AN ANALYSIS OF FACTORS AFFECTING PRICE OF RICE IN THAILAND

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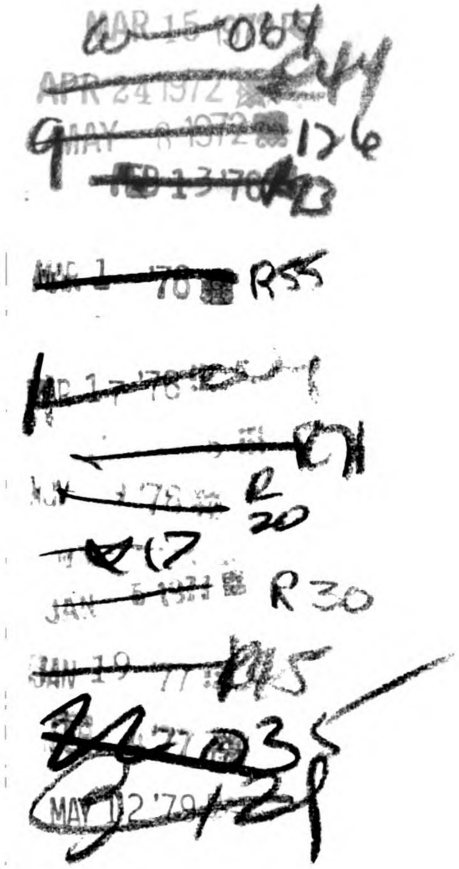

ABSTRACT

AN ANALYSIS OF FACTORS AFFECTING
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By

Chaiwat Konjing

The main purpose of this study is to develop information concerning the current situation in price, production, and marketing of rice in Thailand which is necessary for further developing rice policy. Knowledge of price and marketing patterns as well as the demand and supply structure as developed in this study can be of value in production planning and orderly marketing of rice for both today and the immediate future.

Because of the importance of rice as a national crop, there are many conflicts and controversies concerning the direction of price and production policy for rice. The problem of to what extent rice production should be encouraged, and what price policy should be followed so that the farmers benefit as much as possible from what they produce but not at the expenses of the consumers are of much concern and are answered partially by this study.

The study includes a general discussion of current marketing and production of rice, an analysis of time-series of rice prices in both domestic and export markets, and a statistical estimation of the demand and supply for rice in Thailand. All analyses are based on secondary data obtained from various publications available from Thai government agencies or from the United Nations.

The findings in this study reveal that Thailand's rice industry has characterized by the upward trends in both rice production and price, particularly the price of paddy. At the same time, the degree of competition in the rice market has increased as a result of the development of improved transportation and the relocation of the rice mill industry.

The seasonal variation in quantities of paddy delivered along-side mills in Bangkok metropolitan market has been increasing significantly over time. The quantity exported and export price each also exhibits a significant increase in seasonality pattern. Furthermore, there is a small seasonal variation in domestic prices of rice particularly the price of rice (100 - 5%), and the price of paddy (no. 1) at wholesale level in Bangkok; but there is no evidence that seasonal patterns in these domestic prices are changing significantly.

An analysis of statistical supply of rice reveals that the annual variation in rice production has been

explained partially by the past year's price of paddy, trend, and the past year's acreage. The supply of rice is relatively inelastic. The estimated demand equation for rice is much more reliable than the supply equation. About 81 percent in the annual variation in price of rice at Bangkok wholesale level is explained by the association of the estimated quantity of rice produced, the quantity of wheat imports, the quantity of rice exports, personal income per capita, trend, and the rice export tax. The price flexibility of demand for rice of 0.27 has been found with unexpectedly positive sign. The evidence implies that the demand for rice particularly rice (100%) in Thailand is unbelieveably elastic.

Based on these results, it leads to the conclusions that a policy for increasing rice production as well as rice export and market expansion should be emphasized. The price incentive programs in the form of input subsidies and/or minimum price guarantee should be followed to stimulate rice expansion, and at the same time to lessen price variation which are partially affected by the seasonality in both production and market supply of rice. An increase in rice production will benefit the consumer to the extent that they can buy rice and other food items with lower prices and therefore, less expense. At the same time, the economy will benefit from more foreign exchange earning as a result of an increase in rice exports.

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CHAPTER I

INTRODUCTION

Problem Setting

For Thailand, rice is one of the most important crops in the economy, being both the staple food of the people and the main foreign exchange earner. In the period of 1961-1963, rice alone constituted 13 percent of GNP, 36.2 percent of the income from agriculture, and 35.1 percent of exports.[1] According to the 1960 population census, 74.6 percent of the total population resided in the agricultural sector. Of this, over 75 percent were rice farmers.[2] Because of the dominant position of rice in both production and consumption, rice policy is of critical importance in the economy. More particularly, Thailand is no exception in being concerned with market and price policy for its major food grain such as rice. Since the majority of population is engaged in agriculture, and since agriculture constitutes a major part -- 80 percent

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[1]Office of National Economic Development Board, Thailand, National Income Statistics 1964, pp. 90-91.

[2]National Statistics Office, Thailand, Thailand Population Census 1960, Table 1.

of exports;[3] changes in agricultural price policy should be expected to affect the overall economy.

While the expansion of production in rice in Thailand is encouraged, technologically, it at the same time, creates a number of marketing problems and controversies. One of these difficulties is a matter of the fair price of rice under the free pricing system. A large number of farmers wish to sell at a high price but a large number of consumers wish to buy at a low price. Change in rice price, thus, affects both farmers and consumers. For farmers, a higher rice price means more income and a greater incentive to grow rice. In contrast, for consumers, a higher price of rice means a higher cost of living and thereby a lower level of living. More briefly, a change in rice price benefits some segments of the economy at the expense of others.

Since these two attitudes are inconsistent, the introduction of a rice price policy designed to satisfy all groups in the economy needs primarily careful evaluation of the factors concerned. Another difficulty in the Thai rice economy is the common problems of the uncertainty of the farm production. Those who are engaged in agriculture are subjected not only to low income earnings but also

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[3]Melvin M. Wagner and Sopin Tongpan, "The Structure of Thai Rice Prices: Some Preliminary Findings," Proceedings of the Fourth Conference on Agricultural Economics, Bangkok, Kasetsart University, 1965, p. 203.

to wide fluctuation in both prices and production. Such instability associated with a lack of agricultural knowledge forces farmers into a vicious cycle of poverty.[4] This is inconsistent with the objective of the free price economy. The price mechanism under free price system is assumed to provide two beneficient major functions:[5] (a) Guiding the allocation of resources in production; (b) channelling products into trade. The additional two functions -- (c) stabilizing income over time; and (d) reducing inequity of income among families, introduced by some economists[6] appear relevant to a free price economy but to some extent they are debatable; since these additional two functions are generally related to other social problems in the economy in addition to the issue of free price mechanism. It, therefore, may or may not be necessary that the stabilization of income over time and reduction of inequity of income among the individual families can be secured solely by the performance of the free price system. Nevertheless, in order to fulfill, particularly, the first two functions of free price economy,

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[4]Chaiyong Chuchart and Sopin Tongpon, The Determination and Analysis of Policies to Support and Stabilize Agricultural Prices and Incomes of the Thai Farmers (with Special Reference to Rice Premium). Bangkok: Kasetsart University, 1965, p. 1.

