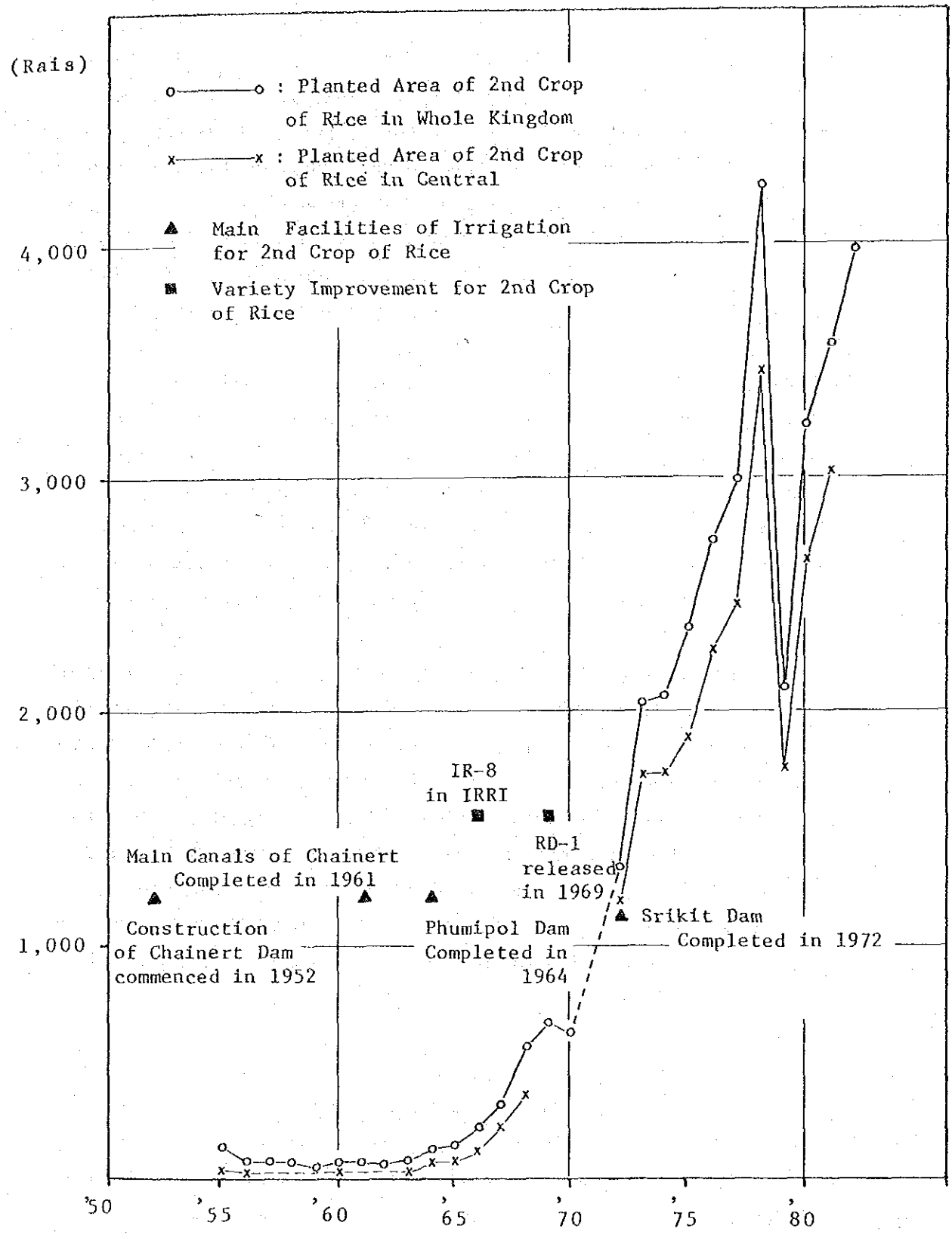


Fig. II-1 Development of 2nd Crop of Rice in THAILAND

iii) Srikit Dam

The Sirikit Dam, which was designed mainly for the purpose of increasing water supply for the second rice crop planting, was completed in 1972. Acreage of the second rice crop planting jumped up then to over one million rais, for the first time, in the Central Plain in 1972/73 agricultural season. The Central Plain had 3 million rais for the second rice crop planting area in 1981/82, which was almost 85% of second rice crop planted area in the Whole Kingdom.

2) Varieties improvement for the second rice crop

Together with the development of the irrigation system in the past years, another remarkably successfully contributor to the rapid extension of the second rice cropping was due to the new varieties which had been improved.

The new variety, RD - 1 created by crossing method instead of pure-line selection method employed in the former variety improvement experimentation, was released in 1969. This RD series of varieties have special characteristics of short-culmed, non-photosensitive, short growing period and still higher yield potentiality, suitable for irrigated area. Actual average yield per rais of second rice crop has been doubled after the release of the RD varieties and reached almost 600 Kgs, as compared with about 300 Kgs before the release of such varieties.

2-2-3 Development of Major Agricultural Products Exports in Terms of Quantity

The quantity of domestic exports (exclusive of re-exports) of Thailand fluctuates according to both domestic and foreign factors.

One of the domestic factor is the yearly agricultural production which is subject to the weather conditions of the year. The exports of the year following poor harvest usually decline compared with the

previous year's exports as in 1973 and 1978 where the previous year -- 1972 and 1977 -- had poor harvest owing to draught.

An important foreign factor is the foreign market conditions which had effects on demand of Thai products. Growing and stabilized foreign market will not only support Thailand's exports but at the same time, the development of Thai agriculture also.

1) Growth of exports in terms of quantity

Thai exports increased in quantity from 2,869 thousand tons in 1960 to 5,961 thousand tons in 1970 and 13,205 thousand tons in 1980. The annual growth rate of exports is averaged at 7.93% during these 20 years.

Exports, however, did not increase evenly in these years. Average annual growth rates of every 5 years in the period are as follows:

15.09%	1960 - 65
0.57%	1965 - 70
9.83%	1970 - 75
6.74%	1975 - 80

2) Exports from Bangkok port

i) Share of exports from the Bangkok port in total exports of the Whole Kingdom

Almost all exports were made through Bangkok port in Thailand. Based upon statistical records, during the past 20 years, exports of Bangkok had been, an average of 88% in quantity and 77% in value of total exports of the Whole Kingdom. The reason why the share in value was less than that in quantity is that such commodities as rubber and tin which have a higher unit value per ton were exported from ports in the Southern region.

Bangkok port registered an average share of 91% in quantity and 83% in value over the 5 years from 1975 to 1979, and 95% in quantity and 86% in value in 1980. Bangkok port is expected to increase its important role in export activities in the coming years.

ii) Growth of exports from Bangkok port

Exports from Bangkok port increased from 2,649 thousand tons in 1960 to 12,485 thousand tons in 1980, at an average annual growth rate of 8.06% over 20 years, based upon the growth of agricultural production, particularly, the rapid growth of upland crops production. (Appendix O-12) However, the growth rate of exports in quantity from Bangkok port has not been consistent throughout the period. The average annual growth rates of 5 year periods during that time were:

12.40%	1960 - 65
0.87%	1965 - 70
12.05%	1970 - 75
7.29%	1975 - 80

iii) Eight major agricultural products shipped from Bangkok port in terms of quantity

More than 80% of exports from Bangkok in terms of quantity consisted of eight major agricultural products in the past 20 years from 1960 to 1980. The percentage share of the eight agricultural products increased from 81% in 1960 - 64 to 88% in 1975 - 79 and 91% in 1980. This fact indicates clearly that exports of these eight agricultural products in terms of quantity dominates the amount of exports from Bangkok port. (Appendix O-12)

Bangkok port should be well facilitated in response to growing exports in terms of quantity and every facility should be well equipped particularly focusing proper shipment of eight major agricultural products.

2-3 Primary Factors Supporting Development of Agriculture After 1950

Both the government and the private sector of the economy have made an enormous effort to develop the country's agriculture through administrative activities and financial expenditures since 1950.