[5]Ibid, p. 1.

[6]For more detail see Chaiyong Chuchart and Sopin Tongpan, The Determination and Analysis of Policies to Support and Stabilize Agricultural Prices and Incomes of the Thai Farmers, Bangkok: Kasetsart University, 1965.

it is necessary that the price program in Thailand should be heavily concerned with major crops such as rice, in an attempt to encourage production; to stabilize the prices of farm products; and then to improve farmer's income as well.

With the state of farming system in Thailand today, it is hard to believe that the production of rice is increasing as a result of a factor, the farmer's incentive to increase rice production in response to a higher price. A study made by Sanittanont[7] indicated that the price elasticties of rice production with respect to the acreage expansion are roughly less than 0.3 in the short-run and 0.6 in the long-run,[8] since most farmers are still subjected, to the large extent, to the risk and uncertainty of the traditional farming -- the variations of the natural and economic environments. The study also indicated the low level of the farmer's incentive to increase rice production by the application of modern techniques such as the use of commercial fertilizer, since the paddy prices in Thailand are relatively low compared to the prices of fertilizer.[9] Low paddy prices means low returns, in monetary terms, to

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[7]Sura Sanittanont, Thailand's Rice Export Tax: Its Effect on Rice Economy, Doctoral Dissertation, University of Wisconsin, 1967.

[8]Ibid, p. 93.

[9]Ibid, p. 98.

increasing output which its production cost is relatively high. These facts imply that under the current rice marketing policies, the rice production will not increase at a more rapid rate without either an increase in paddy prices or a reduction in the cost of production, particularly the lower prices of fertilizers.

A pessimistic study made by Roy[10] have also called attention to increase rice production in the Thai economy. The study indicated that Thailand will face with the problem of rice deficiency sometime during this decade. The rapid population growth will require an increase in the amount of rice for domestic consumption, even if the amount of rice export will be gradually declining. His study leaves us the significant conclusion that, with his estimate of the rate of per capita rice consumption requirement[11] the trend of domestic rice consumption will pass that of production sometime between 1976 and 1980. The date of Thailand's metamorphosis from a rice surplus to a rice deficit country thus looms on the horizon no more than 10 years away and possibly sooner.[12] To cope with this problem, or at least to partially remedy the impending crisis

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[10]Edward Van Roy, "The Multhusion Squeeze on Thailand's Rice Economy," Asian Survey, VII. (November, 1967).

[11]The detail will be discussed later.

[12]Ibid, p. 474.

in rice, a policy issue with an emphasis on increasing rice production associated with increasing in farmer's incentives and stabilizing prices should be immediately come into consideration.

But, others hold different views. Some economists believe that within this decade, Asian countries will become self-sufficient and will increase their rice exports into the world market.[13] The success in subsistence level, or in other words, the "Green Revolution" in these countries will certainly cause significant rice surplus problems for this part of the world. The significant increase in rice production is presumably due to the adoption of the new varieties of rice such as IR-8, the use of fertilizer, pesticides and insecticides and so forth. If this possibility be true, however, the price policy which is ideal for increasing rice production will not be ideal. In this connection, the development of a different policy is definitely required; but the same basic information is needed for either case.

As far as a policy is concerned, however, nobody can effectively enhance this effort except the government.

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[13]Economists like Clifton R. Wharton, "The Green Revolution" Foreign Affairs, Council on Foreign Relations, Inc., New York; (April 1969), pp. 464-476. Joseph W. Willett, The Impact of New Grain Varieties in Asia, USDA ERS-Foreign No. 275, Washington, D. C. 1969.

It is agreed that, practically some policies issued by the government create many conflicts, and the government itself cannot find any equitable solution. With an optimistic attempt, however, to insure that rice availability for domestic consumption is adequate, stable and reasonably priced, the Thai government has stepped into the rice market since the early days of the country.[14]

In this connection, some policies were issued. One of these is the policy on rice export tax aimed at regulating rice exports and insuring the availability of an adequate supply for domestic consumption. At the same time, the government earns a substantial part of its revenue from the rice export tax. The price and quantity of rice export is adjusted by simply changing the export tax rate in relation to the change in price and quantity of rice in the world market. Two other policies were the domestic market minimum farm price guarantee and the Rice Marketing Cooperatives, but these are on limited scale and temporary basis. Regardless on the basis of these policies, the government assumes that they should benefit both farmers and consumers and all other groups concerned. But the question of what should be the range of policies to be employed in order that it will be working successfully, has not been

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[14]Sopin Tongpan, An Economic Analysis of the Price of Thai Rice, Unpublished Doctoral Dissertation, Ohio State University, 1969, p. 1.

given much consideration. Moreover, as the economy of Thailand continues to grow and change, the price policy which is ideal today will probably not be ideal in the future. No matter for what situation a price policy for a particular commodity is developed, it is necessary that basic information concerning the production and consumption patterns of that commodity be investigated; and its price behavior in both internal and external markets be determined. Also, other economic variables affecting prices and their impact on the market must be evaluated. For instance, knowledge of the nature of both domestic and export demand and supply would help provide basic information to the policy makers to decide what action might be appropriate so that the desirable results in price and market policies are most likely attained.

Objectives of the Study

It is not the purpose here to examine specific policies, but rather to study the general principles and factors considered of primary importance in the pricing of rice. More specifically, the purposes of this study are:

(1) to describe the rice price behavior both in domestic and export markets.

(2) to examine the effects of economic variables on the domestic prices of Thai rice.

(3) To discuss some points of view toward the rice policy in Thailand, particularly the implications of pricing policies for Thai rice trade.

Since there are very few studies on Thai rice market and policies, this study is supposed to provide some basic estimates of rice price behavior in this country.

CHAPTER II

A REVIEW OF THE THAI RICE ECONOMY

Rice Production

Rice Acreage

Rice production has been the main occupation of the Thai people for generations. This occupation occupied 41.3 million rai[1] or 13 percent of total cultivated areas in 1963.[2] From available records, the rice acreage has increased year by year. From 1907 to 1966, or over the past 60 years, the rice area has increased by more than 300 percent. That is, it increased from 9.3 million rai in 1907 to 41.3 million rai in 1963 and up to 46.1 million rai in 1965.[3]

Geographically, (Figure 2.1), Thailand is divided into four regions, namely the Northern, the Northeastern, the Central and the Southern region. Rice production can be found in almost everywhere throughout the country. But

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[1]rai is equal to 0.395 acre.