2-3-1 Role of the Government

Since 1950, large amount of fund has been allocated for developing the infrastructure to support the progress of agriculture by the government as well as the establishment of new institutions to support the agricultural development.

1) Infrastructure development

i) Irrigation works

Irrigation works have developed remarkably since 1950 and the agriculture entered a new stage of irrigation. The following are specific features of irrigation works since 1950.

1. Project scale increased.
2. Water ways had been made mainly for the purpose of transportation before 1950, however, since 1950 emphasis has been placed mainly on irrigation.
3. Projects are not only for flood control, but also have the purpose of double-cropping.

Government irrigation indicates that irrigated areas increased from 4,296 thousand rais in 1950 to 20,254 thousand rais in 1981. (Appendix O-13)

Many irrigation projects were completed between 1950 and 1980. Two projects, however, have to be given special attention with respect to the new innovatory system of irrigation in Thailand.

a) Chainert Diversion Dam (Weir)

The project is to construct a high, strong and long weir across main stream of Mae Nam Chao Phraya at Chainert and diversify a large volume of water to two sides, to the east and west banks to send irrigation water to the higher level Central Plain. This project expanded the paddy growing area and, at the same time, flood control in the Central Plain. This project is also the basis of delicately designed vast irrigation system including second rice cropping in the following years.

b) Phasom Dam ("Sirikit Dam")

The government built this second large dam after the first large-scale dam ("Phumipol Dam"was completed in 1964 for generation of electricity) in 1972. The main purpose of this project is to supply irrigation water for dry season rice cropping in the Central Plain. Statistics for a second rice crop have continuously appeared in government publications since completion of the dam after the 1972/73 agriculture season in Thailand.

Irrigation works since 1950 contributed greatly to improvement of agriculture.

a) The percentage of the irrigated area with respect to the area under annual crops improved from 11.92% in 1950 to 24.09% in 1981, even though the estimated area under the annual crops increased from 36,021 thousand rais to 84,077 thousand rais. (Appendix O-13)

b) The ten years average percentages of the harvested area against the rice planted area before 1950 had never been over 90%. These rates have visibly improved since 1950, and registered the following:

88.7% for 1920 - 29
86.4% for 1930 - 39
86.8% for 1940 - 49
91.6% for 1950 - 59
92.4% for 1960 - 69
93.3% for 1970 - 79

The rates of variation of these percentages are 17.7% for 1920 - 29, 29.4% for 1930 - 39, 31.9% for 1940 - 49, 16.3% for 1950 - 59, 9.8% for 1960 - 69 and only 6.3% for 1970 - 79. These indicators confirm a better stabilization of rice farming since 1950 by the benefit of irrigation. (Appendix O-14)

Double rice cropping has been improved in the Central Plain which contributed an enormous amount to the rice exports in the later part of the 1970s. The production of the second rice crop reached more than 2 million tons in the recent years. (Appendix O-15)

ii) Road construction

There were almost no road traffic services in Thailand before 1950. Waterways and railways were the only transportation means to carry all commodities. There were only a little more than 2,000 Km. State Highway without any pavement. The first paved road, 23 Km in length from Bangkok to Don Muang and another road 19 Km between Bangkok and Pak Nam were completed in 1936 and opened to the public. (Appendix O-16)

Highway Construction started systematically after 1950. Initial highway construction (Friendship Highway, East-West Highway and New Highway from Bangkok to Saraburi) was completed by 1960. New highways and/or road systems were extended to the remote areas throughout the country and the road conditions were much improved by paving year by year. The highway system extended as long as 11,287 Km. with 38.8% paved road in 1963 (Appendix O-17), and

28,079 Km. with 79.5% paved road according to the most recent data in 1980. (Appendix O-19)

The extension of highway facilitated the delivery of agricultural products from remote corners of the country to Bangkok to be exported. Maize cultivation started and expanded along the constructed highway. Diversification of the agriculture in Thailand began, for the first time, through the maize cultivation. It grew steadily at the early stage of highway construction, and was followed by other upland crops --- kenaf, cassava and sugar cane --- depending upon the different agro-economic condition of the different regions, along the extended highway network. Area under upland crops increased tremendously from a little more than 2 million rais estimated in 1950, 6 million rais in 1960, 20 million rais in 1970 and to more than 26 million rais in 1980.

Highway construction contributed substantially to the vast expansion of upland cultivation along the roads after 1950, as in the case of expanded rice cultivation outside the Central Plain along the railway. During the railway extension period of 1900 - 35, the transportation of rice from the up-country where no transportation was available formerly to Bangkok become possible.

According to an estimate of the Ministry of Transportation and World Bank, transported tonnage in 1979 was as follows:

- 6.2 million tons and 2.8 billion kilo-tons by railway
- 45.2 million tons and 11.8 billion kilo-tons by road
- (Figures unavailable for tons) 1.2 - 1.3 billion kilo-tons by water way

Estimated shares of each means of transportation (railway, road and waterway) upon a kilo-ton basis are 18:74:8. Transportation by road is now expected to have an 80% share during the 1980s, upon kilo-ton basis.

2) Agriculture supporting institutions

i) Research works

Agricultural research has developed remarkably since 1950. It is now conducted mainly by the Department of Agricultural Technology of the Ministry of Agriculture and Cooperatives. Three national universities of Kasesart, Chieng Mai and Khon Kaen together with the Institute of Chieng Mai (University level from vocational courses) are also engaged in the agricultural research. Each of these governmental agencies maintains research stations in various places throughout the country.

a) Development of research on rice

- It is generally believed that more than 3,000 naturally hybridized varieties of rice were planted throughout the country up to 1950.

- A rice experimental station was established as early as 1916 at Rangsit. From the standpoint of improvement of the quality of the export rice, a rice quality contest was conducted and the winners were honoured.

- Pure line selection research was started and carried out energetically from 1950 to 1954. The first recommended variety, Nahng Mon S-4, was in 1956. A number of the recommended varieties were introduced successively from the pure line selection works among the existing native varieties, particularly in 1959. The average yield of rice per rais increased remarkably in the following years. The average yield per rais for the major rice crops jumped from less than 200 Kg. in the 1950s to more than 250 Kg. in the 1960s. (Appendix O-20)

- The International Rice Research Institute (IRRI) was established in 1962 and IR-8 which is resistant to blast was introduced in 1966. IR-8 obtained the catch-word,

"Green Revolution". Most of the Southeast Asian countries adopted directly this variety for increasing production of rice. Thailand, however, did not do so. Thailand entered the stage of "cross breeding" from "pure line selection". A new variety created by crossing method was introduced as a recommended variety in 1969, called RD-1, which was the first non-photosensitive variety to be grown in an irrigated area in the dry season. Without such non-photosensitive varieties, second rice cropping could not be successful in the following years.

b) Research on maize and other upland crops

Maize is a traditional crop from long ago in Thailand. Traditional varieties of maize in Thailand belong to waxy, pop and/or flint. A new variety with higher yield, the Guatemala Collection No. 110 (commonly called "Guatemala-C-110, created by crossing Dent and Flint) was introduced in 1952. This variety has an average yield of more than 350 Kg. per rais as compared with about 200 Kg. for traditional varieties. This higher yield variety of maize gave impetus to quick expansion of maize cultivation in the upland crops area as a cash crop.

Sorghum appeared as a cash crop after the research work on sorghum started in 1966, and improved varieties, KU-257 and KU-206, were used for more than 70% of the sorghum planted acreage.

Many other research works on upland crops are now carried out: a new type of maize S-1 and S-2 by crossing Flint and Guatemala-C-110 and also, new soybean varieties, SJ-1 and SJ-2 by pure line selection method, SJ-4 and SJ-5 by crossing method are also being improved.

ii) Agricultural extension services

Thai farmers, in general, were in favour of small input, small risk and low-return of agriculture operation and had little or no use for findings of research for a long time, because they could not reproduce the same conditions under which the crops were grown at the research and/or experimental stations. The extension services have been offered from many different governmental agencies sporadically and so, agricultural extension services have been slow. An attempt was made to improve and strengthen all aspects of extension services and obtain coordination between these services and research centers in 1968, and then extension branches of various departments were combined into one Extension Department within the Ministry of Agriculture and Cooperatives. At the same time all local extension branches were also combined together at the levels of both Changwat and Amphoe.

However, the extension staff were scarce at all administration levels. Because of short of staff workers, in 1977, one extension officer had to cover an average of more than 8,000 farming families before the new expanded agricultural extension services system was inaugurated. The new, more intensively staffed extension system is called "kaset Tambol", because at least one extension officer is assigned to stay in the boundary of Tambol, to have direct contact with the individual farmer. Extension works focus on training and visiting contact-farmers (about 10% of farming families are selected), to transfer new agricultural technology such as improved varieties, proper spacing, and new agricultural practices, for example, necessary input and timely use of fertilizer, etc.

iii) Farmers' organizations for supporting agricultural development

In the light of the staff shortage of government officials in the early administrations and the complexity of agricultural works on farms, the possibility of government experts' direct contact with individual farmers was very time-consuming. There are, therefore, very practical reasons in principle in working through the farmers' organizations, although there are many other reasons which call for

the necessary requirements for the formation of farmers' organizations.

This principle had been widely adopted in Thailand, and many different kinds of farmers' organizations were established in ways of spontaneous initiation. Some farmers' organizations use different names, even though their functions are not very much different. (For example, the original credit cooperative, established in 1916, modeled after German Raiffaisen style; two farmers' groups, one under close contact with former Department of Rice and another under close contact with former Department of Agriculture; in addition to the above mentioned three, innumerable farmers' groups of clubs such as land improvement organization under specially recruited agronomists in IRD, people's irrigation association and so on)

The reason of these separate approaches lies in the initiatives taken by different government agencies to meet some felt need as it arose, when no other agency was then tackling it, --- for example, a push to improve the yield of rice, or to diversify to upland crops, etc. The trouble with these individual separate approaches is that when after the original purpose was fulfilled, all the other linkages in the chain of modernized and improved production methods are required, in other words, necessary inputs and agricultural services provision in a harmonious and timely manner would also be required. Farmers' organizations would be, then, reorganized based upon new social and agricultural requirement.

In 1968, the new Cooperatives Act was enacted in order to amalgamate several former village-level credit cooperatives into one Amphoe-level cooperative which would be capable of multi-purpose functions. At the present time, their activities include agricultural credit services, purchasing, land improvement, processing (rice milling is one of them), marketing of farm products and also extension services as well. Cooperatives amalgamation took three years to arrive at full operation from 1969 to 1972.

a) Classification of farmers' organizations
(formal and informal)

Different kinds of Farmers' organizations can be classified into formal and informal organizations. From another point of view, they can also be divided into economic and non-economic organizations. However, in the practical view they interact with each other practically and can not be separated for their specific functions in the daily lives of the villagers in the rural areas of Thailand. Informal organizations of farmers refer to groups that have no fixed hierarchical administration pattern such as the temple committee, school committee, young people's association, funeral society, labor exchange group and others. It is reported that about 60% of the agricultural households in the intensified farming area have been requested to help their neighbors in the harvesting and threshing activities.

b) Formal farmers' organizations
(cooperative and farmers' group)

Important formal farmers' organizations in Thailand are cooperatives (Sahakorn) and registered farmers' groups (Klum Kasetakorn). The functions of cooperatives and registered farmers' groups are very similar: in other words, they provide loans, fertilizer, insecticide, and farming equipment to member-farmers.

One difference is that cooperatives are under the supervision of the Department of Cooperatives usually with larger memberships and capitals, while the farmers' groups are under the Department of Agricultural Extension, and are usually smaller. Another difference is that farmers' groups are usually established by the villagers themselves, whereas cooperatives are established by the governmental administration.

Usually there is only one cooperative in one Amphoe and it is situated at the Amphoe Headquarters. There may be more than one farmers' group within one Amphoe, from the larger ones established in the old days which had as many as 600 members and provide all services needed for farmers as mentioned above, to the smaller ones with less than 100 members, which provide only cheap fertilizer.

In addition to registered farmers' group, there is another type, the unregistered farmers' group (Klum Chao Na).

This type of farmers' group is completely different from the foregoing registered farmers' group (Klum Kasetakorn), and does not undertake any activity such as a cooperative or Klum Kasetakorn. This group consists of only 10 - 30 members, two thirds of which must be land-owners. The functions of this group are quite limited. Individual members are provided with institutional credit on a collateral security basis.

iv) Agriculture financing institution

Agricultural extension services and farmers' organizations, which act synthetically providing both tangible inputs and invisible agricultural services, are necessary for the modernized agricultural operations. However, a good institutional agricultural financing system is also one of the indispensable elements which should be operating together with the foregoing two elements.

Before the Bank for Agriculture and Agricultural Cooperatives (BAAC) was established in 1966 the estimated outstanding debts of farmers amounted to 9 billion Bahts, mostly in the Central Plain. A great deal of this debt came from the very high interest rate charged by private money lenders. Interest rates are said to range from 25 to 60 percent per annum, or even higher according to risk from time to time (Appendix O-21). Demand for loans for agricultural production in those days amounted to 13.4 billion Bahts and the GDP of agriculture was 28.0 billion Bahts, in addition to such poor financial position for the farmers, only 8% of the needed

loan was granted from cooperatives and other institutional financial agencies. (Appendix O-22)

The government made a fresh start to put more necessary funds into institutional loans for farmers. Encouragement was given to the formation of new multi-purpose cooperatives or registered farmers' groups, and then, strenuous efforts were made to develop loan operations.

More or less 52% of the total estimated farmers 4,532 million bahts in 1981, were able to be provided with institutional finance. (Appendix O-23) According to a forecast of Bank of Thailand, the country's total credit requirement for farmers in 1980 amounted to 33,212 million Bahts. Institutional credit provisions to agriculture was 21,508 million Bahts representing 66% of the total demand. Financial operations should be considered as significantly improved within less than 20 years in comparison with those days before BAAC was established.

2-3-2 Investment

For the development of agriculture both public and private investments are required. Substantial expenditures were made from the government to set up various kinds of institutional instruments to support agriculture both before and after 1950. Private investment, at the same time, had also been made proportionately during the development of agriculture. But, the investment pattern has changed somewhat a little before and after 1950.

1) Investment before 1950

Agriculture in Thailand before 1950 used very little capital equipment. As commercialization proceeded in the rice production, farmers tended to spend more money for labor, but not for labor-saving devices. The expansion of rice production was accompanied by the capital investment in "rice mills". Rice mills were, at first, concentrated in Bangkok, however as railways operated in the North and Northeast, there was a tendency for the smaller mills to be

dispersed throughout the rice-growing regions. This is the investment pattern in the rice production expanding period before 1950. Such investment in rice mills was made entirely by the private sector of economy, and the rice mills at Bangkok served as shipping facilities for exporting rice.

2) Investment after 1950

The investment pattern after 1950 had changed accordingly to the diversification of agriculture, in line with the following:

investment in capital equipment,
investment in agricultural product processing facilities, and
investment in exporting facilities.

i) Investment in capital equipment for farming

Private investment has begun, by the using of capital equipment, particularly for machinery such as tractors.

Tangible investment can be identified, as production of upland crops expanded. Percentages of the agricultural households who used tractors in cultivation increased from 5.53% in 1962 to 33.00% in 1977, according to the statistical data of the Agricultural Census Reports of 1963 and 1978. Especially, in the latter year, large-size tractors (four-wheel tractors) had a share of 23.93%.

	1962	1977
Total number of agricultural households	3,179,050 (100.00)	3,991,123 (100.00)
Number of households using:		
tractors (total)	175,825 (5.53)	1,316,677 (33.00)
4 wheel only	n.a.	954,977 (23.93)
sprayer	124,538 (3.92)	754,762 (18.91)
thresher	58,360 (1.84)	211,287 (5.29)

Source: Agricultural census reports of 1963 and 1978

ii) Investment in agricultural processing facilities

The expansion of the upland crops production was accompanied by the capital investment in the upland crop processing facilities, for example, sugar mills for the sugar cane and the cassava pellet processing plants for the cassava roots, after 1950, while the expansion of commercialized rice production stimulated the establishment of rice mills before 1950.