[2]Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1963 (Bangkok: 1965), p. 162.

[3]Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966. (Bangkok: 1968), p. 47.

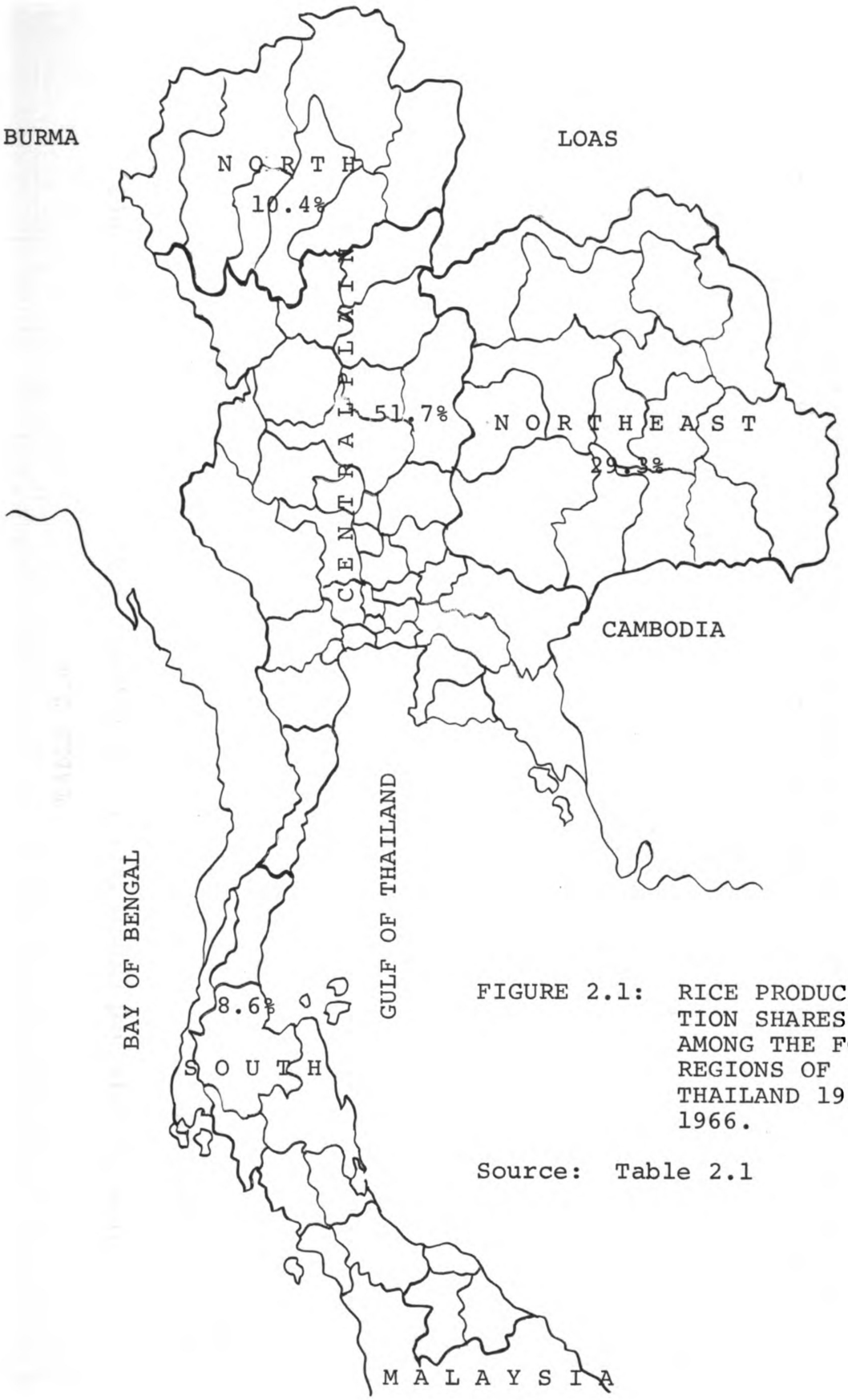

FIGURE 2.1: RICE PRODUCTION SHARES AMONG THE FOUR REGIONS OF THAILAND 1954-1966.

Source: Table 2.1

TABLE 2.1

Rice Acreage and Production by Geographic Region, Thailand, 1954-1966

Year	Acreage (1,000 rai)					Production (1,000 metric ton)					
	North	North-east	Central	South	Total	North	North-east	Central	South	Total	Average Yield
1954	2,352	12,193	17,146	3,041	34,732	655	1,470	2,927	657	5,709	202
1955	2,422	14,518	16,448	2,672	36,060	745	2,150	3,769	670	7,334	218
1956	2,360	15,517	16,913	2,858	37,648	799	2,613	4,224	661	8,297	230
1957	2,421	10,366	16,250	2,689	31,726	822	1,572	2,654	522	5,570	208
1958	2,459	13,495	17,061	2,972	35,987	720	1,978	3,731	624	7,053	218
1959	2,564	15,421	17,077	2,847	37,909	796	2,020	3,307	647	6,770	206
1960	2,620	14,557	17,021	2,810	37,008	782	2,295	4,119	639	7,835	222
1961	2,578	15,408	17,639	2,994	38,619	874	2,323	4,273	707	8,177	231
1962	2,569	17,820	18,078	3,150	41,617	855	3,082	4,600	743	9,280	240
1963	2,616	16,920	18,455	3,286	41,277	909	3,026	5,348	886	10,169	253
1964	2,671	15,470	19,481	3,268	40,890	986	2,764	5,157	733	9,640	256
1965	2,679	15,183	19,391	3,239	40,492	1,057	2,222	5,066	874	9,219	249
1966	2,740	19,477	20,422	4,456	47,095	1,126	3,831	6,168	850	11,975	276
Average	2,542	15,103	17,799	3,099	38,543	856	2,411	4,257	709	8,233	229
Percent	6.60	39.18	46.18	8.04	100	10.4	29.3	51.7	8.6	100	-

Source: Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966, (Bangkok: 1968), p. 48.

a high percentage of total rice areas is concentrated in the Central region, where it was 46 percent of rice acreage during 1954-1966. The Northeastern region is the second largest rice area and it accounted for 39 percent. The Northern and the Southern regions are the smallest, where the rice acreage was only 7 percent in the North and 8 percent in the South.[4] However, from the previous study made by the Division of Agricultural Economics, Bangkok,[5] it indicated that even though the rice acreage has increased by more than 300 percent over the period of 1907-1966, during the last 15 years the rate of increase has declined.