The difference is that upland crop processing facilities were set up in the upland crops growing areas instead of Bangkok where large-size commercial rice mills were concentrated during the stage of rice production expansion before 1950. At the same time, rice mills functioned as the shipping facilities to outbound ships for several decades.

iii) Investment in shipping facilities

However upland crop processing facilities could not perform the dual functions as the rice mills did at Bangkok, but remaining only the processing function. This is because these facilities were located primarily in upland crop growing areas far away from Bangkok. There is a fundamental necessity to establish another separate facilities at appropriate locations at or around Bangkok to make proper shipment possible.

Most upland crops and their processed goods such as maize, cassava pellets and sugar, are shipped in bulk. In addition to the processing facilities, numerous shipping facilities have been arranged, in accordance to the expansion of upland crops production especially after 1970.

The first facility with silos and automatic loading spouts for maize shipment was constructed at Prapradaeng in 1966 and its operation commenced in 1967. Such facilities along the main stream

of Mae Nam Chao Phraya attained, by 1981, an estimated total capacity of:

Storage of more than 355 thousand tons for silos,
Storage of more than 550 thousand tons for flat warehouses and
55 - 61 thousand tons per day, loading speed at spouts.

In the case of cassava pellets, a huge shipping facility was constructed at sea borne area in 1977, where loading in bulk is possible for more than a 100 thousand ton D/W tanker with normal loading speed of 600 M/T per hour, automatically. In addition, two floating pontoons off Ko Sichang facilitates automatic loading at a speed of 14,000 M/T per day to 170,000 D/W ocean-going vessels.

More sugar terminal facilities also started in 1978 and sugar can now be both stored and loaded in bulk.

CHAPTER III MARKETING SYSTEM OF AGRICULTURAL PRODUCTS

CHAPTER III MARKETING SYSTEM OF AGRICULTURAL PRODUCTS

The existing marketing system of the agricultural products such as rice, maize, cassava and other commodities which contributed greatly to the exports of Thailand is studied in this chapter.

3-1 General Marketing System

Thailand has a marketing system which, on the whole, has been capable of responding to the demands of the market, moving the goods from farm to consumers or point of exports.

Although there are a few provincial terminal markets, Bangkok is the focal point of the marketing and the transportation systems. Trade and the transportation facilities between the provinces remain rather limited.

Agricultural commodity prices in any locality are not determined by the local supply and demand. All local marketing systems are open to outside suppliers. Local merchants (including middlemen) work in the centers of the producing areas, keeping track of export prices and soliciting bids from exporters and wholesalers in Bangkok.

Traders in Bangkok send out commodity price quotations (so-called "Hang Cheng Price") to their regular clients upcountry. Price quotations are sent by truck, by mail, or if prices change abruptly, by telephone. Generally, the traders provide trucks to transport the commodities to the exporters' or wholesalers' warehouses and pay unloading charges in advance. At the warehouse, they weigh and measure shipments and act as an agents for their upcountry clients. Local Merchants charge between 0.5 and 1% for their services depending on the location and the commodity.

Most farmers generally move their crops to market immediately after harvest due to lack of storage space, and to pay back debts and obtain cash for living expenses.

Farmers have to accept whatever price middlemen offer. By the same token, local merchants buying up small lots of commodities for resale have to take whatever price the central traders offer and deduct their marketing costs to arrive at the price paid to local growers.

Marketing of crops from farm-gate to consumer or export point is generally handled by four or five separate merchants and traders such as middlemen, local merchants in producing areas, and wholesalers, exporters in Bangkok. A number of large wholesalers and exporters maintain outlets or may also send directly to the consumers or the port of export.

Despite a market news service that has been functioning in the country, throughout the regions, market news has often been untimely, limited in scope, and in general available only to merchants and traders concerned, and not to the ordinary farmers.

For centuries, rivers and canals used to be the only year-round transportation routes to the city markets. However, the recent development of new highways and feeder roads has been providing an increasingly large number of farmers with better access to the market or collection centers. Commodities moved from the provinces to Bangkok consist largely of farm products. The major items in bulk and value are rice, cassava and maize.

3-2 Characteristics of Agricultural Product Marketing in Thailand

The national development programs so far have been concentrated mainly on the agricultural sector, since as agriculture is a primary source of the national income, accounting for about 26% of it's total income. In addition, employment in agriculture involves 15.6 million people or approximately 70% of the total employment. Agricultural export holds 68% of the total foreign exchange earnings of the country in 1979.

During the past 20 years, agricultural output has expanded at a rather high rate of about 5% per annum compared with the annual worldwide agricultural growth rate of only 2.5 to 2.8%. Thus, Thailand has become the only country in Asia who has continuously enjoyed the position of a main net food exporter during the period.

However, the characteristics of the country's past agricultural development and marketing rest on the following factors:

1) Thai agriculture has diversified into many new cash crops in order to satisfy domestic and world demand. There are 10 representative crops, the added value of which exceeded 1 billion Bahts. The total added value of these crops represented more than 80% of total crops of 1979.

2) Thai crops such as maize and cassava rely largely or almost entirely on foreign markets for commercial outlets, and since the export outlook for most of the Thai crops is uncertain, a large share of Thai foreign exchange and the cash income of many Thai farmers depend somewhat precariously on the unpredictable world market and competition.

3) Agricultural export commodities are collection of small quantity production from millions of farmers. With paddy, for example, farmers in the Central region retain about two fifths of their production and sell the rest.

4) Local farm trade lacks a basic marketing infrastructure such as storage and transportation causing farmers to rely on middlemen.

5) The "as is" quality of most products entering trade channels indicates a lack of proper post-harvest treatment. As a result, the quality of export shipments is substandard and not uniform.

6) A large quantity of products is normally marketed at the early stage of the harvesting season due to farmers' need of daily expenses and the lack of storage. The farm-gate price becomes rather low during the harvesting season.

7) Formulation of farmers groups for the trading purposes is still underdeveloped, so trade through cooperative systems or farmers organizations has been still limited.

8) Prices of most agricultural products are determined by wholesalers and export traders who are directly connected with the local merchants including middlemen and they have better information on market movements and price fluctuations than the general farmers. This weakens the relative bargaining power of the farmers.

9) Paddy collected from the farmers by middlemen is sold to rice mills and is kept mostly in warehouses owned by rice mills in the producing area until milling. Usually milled rice is delivered to clients such as wholesalers, exporters soon after the milling, however, when export is not active, the stockpiles of milled rice in the rice mills in the producing area increase largely.

10) Because of the marketable surplus of the major agricultural products is gathered into the metropolitan area for both area consumption and export, Bangkok is a main business center of the agricultural trading.

It is generally recognized that post-harvest practices and marketing shortcomings — including uneven product quality and lack of marketing facilities especially storage capacity — are inhibiting factors in Thai agricultural economy and which suppress farmer's income.

3-3 Government Policy on Marketing

Thailand's economic development over the last two decades through the diversification of the agricultural sector has been a success story, but the world economic and financial environment has now changed dramatically, necessitating that Thailand rethink its economic development strategy.

In the Fifth National Economic and Social Development Plan more specific guidelines for the development of export-oriented industries were laid down. Two of the major objectives of the 5th Plan are to attain semi-industrialized country status and to develop export-oriented industries.

The measures taken by the government during recent years to promote exports include the following:

1) Fiscal measures: The government has adopted a new policy on export taxes, and taxes on imports of raw materials for the manufacture of export products that is more in line with present realities. It includes the reduction of export tax and the speeding up of tax rebate payments in an attempt to make Thai exports more competitive abroad.

2) Customs formalities: The government has reduced the number of steps involved in applications for export permits, improved documentation systems to bring them into line with international standards, and increased manpower in order to serve exporters with greater speed and efficiency.