Particulary, during 1951-1956 there was no upward trend in acreage. During 1958 to 1962, however, it did increase sharply then decreased slightly in the later years, 1963-1965. These variations in rice have been found in all parts of the country. During the past 15 years, it is also found that the Northeastern region represented the largest increase in rice area. The increase was 61 percent or from 12.2 million rai in 1954 to 19.5 million rai in 1966 (Table 2.1). Acreage in the Central region increased approximately 20 percent. About 12 and 50 percent increase occured in the Northern and Southern region respectively, during 1954-1966. The overall acreage increased 36 percent in the same period

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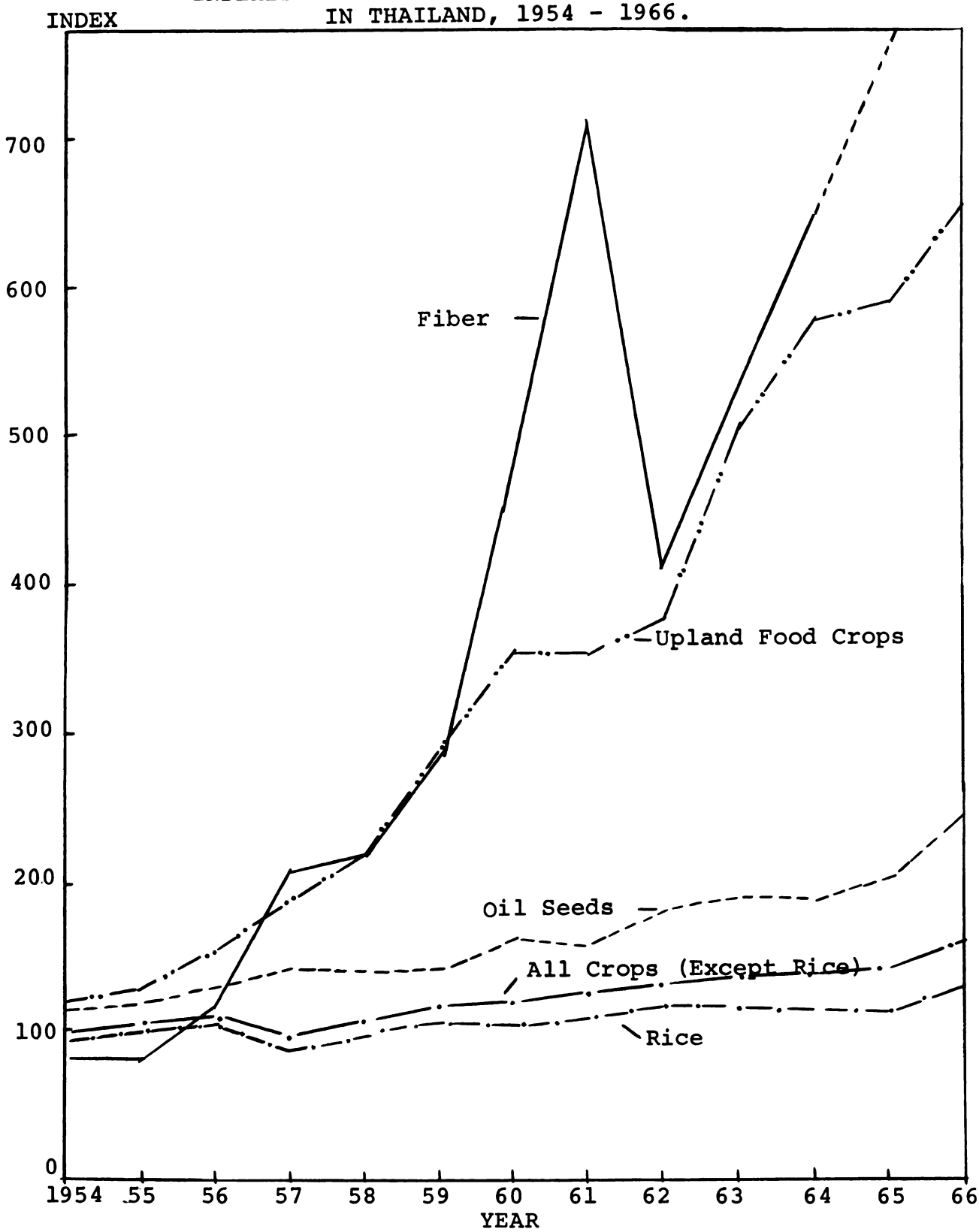
[4]See Table 2.1.

[5]Thailand, Division of Agricultural Economics, A Study on Rice Production and Consumption in Thailand, (Bangkok: 1967), pp. 6-7.

FIGURE 2.2
INDEXES OF ACREAGE OF PRINCIPAL CROPS IN
IN THAILAND, 1954 - 1966.



Source: Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966. (Bangkok: 1968), pp. 35-38.

less than those in the former periods. The increase in acreage in the period of 1907-1920 was 64 percent, and in the period of 1920-1948 was 113 percent.[6] The reasons for the recent slow rate of increase in acreage are due to the limitation of geographic expansion of rice area since water supply is the most important limiting factor. At the same time, Thailand has achieved a certain degree of farm diversification. The areas devoted to other principal crops such as corns, kenaf, and fruit tree, etc., were more than double during the past decade (Figure 2.2).

Production and Yield

Rice production depends on acreage and yield. Production increases as either planting area or yield increase. Agriculture in Thailand still, to large extent, depends upon weather conditions. As a consequence, rice production is obviously characterized by sharp year to year fluctuation in output. Rice harvest tends to be poor when there is inadequate rainfall, but excessive water supply is also a detriment to rice crops. In the long-run, however, rice production has been considerably increased since the early 1900's. The average output during 1907 to 1919 was about 3 million tons,[7] during the period of 1920

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[6] Ibid, p. 10.

[7] Ton as used in this study refers to metric ton.

to 1947 and 1948 to 1962 were 4.5 and 7 million tons respectively.[8] The production increased to the high of 12 million tons of paddy in 1966 (Table 1). The increase in rice production in each of three periods were 65 percent in 1907 to 1919, 60 percent in 1920 to 1947, and 36 percent in 1948 to 1962.[9] The rapid growth rates in rice production in the first two periods were due to the substantial increase in acreage since some more arable lands were available, and to the increase in demand for rice as population increase. However, the increase in rice production varied annually associated with annual variation in yield per rai. In term of long-trends in paddy yield per rai, it also, can be divided into three periods over the entire period of 1907-1966:[10] (1) period of little change in yield but rapid growth in output and acreage, 1907 to 1919; (2) period of declining yield and slow growth in production and area, 1920 to 1947; (3) period of rising yield with slow growth in production and moderate growth in area, from 1948 up to the present. Associated with the variations of paddy yield in each period, the variations of the yield per rai among

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[8]Thailand, Division of Agricultural Economics, A Study on Rice Production and Consumption in Thailand, (Bangkok: 1967), p. 10.