3) Quality control: Standards of inspection of export products have been tightened and more products have been made subject to quality control. Recently the government has taken measures to liberalize agricultural exports in order to boost farm gate prices. This has led to fierce competition and price cutting among Thai exporters, some of whom have resorted to adulteration in order to maintain profits. Such practices spoil the reputation of Thai products and lead to the loss of markets to Thailand's competitors.

4) Services: The government has streamlined the Export Service Centre to facilitate the activities of exporters, particularly solving problems and identifying new markets. Government support for the private sectors, in the form of identification of new markets, marketing strategy, market research, marketing information, marketing services and identification of new products, remain far from satisfactory and are insufficient in comparison with what pertains in successful exporting nations.

5) Infrastructure: The government is promoting marketing facilitate for export. These still lack adequate public utilities, for instance local markets, warehouses, transportations and telecommunications, which remain to be improved.

6) Development of Technology.

The development of appropriate technology for Thailand deserves close consideration for its long-term cost reduction benefits. At present Thai industry depends almost entirely on imported technology which is not entirely suitable to Thailand's conditions. The government should therefore encourage institutions concerned to intensify research into appropriate technology.

The world recession affected the Thai economy severely in the recent years. The economic slump in industrialized nations dampened the demand for farm export items, with the result that, while exports of all the main commodities increased, their export values increased only marginally and even decreased in the cases of rice rubber and maize.

Average world prices of rice fell by approximately 40 per cent in the year of 1982, causing local wholesale and export prices to decline markedly. In the face of this situation the Government implemented a number of measures designed to boost the price of paddy. New, gradually ascending floor prices for paddy were announced, and the Public Warehouse Organization and Marketing Organization for Farmers were instructed to intervene in the rice market when prices fell below the floor price level.

The scheme under the policy of "Paddy Price Support and Stabilization" has been launched from the 1980/1981 crop with the objective of raising farmer income. The PWO played an important role in the operation of the scheme by purchasing over one million tons of milled rice from millers in the crop years of 1980/81 and 1982/83. However, the operation resulted in an extremely large financial loss due to the lack of funds, storage facilities and skillful personnel in the operation.

Presently, the Government intends to intervene in the market by purchasing and selling about 10% of the marketable surplus of agricultural products, particularly, paddy, in order to increase the income level and living standard of farmers.

3-4 Production, Marketing and Export of Major Agricultural Products

3-4-1 Rice

In Thailand's economic history, rice has been the principal crop, leading export and mainstay of the economy. Its role in the farm production remains preeminent, although new crops have been developed at an astonishing rate.

Rice now provides roughly one-fifth of the value of Thailand's total exports. Accounting for two-fifths of the total value of farm production, rice holds one-tenth of GDP. By regulating the price of rice, the Government can affect the cost of living, since this price has a major impact on the consumer prices and, indirectly, on the nonagricultural wages.

There are hundreds of varieties of rice grown in Thailand. They are generally classed according to the time required to mature after transplanting. Early varieties ripen in 2-1/2 to 3 months and medium varieties in 3 to 4 months. Varieties taking 4 to 5 months or more account for the largest share of the harvest. In general, the longer the ripening period, the better the quality of the rice. By growing a little of each type, a farmer gains some insurance against the vagaries of annual rainful, and achieves better distribution of planting and harvesting labor.

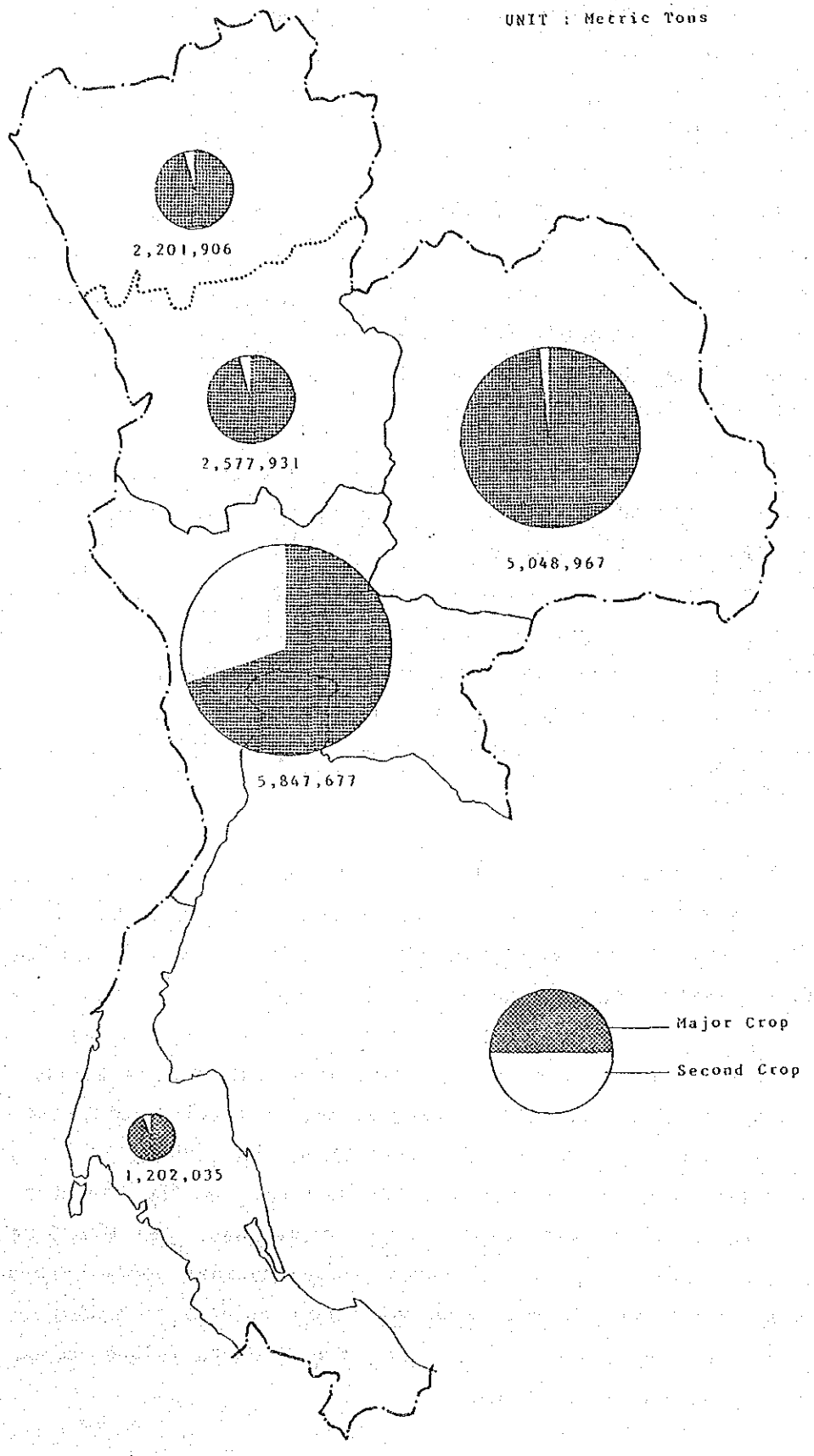
In Thailand both glutinuous and nonglutinuous rice are planted, the latter on about two-thirds of the total rice area. Glutinuous rice is grown mainly in the Northern and Northeastern Zones. The Central Zone leads in both area and production of rice.

In the Central Zone, the planting season usually starts in May and extends through August; harvesting starts in October or November with the onset of the dry season and continues until January or February. The main harvesting months are November-January. In the Northern and Northeastern Zones, planting usually starts in June. In the Southern Zone, planting operations extend over July-December and harvesting over January-April. Where two crops of rice are planted within a year, the second crop is generally grown between January and early July and harvested in August-September.