[9]Ibid, p. 10.

[10]Sopin Tongpan, An Economic Analysis of the Price of Thai Rice, Unpublished Doctoral Dissertation, Ohio State University, 1969, p. 8.

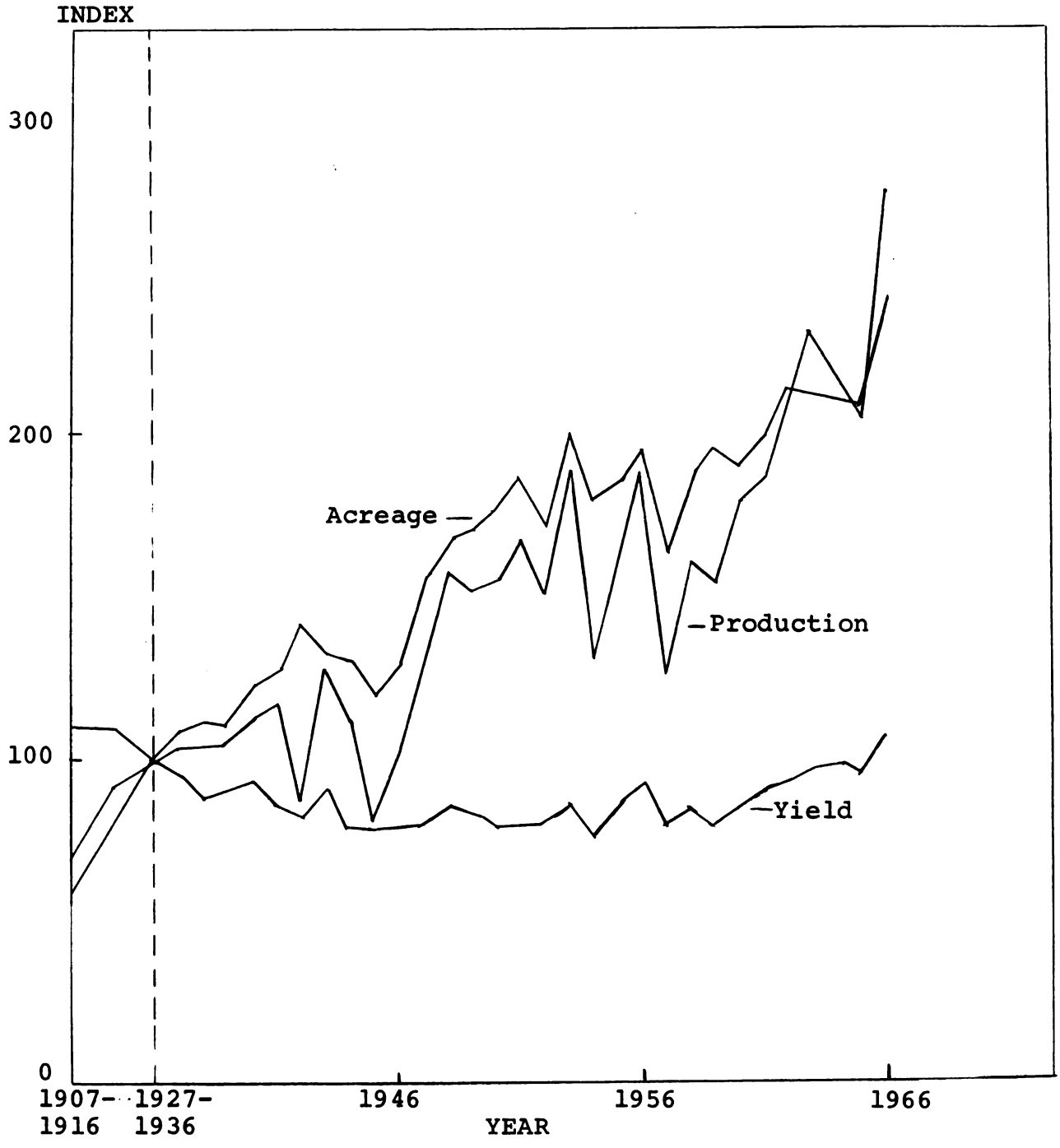
the four regions also existed. In the period of 1948 up to 1963, there was an apparent increase in yield in all region. Among the four regions, the Northern region possessed the highest average yield and acquired the most rapid yield increases over the last 16 years. This is due to the better irrigation system in the North. In contrast, the Northeastern region acquired a very low paddy yield and the rate of increase is very slow since most land areas and irrigation systems in this region are relatively poor.

Considering the trends of paddy yield in the past 60 years, it obviously indicates a downward trend until 1959 with many fluctuations associated with the variations in weather conditions. Even though more land areas has been used for rice cultivation and thereby total output has increased, the average yield, in the contrary, has exhibited in the negative manner. (Figure 2.3) This is because of the following two reasons in addition to the effect of the weather: (1) The supply of the fertile land is limited and as farming becomes more extensive, more use of less desirable land without the application of fertilizers results in less paddy yield; and (2) the same land areas were used for only single crop, rice, year by year without knowledge of how to maintain soil fertility. Productivity of land has subsequently declined. Fortunately, the downward trends in the yield has been revealed since 1960

FIGURE 2.3

INDEXES OF RICE ACREAGE, PRODUCTION, AND YIELD IN THAILAND, 1907-66.

(1927 - 1936 = 100)



Source: Computed from data in Agricultural Statistics of Thailand, 1966, (Bangkok: 1968), pp. 46-47. Using 1927-36 as base year period.

by the expansion of irrigation projects and to a large extent by the desirable weather conditions. At the same time, the government efforts in an attempt to improve the rice varieties has been working out. Also, the application of commercial fertilizers has been encouraged.

However, two previous studies, the studies made by Soothipan[11] and Berhman,[12] indicated that changes in rice production in Thailand in the past were due mainly to the effects of irrigation and damaged area. The modern techniques made insignificant contribution to rice production in Thailand even in the recent years.

While the yield has improved recently because of the improvement in irrigation as well as the good weather conditions, the paddy yield in Thailand is relatively low when compared to those in other countries in Asia except the Philippines. For instance, in 1965 the yield per rai was 256 kilograms in Thailand while Burma, Malaysia, Taiwan and Korea acquired respectively 266, 433, 604 and 616 kilograms on rai basis.[13]

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[11] Ibid, pp. 73-77.

[12] Jere R. Behman, "Significance of Introcountry Variations for Asian Agricultural Prospects: Central and Northeastern Thailand," Asian Survey, VIII (May, 1968), pp. 157-173.

[13] Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966, (Bangkok: 1968), p. 49.

This evidence shows that under the present system of farming, the importance of maintaining and improving soil fertility should receive more attention; and the efforts to introduce the use of modern techniques of cultivation should be continuously encouraged.

Domestic Rice Trade and Market

Rice Marketing Channel

Usually, the gestation period of rice from transplantation to harvest is between 90 to 200 days depending upon the variety.[14] Most farmers in Thailand start cultivating their land during the period of May to July. And they harvest the bulk of rice crop around November to January for every crop year. Thus, the big supply of new-season paddy comes to market during December to March or April. As a result, the paddy prices during this time of the year are relatively low compared to other periods. Practically, there are four basic economic units in Thailand to be concerned with rice market activities, namely, the paddy farmers; the rice mills;[15] the middleman; and the consumer (domestic and foreign). Paddy Farmers sell their paddy to

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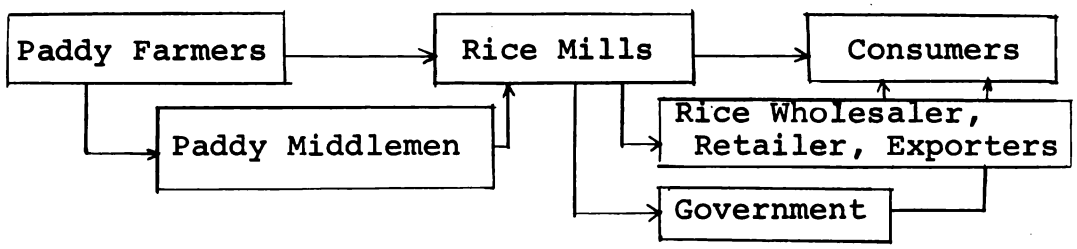
[14]Phairach Krisanamis, Paddy Price Movements and Their Effect on the Economic Situation of Farmers in the Central Plain of Thailand, Doctoral Dissertation, Indiana University, 1967, p. 13.

[15]Particularly, to some extent, a rice miller may perform his function as domestic wholesaler, retailer and rice exporter.

the rice mills and the rice millers sell their rice to the consumers through the wholesalers, retailers, exporters and even the government. In many occasions, the farmers may sell their paddy to the middlemen before paddy has been bought by the millers. Diagramatically, the basic structure of the rice marketing channel in Thailand can be illustrated as follows.[16]



According to a survey conducted by Dr. Udhis Narksawasdi in 1958, it appeared that over 70 percent of paddy sold to market in the Central Thailand was handled by the middlemen at either local or regional levels. About 20 percent had been sold to the local and regional rice mills. The remaining 10 percent was disposed of to the landlords, the Marketing Cooperative units and the farmer's neighborhood.[17] It is, obvious that the middlemen played an important role

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[16]Sura Sanittanont, Thailand's Rice Export Tax: Its Effects on the Rice Economy. Doctoral Dissertation, University of Wisconsin, 1967, p. 54.

[17]Udhis Narksawasdi, Farmers Indebtness and Paddy Marketing in Central Thailand (in Thai), Bangkok: The government of Thailand, 1964, p. 5.

in rice marketing in Thailand in the past and probably even today.

Farmers and Paddy Supply

Paddy is a semi-subsistence crop in Thailand. Part of paddy produced is used for home consumption. Only that in excess of what is needed for consumption. - the marketable surplus, is disposed of into the market. Most farmers sell their surplus within a relative short period of time after harvest. This is because of the following economic and practical reasons:[18] (1) Most of them are poor -- about 68 percent of farm families were indebted in 1958;[19] it is necessary for them to sell their paddy for money for their urgent needs and payment of their land rents and debts; (2) farmers usually lack the storage facilities to hold their paddy for the higher prices. These are reasons why most farmers in this country receive very relatively low prices from paddy they produce and thereby low income earnings.

The Middlemen

Whenever the paddy has moved out of the farm, many levels of middlemen are involved. Local middlemen, located

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[18]Sura Sanittanont, op. cit., p. 57.

[19]Pantum Thisyamondol and Millard F. Long, Agricultural Credit in Thailand, Kasetsart University, 1965, p. 20.

in the farm areas or in adjacent towns, often play an important role in paddy market. Since they have many advantages[20] over regional middlemen usually located far away in towns or in central markets, most of their business involves assembling paddy in local areas and selling part or all of amounts purchased to the rice mills or other buyers.

It is, thus, found that most of marketable paddy surplus flow into the hands of the local middlemen. The regional middlemen also perform similar business in paddy trading. This type of paddy trader purchases paddy from either local middlemen or directly from the farmers. Most of them own their transport facilities such as trucks and boats. Many provide storage and credit facilities to the farmers. Sometimes, they act as a speculator storing paddy for the purpose of price speculation.

Rice Mill Industry

A rice miller is a buyer of input paddy, an agent of transformation and a seller of rice products.[21] There has been a great increase in number of this kind of industry since after World War II. A number of mills with different sizes has been operating both in regional areas and in the

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[20]More detail will be discussed on the following section.

[21]Sura Sanittanont, Op. cit., p. 59.

locations where paddy is produced. The local millers, because they locate close to the farmers, are in a better position in terms of the amount of paddy required for their processing capacities, marketing costs, and bargaining power as well as personal contacts. The purpose of milling is to separate the kernel from the husk and bran. A typical mill might separate its output into six categories:[22] Head rice (consisting of 100 percent rice, 5 percent rice or possibly as low as 15 percent rice); half broken grains (A_1); very small broken grains; fine bran; and coarse bran. The ratios between the paddy milled and rice produced differ primarily with the varieties but partly as a result of weather, soils and the type of mill used. Usually, the weight of rice, excluding bran is about 66 percent of weight of paddy milled.[23] It is estimated that one ton (1,000 kgs) of paddy milled yields approximately 420 kilograms of head (whole) rice, 240 kilograms broken rice and 96 kilograms of bran (including fine and coarse bran).[24]

There are different size of mills in term of milling. The big commercial mills that separate rice products

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[22]Dan Usher, "The Thai Rice Trade," Thailand: Social and Economic Studies in Development, ed. T. H. Silcock, Durham: Duke University Press, p. 211, 1967.

[23]Thailand, Division of Agricultural Economics, A Study on Rice Production and Consumption in Thailand, (Bangkok: 1967), p. 45.