Fig. III-1 RICE PRODUCTION in THAILAND

(Crop Year 1982/83)

UNIT : Metric Tons



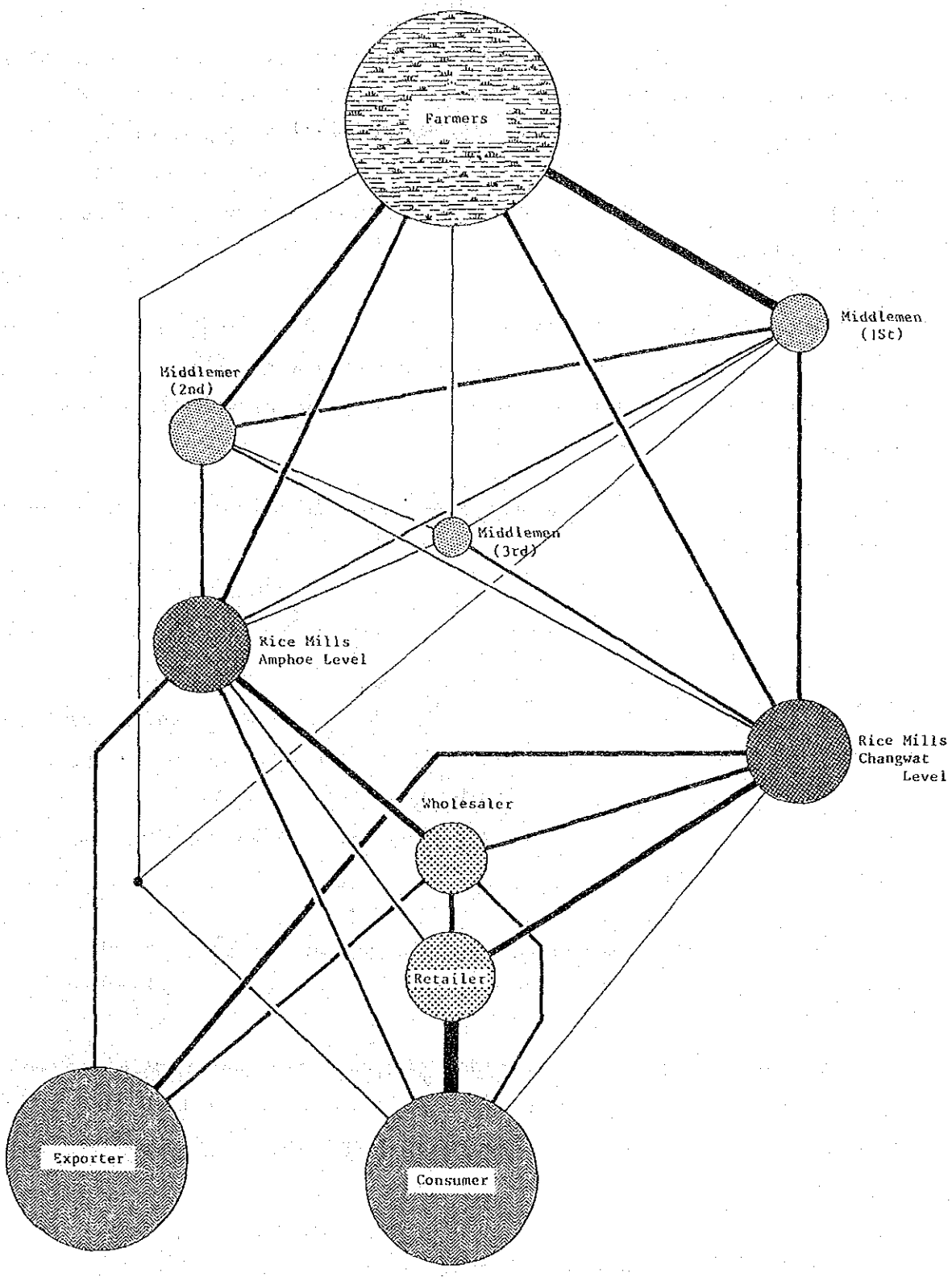


Fig. III-2 RICE MARKETING FLOW

- AN EXAMPLE IN CENTRAL REGION -

Farmers generally sell their rice surplus paddy either to middlemen or itinerant merchants or directly to the mills. The farmers retain, as a very rough average, about two-fifths of their production and sell the rest. About one-third of the amount retained by the farmer is used for seed and feed. The bulk of the marketed production is sold soon after harvest, when prices are very low.

The paddy marketed from the farms generally flows toward rice millers with regional excess supply moving toward deficit areas. The pattern will vary in timing between regions as harvest times and post-harvest patterns differ.

The basic flow pattern of paddy and milled rice is shown in the attached illustration.

1) Middlemen

Paddy middlemen consist of primary, secondary and often third middlemen, primary middlemen not only collect and purchase paddy, but lease daily goods, sell agricultural equipment to farmers and lend money in return for paddy. They are closely linked to the daily living expenses of the farmers.

As primary middlemen do not possess storage facilities, they have to sell paddy to rice mills or secondary middlemen during collection.

The secondary and third middlemen purchase paddy mainly from the primary middlemen, but may also purchase it directly from the farmers. Such paddy is sold to the rice mills depending on the current market situation.

2) Rice Mills

Rice mills are located in paddy producing areas. Although they purchase paddy directly from farmers at times, they mostly depend on the middlemen for the procurement of paddy. When paddy is needed, they ask the middlemen to deliver the necessary amount in return for cash.

Rice mills process paddy into milled rice, and sell it to milled rice merchants depending on the current market.

In this country the number of rice mills amounts to approximately 30,000. However, of this total, rice mills having a capacity of more than 10 tons per day number approximately 6,000. Recently, however the situation has changed due to an increase in the number of large mills and a decrease in both small and medium mills. The following table clearly shows this tendency.

Table III-1 Rice Mills in Thailand

(Unit: %)

Scale of Rice Mill	Number of Rice Mills			Milling Capacity		
	1960	1971	1982	1960	1971	1982
Small (Capacity: ≦10 Ton/day)	56	85	52	12	14	11
Medium (Capacity: 10~50 Ton/day)	39	11	34	37	19	27
Big (Capacity: ≧50 Ton/day)	5	4	14	51	67	62
Total	100	100	100	100	100	100

Source: Ministry of Agriculture and Cooperatives

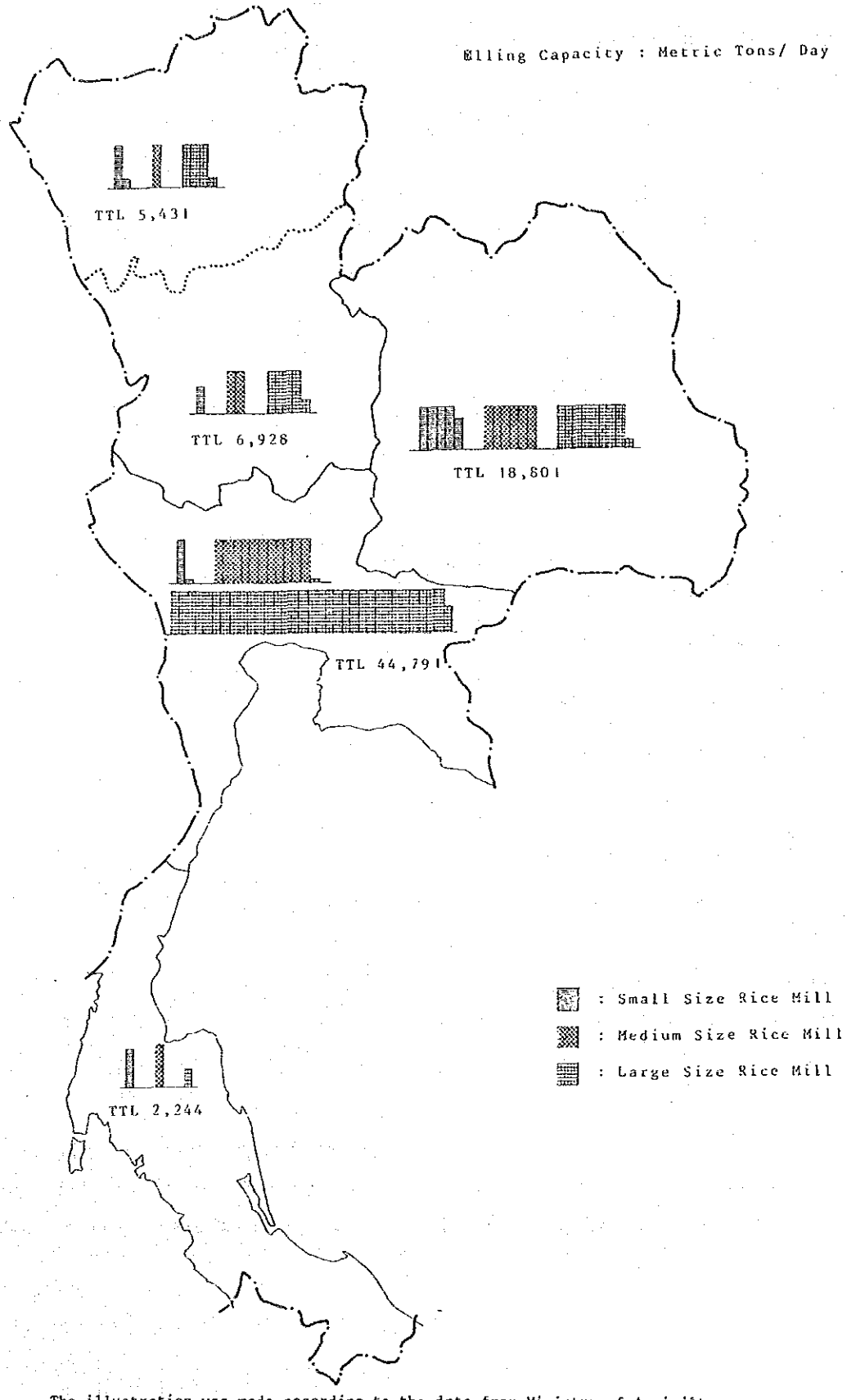
3) Milled Rice Merchants and Wholesalers

Milled rice merchants are brokers acting between the wholesalers in cities and the rice mills. Local retailers deal directly with the mills, generally not relying on middlemen or wholesalers. City wholesalers often act as exporters.

Fig. III-3

RICE MILLING CAPACITY in THAILAND

(Dec, 1982)



The illustration was made according to the data from Ministry of Agricjlture and Cooperatives.

4) Exporters

Rice exporters must register with the government. The qualification for registration is described below;

i) Capital exceeding 5 million Baht (about 70 million yen) with Thailand equity over 75%.

ii) Warehouses with a total capacity of 10,000 bags (1,000 tons)

iii) Membership in the BOT (Board of Trade of Thailand)

After registration, exporters are requested to participate in the Rice Exporters Association. There are currently 155 registered exporters.

5) Government Policy on Rice Export

The rice export premium existed as far back as when private merchants were first allowed to export the commodity in 1954, prior to which it was a state monopoly. Over subsequent years, the premium, — the specific export tax levied by the Ministry of Commerce on the basis of rice quality — has been the single most effective export control measure imposed by the government. The two objectives of the premium were that it should serve as a source of revenue and a tool to control rice export volume, thus stabilizing local prices and ensuring adequate supplies for local consumption. The rates were adjusted up or down to discourage or encourage exports.

Over the years, the premium grew into a major source of revenue for the government. In the 1960s the rice premium accounted for 11% of total government revenue, whereas the corporate and personal income tax made up only 9 to 10% during the corresponding period. Even though the rice premium was raised for 10, 15 and 20% white rice (the three grades with largest export quantity) on April 21, 1971 following a drastic fall in local prices and strong criticism on the adverse pressure it put on the paddy price, the premium was restored on September 1, 1972.

Because of extremely high world rice prices in 1974, the government upped premium rates several times. As a result, the premium collected in 1974 hit an all-time high of 2.752 billion Baht. While domestic consumers enjoyed low-cost rice and the government gained high revenues, exporters believed that the high premium prevented them from fully exploiting the potential of foreign markets and economists claimed that farmers were gaining only marginally from high world prices. This criticism forced the government to lower premium rates. The premium rate which had peaked at 4,600 Baht per ton on March 22, 1974 dropped to 1,700 Baht per ton on December 25, 1974 for 10, 15 and 20% white rice. A series of reductions during the next six years pushed premium rates down to 350 Baht per ton for 10 and 15% rice and 250 Baht per ton for 20% white rice on October 29, 1980.

Last year the government announced that between October 1, 1983 and June 30, 1984, the rice premium was to be halved from the posted rates of October 29, 1980. As a result, the present premium rates are the lowest in 30 years. If the result of the nine-month trial period proves encouraging, the government will consider abolishing the premium altogether.

To support its shift toward trade liberalization, the government in April 1982 decontrolled the number of rice export permits and abolished the rice reserve requirement in May 1982. Thereafter, the number of rice exporters registered with the Ministry of Commerce immediately jumped from 80 to 155. The government also cut export costs further by reducing the export tax from 5 to 2.5% effective October 30, 1983.

Vast amounts have been invested over the years in the hope of raising farmers' income, yet it is debatable whether, as a result, Thai farmers are any better off. Price support schemes aimed at sustaining paddy prices at government-set levels have been in operation since 1966. The government initially allocated 40 million Baht from the budget for this purpose, with the Public Warehouse Organization acting as the main intervention agent.

The price support program artificially created demand at the beginning of the trading season in order to prop up prices only to release rice back into the market in later months. On December 27, 1983 the government ordered the role of the PWO to be suspended. The PWO itself has been plagued with administrative problems, inadequate funds, improper storage facilities and shortage of competent manpower.