[24]Dan Usher, op. cit., p. 212.

into five or six grades can mill from 15 to 100 tons of paddy per day. Others are small -- 3 or 4 ton capacity. These mills produce an inferior product but they have an advantage when no big mills are nearby or when the amount of paddy is less than big mills can conveniently handle.[25]

Storage

Practically, the majority of the Thai farmers does not hold stock of paddy for higher prices. They need to satisfy their urgent needs for cash and have to repay their debts soon after harvest season. Though some people store paddy, it is difficult to say what proportion of farmers save paddy after harvest. These kind of data are not available. In contrast, it is true that most rice millers hold large stocks of paddy and rice. The amounts of stock held varies from mill to mill and month to month. Again, data concerning the amounts held by millers are not currently available for each period of the year. It is quite difficult to obtain the data since most millers are reluctant to reveal the exact amounts of rice and paddy they hold for the purposes of their competition in the industry and to avoid a greater business income tax charge on their income earned. Holding stocks of paddy and rice, to some extent, usually affects the market prices; and it is

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[25]Ibid, 212.

assumed that the miller will not keep stocking them at all if his profits can not cover the storage costs. This fact is supported by an estimate that a miller can earn 10-13 percent net return over the storage costs.[26] In an attempt to roughly figure out the amounts of paddy held in a particular crop year, however, an alternative way to look at it is to estimate from the capacities of the existing storage bins which are located in various different regional areas. Most bins belong to the rice millers and paddy merchants. Available data indicate that in 1956 there were 30,015 storage bins throughout the country with a total storage capacity of about 1.5 million tons.[27]

Rice Grading

Grading of rice is usually done at the mills. For the purpose of export, rice grading seems to be different from that of the domestic market. Grading in the domestic market is a subtler process. There is no need to enforce classification because consumers can judge the value of rice for themselves before buying it. The reason is that it is generally customary for Thai people to associate rice with the location where it is grown.[28] Nevertheless, in

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[26] Ibid, p. 215.

[27] Government of Thailand, Ministry of Agriculture, Number of Rice Mills and Rice Storage Bins in Thailand, 1956, (Bangkok: 1957), p. 36.

[28] Dan Usher, op. cit., p. 209.

many places rice is graded in the same manner as for the export market. In others, locality as well percentage broken is recognized directly as the distinguishing feature of quality.

In contrast, grading in the export market is rather uniform and is officially enforced. In 1957, a rice standard regulation was promulgated in an attempt to ensure a standard and unique quality of Thai rice. Under the regulation, inspection is necessary and compulsory for rice export. Before shipment, grading has to be carried out at either the mills or the riverside warehouses by the semi-official Rice Inspection Committee. In grading for rice export, the percentage broken is treated as the primary characteristic of rice. For instance, rice which is classified as 100 percent must be characterized by 100 percent unbroken white long-grained rice only. Completely unbroken but yellowish or short-grained are a different grade. The grades for exports from best to worst are as follows: 100 percent (first class, second class, or third class); 5 percent super, 5 percent; 10 percent; 15 percent; 25 percent super; 25 percent; 35 percent; 45 percent; A_1 (four classes); C_1 (three classes); and C_3.[29] The strictness in grading and inspection has made the quality of Thai rice unique and well known in the international market.

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[29] Ibid, p. 209.

Direction of Interregional Flow of Rice

The origin of suppliers of milled rice are rice millers, and the ultimate buyers are domestic and foreign consumers. Rice use as an industrial input is relatively insignificant in Thailand. Rice trade is usually handled by the wholesalers, retailers and rice exporters. In many cases rice millers also perform an additional function as the wholesalers and exporters. These rice traders are mostly Chinese people by race; a typical Thai trader is rarely found. The direction of interregional trade within the country is generally south, from the rice surplus areas of the North, Northeast and Central Plain to Bangkok or metropolitan area for the local consumption and export to the rice deficit areas of the southern peninsula (Figure 2.4). There are exceptions to this general movement. For instances, low grade rice and bran for animal feed sometimes move into the North and the Northeast from the Central Plain. Also, the North occasionally imports white rice at the same time as it exports glutineous rice.[30]

Transportation

Paddy and rice can be transported by the same kind of transport facilities. Generally, they are shipped by surface from the villages or the farms to the port of

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[30] Ibid, p. 208.