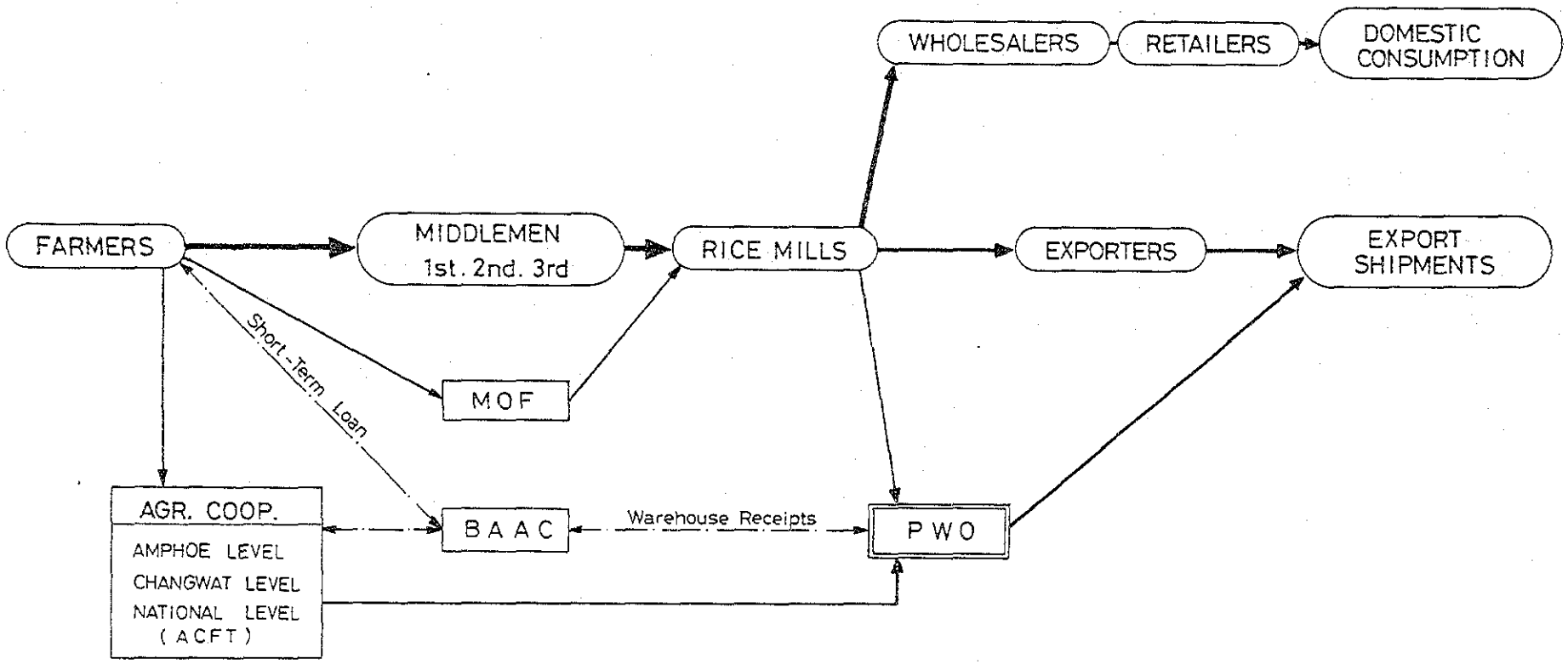


Fig. III-4
PUBLIC ORGANIZATIONS in RICE MARKETING ACTIVITIES

Table III-2 Changes in the Premium Rate for 10% White Rice

Date	Baht (Baht/ton)
30 Dec. 1954	400
Aug. 1955 - Feb. 1967	840 - 950
Mar. 1967 - Aug. 1969	1,010 - 1,910
3 Dec. 1969 - 20 Apr. 1971	675 - 900
21 April 1971	Abolished
1 Sept. 1972	500
18 Sept. 1973 - 30 Jan. 1974	1,300 - 2,700
31 Jan. 1974 - 24 Dec. 1974	3,250 - 4,600
25 Dec. 1974 - 3 Dec. 1975	1,300 - 1,700
4 Dec. 1975 - 28 Oct. 1981	500 - 700
29 Oct. 1981	350
3 Oct. 1983	175

Source: Ministry of Commerce

3-4-2 Maize

Maize has been actively exported from Thailand for several decades. Production totaled 137,000 tons in 1957/58. Since the late 1950s, increasing demand for maize as animal feed in the world market pushed prices very high. This served as an incentive for farmers to rapidly expand cultivated areas. Production rose from 1.3 million tons in 1967/68 and reached an all-time high of 3.7 million tons in 1981/82.

After rice, maize is the next important grain grown in Thailand. In recent years, it has gained a significant position in the nation's economy and now accounts for more than one-tenth of total export earnings. Thailand has become one of the world's largest exporters of maize.

This spectacular increase was brought about by the farmers themselves in response to the foreign market and virtually no direct assistance was provided by the Government. However, construction of new roads linking the production area with the market gave impetus to the cultivation of maize.

Maize is grown mainly in the Central Zone and adjacent areas in the Northeastern Zone. Usually, the crop is planted in March-April and harvested in July-August. Sometimes a second crop is planted, generally in July-September, but there is risk of insufficient rain during the growing season.

At present, nearly the entire crop is flint corn, consisting of the Guatemala variety. Fertilizer is applied only to an estimated about 10% of the cultivated area, although maize cultivation causes rapid depletion of soil fertility unless corrective measures are taken. Virtually no hybrids are grown, but farmers have planted high-yielding composite varieties. After harvesting, ears are generally spread on a raised platform to dry in the sun and are shelled a few days later, sometimes on a custom-hire basis, by small cylinder-type shellers mounted on oxcarts or tractors.

The first crop is sometimes difficult to dry because it is harvested during the rainy season, and this may be one of the main causes for the invasion of toxic fungus in maize kernels during various steps of post-harvest works.

The local price of maize is usually set in relation to the fixed moisture content of 14%. Except during the period immediately following the first harvest, in the rainy season farmers attempt to reduce excess moisture by sun-drying the grain prior to sale to get the best price. The shelled maize is shipped through dealers to the Bangkok area, the center of domestic and export markets.

Most of the maize collected in Bangkok is still high in moisture content. This always causes quality problems in the rainy season, especially when moisture is excessive and transportation is delayed. After the necessary processes of drying and cleaning to conform to export standards, the maize is stored in silos for overseas shipment.

Most of the maize moved from the provinces to the Bangkok area is generally handled in bulk. This requires receiving facilities with proper equipment to perform the following operations.

a. Receiving
b. Cleaning
c. Drying and cooling
d. Storing
e. Shipping (mainly overseas shipments)

From the middle of the 1960s modern maize silos to handle export maize were built and operated along the Chao Phraya River near Bangkok and Tarua.

Even though the Government had under various conditions intermittently allowed free trading to boost exports, the demand pattern for Thai maize has changed dramatically over the last ten years because of a simultaneous decline in trade volume with contract markets and the increasing importance of non-contract markets. Originally markets for maize were limited to Japan and Taiwan, and these two markets once accounted for over 70% of total annual exports of maize. These markets once determined the export volume and local maize price. Over the years markets have diversified to include Malaysia, Singapore, the Middle East and African countries. In 1972, contract markets accounted for 77% of total maize exports, but the percentage declined to 50% in 1977. In 1980, non-contract markets which included Malaysia, the USSR, Singapore, Saudi Arabia, Angola, Iran, Iraq, Kuwait and the Philippines collectively imported 70% of total Thai maize exports.

Maize is one of Thailand's biggest exports and has been providing substantial foreign exchange earnings for the country. Most importers use it for animal feed. Mycotoxin problem especially on Aflatoxin, Aspergillus flavus, became a big issue since a number of countries started to limit aflatoxin content in their importing commodities. Exess aflatoxin contamination in food or feed can cause physical weekness or disease in human and animals. Studies have shown that invasion of aflatoxin fungus in maize kernels is fairly common in countries with hot climate at temperature between 25 to 30°C and humidity over 85%. Maize harvestings in Thailand between May and June have an average of around 100 ppb of this contamination while the international limit is barely 20 ppb.

3-4-3 Cassava Pellets

Production of Cassava has expanded rapidly since the 1970s. Thai cassava exports grew from an initial 500,000 tons in 1970. By 1982, total cassava exports of Thailand were 7.8 million tons, surpassing rice as the top agricultural product earning foreign exchange. This dramatic increase is often cited as one of agriculture's most striking success stories in recent years of Thai agriculture.

In most tropical areas cassava is grown mainly for subsistence, and in many undeveloped countries it is a significant component of the diet. In Thailand, however, cassava is grown primarily as a cash crop for export and very small quantity is consumed domestically.

Most of the cassava is grown in two regions, Southeast and Northeast, but some is planted throughout other areas of the country. Cassava products, including pellets, flour, meal and chips account for about 25% of Thailand's total export income. Most exports are now in the form of pellets. EC countries are the chief customer for pellet.

Planting of cassava begins in the main producing area in November-December and elsewhere generally in May. The crop can be harvested 10 to 15 months after planting. Farmers generally inform cassava dealers when they wish to sell their roots. The crop is uprooted by crews hired by the dealers who also use their own trucks to transport it to the processing plants.

Cassava is very easy to cultivate, so creating an artificial demand will only mislead planters to plant more and the problem will become worse in the following years. A major obstacle to the future of export of cassava pellet is import quota restrictions imposed by the EC countries, the largest importers of Thai cassava pellet.

In this situation, the Government is taking measures to limit the area of cassava cultivation by urging farmers to grow rubber and cashew nut as substitutes.

3-4-4 Sorghum

Sorghum production was 236,300 metric tons in the 1982/83 crop. Nearly all of it is exported, primarily to Singapore for feed. Research is being conducted to adapt sorghum cultivation to the local conditions of Thailand. The crop may become an important export item if production expands.

3-4-5 Mung Beans

Mung beans have long been cultivated in Thailand, primarily in the Central Zone but also on the Khorat Plateau. Production has been expanded rapidly and was estimated at about 281,360 metric tons in the 1982/83 crop including black matpe. Domestically, mung beans are used almost entirely for food, often as bean sprouts. The crop, however, has good overseas markets principally to India, Malaysia, Hong Kong and Singapore.

3-4-6 Other Agricultural Products

Thailand has an abundance of agricultural products such as fiber crops of kenaf, cotton, kapok; oilbearing crops of coconut, groundnut, sesame, castor-beans as well as sugarcane, tobacco, rubber, and various fruits and vegetables. Marketing system of those products is mostly similar to these of rice. Local merchants collect those products from farmers and sell them to central merchants. Marketing of the commodities mostly rely on central buyers.