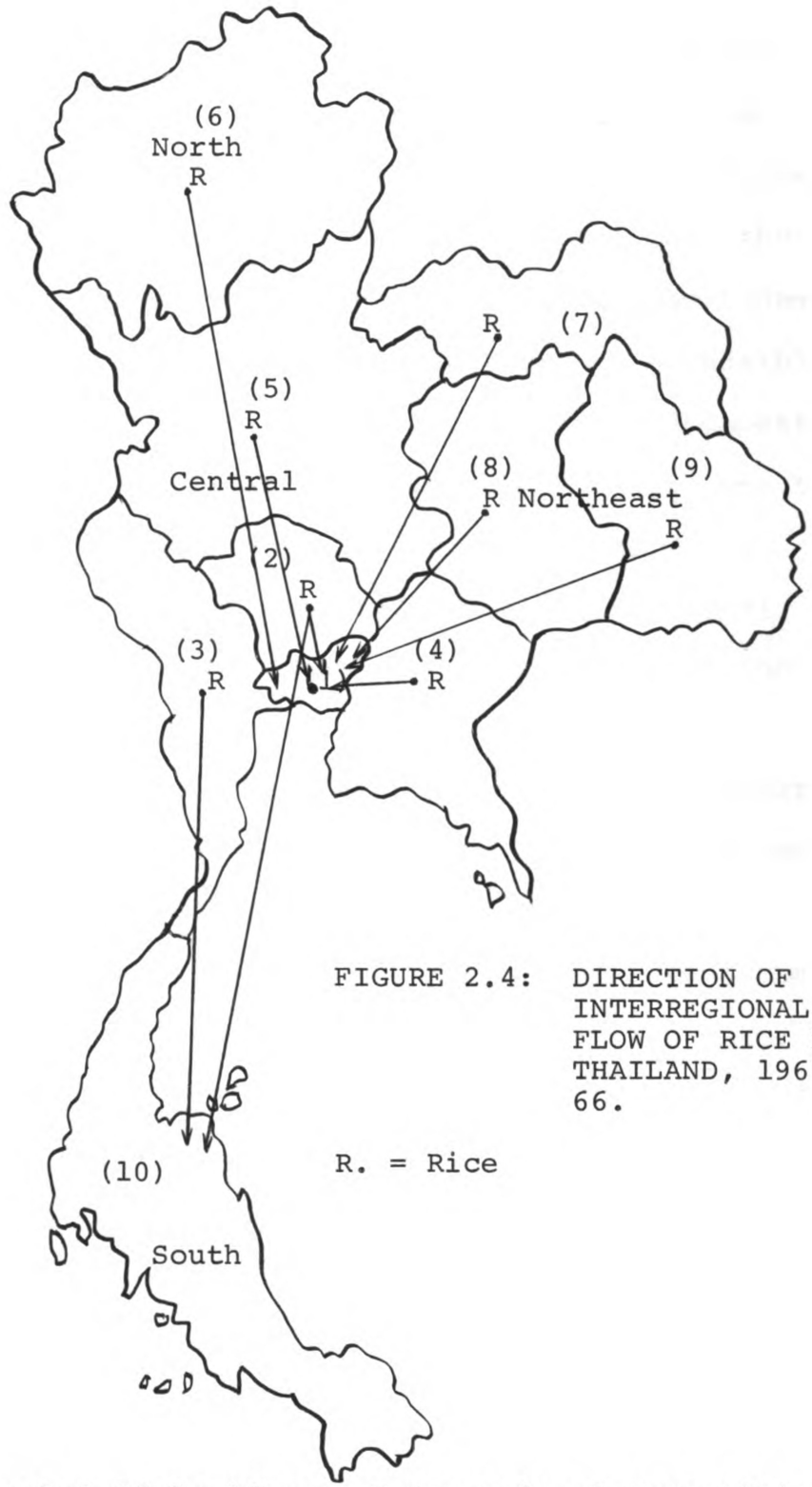

FIGURE 2.4: DIRECTION OF INTERREGIONAL FLOW OF RICE IN THAILAND, 1965-66.

R. = Rice

Source: Kamphol Adulavidhaya, Interregional Competition in Agricultural Production in Thailand. Unpublished Doctoral Dissertation, Purdue University, 1970, p. 85.

Bangkok and other provincial ports through rivers, railroads, and highways. Rivers are by far the important mean of rice traffic. Data are not available on the exact quantity of paddy and rice shipped by these different means of transportation. But indications are that the railroads and highways are generally gaining importance in the areas where the water transport is not accessible. However, river transportation is generally the cheapest form, costing as little as approximately 0.1 baht per ton kilometer.[31] The disadvantage of river transport is obviously that it is too slow and requires additional shipment if the final destination is far away from the banks of the accessible rivers.

Truck transport has been introduced as alternative means in rice trade, since new and better roads are continuously constructed. But the cost is relatively high approximately 0.16 baht per ton kilometer for the longest haul (750 kilometers and up) as indicated by Dan Usher.[32] The high rates are partly due to the road condition and the limited truck services. Aside from these, the ox-cart is likely the most expensive form. This kind of transportation is usually used to carry paddy from the field to the farm houses or from the farms to the mills nearby. It is competitive with the truck only over very short distances.

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[31] Ibid, p. 217.

[32] Ibid, p. 217.

Recently, transport by rail was introduced with the cheaper rate than by truck. But competition has reduced truck fares to a point where truck and rail can compete equally on price, although truck still gains advantage in terms of speed of delivery. River transport is generally chosen over truck or rail when all three are available and when distance is long enough to make the difference in transport costs significant.[33]

Domestic Demand for Rice

Before getting into the generalization of domestic demand for rice for the whole country, it is desirable to consider the consumption pattern of the Thai people with respect to their per capita consumption of food. In basic form the Thai meal is similar in all parts of the country and for all classes, except for those urban Thai who are acquainted with certain Western food habits.[34] In the Central and the South, nonglutinous rice is the staple item. In contrast, in the North and Northeast glutinous rice is generally preferable. For every daily meal, rice is indispensable base; fish, vegetable, and meat are embellishments used for flavoring rice and make it more palatable.

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[33]Ibid, p. 217.

[34]Thailand, Division of Agricultural Economics. A Study of Rice Production and Consumption in Thailand, (Bangkok: 1967), p. 26.

Nevertheless, in Bangkok and some other urban areas, the tendency to consume more vegetables and meat products is visible. But, rice still retains its importance. Two surveys on the nutrition intake indicated that by average, rice alone constitutes 70-90 percent of total calories intake per capita per day.[35]

With given per capita consumption of rice one can estimate the total demand for rice of the economy. Unfortunately, in Thailand, reliable data -- time series and cross section data regarding domestic consumption and other usages of rice are not available. The best way to estimate total consumptions is to simply estimate the total rice disappearance within the country no matter for what purpose it is used. Since rice is a staple food of the people in this country, a large part of total rice disappearance in the country will represent the quantity of rice consumed. With this procedure, the total amounts of rice disappearance within the whole kingdom and thereby the total domestic consumption of rice is equal to the difference between the total production of rice and the amounts of rice exported for a particular crop year.

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[35]A study made by Interdepartment Committee on Nutrition for National Defense, Nutrition Survey, (Bangkok: 1960). Another survey was conducted by M. M. Anderson, FAO Nutrition Advisor to Thailand, Summary Classification of Food Consumed by Households in 10 Villages of Ubol Province, Northeastern Thailand, Unpublished Field Progress Report, 1962.

Inversely, if the amounts for export is to be set for years to come, information on domestic rice consumption as well as rice production will help satisfy this purpose. The calculation can be made on either paddy or milled rice basis. Given the total rice disappearance in the country then the per capita rice consumption, in other words, the roughly estimated per capita demand for rice is derived by dividing the total rice disappearance in the country (rice availability for domestic consumption and other uses) by the total population of that year.[36] By this approach, it is estimated that average annual demand for rice per capita was 159.0 kilograms (milled rice).[37] Also, other recent studies have come to similar conclusion with slightly different figures.[38] This knowledge on total demand for rice is necessary and helpful for estimating the amounts of rice export for the new crop year. It means that the domestic demand for rice can be projected for many years ahead so long as the projections of population and rice production are made. Then, the quantity of rice export for the years to come can be forecast.

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[36]This idea follows the approach handled by Edward Van Roy on his article titled "The Multhusian Squeeze," Asian Survey, VII (Nov. 1967).

[37]Ibid, p. 469-473.

[38]Figure estimated by the Ministry of Agriculture, Bangkok was 143 kgs. per capita during 1954-1964. But the results of the Household Expenditure Survey was 167-168 kgs. per capita in 1962.

According to Roy's projection, it appeared that given per capita rice consumption of 159 kilograms per year and population growth of 3.3 percent per annum, the domestic demand for rice will overtake the supply by 1977 given an annual rice production of 9.6 million tons paddy.[39] His estimate and projection of domestic rice consumption requirements during 1947-1980 is presented in Figure 2.5. Incidentally, if Roy's projection is correct, it means that the pressure of increasing population will be critical and the result will be increasing domestic price with the passage of time. Unfortunately, the study by Roy failed to recognize the increase in per capita income in this country. It is observed that since 1950 per capita income has increased gradually from 1,199 baht in 1950 up to 2,499 baht in 1966.[40] And according to the Engel's Law, we recognize that as one's income increases it is assumed that the percentage of his expenditure on his consumption of food such as rice in this case has declined. Specifically, with increase in income people will decrease in percentage spending on their rice consumption and increase spending on other more expensive products, as their income permits, such as meat, fruits or dairy products. This

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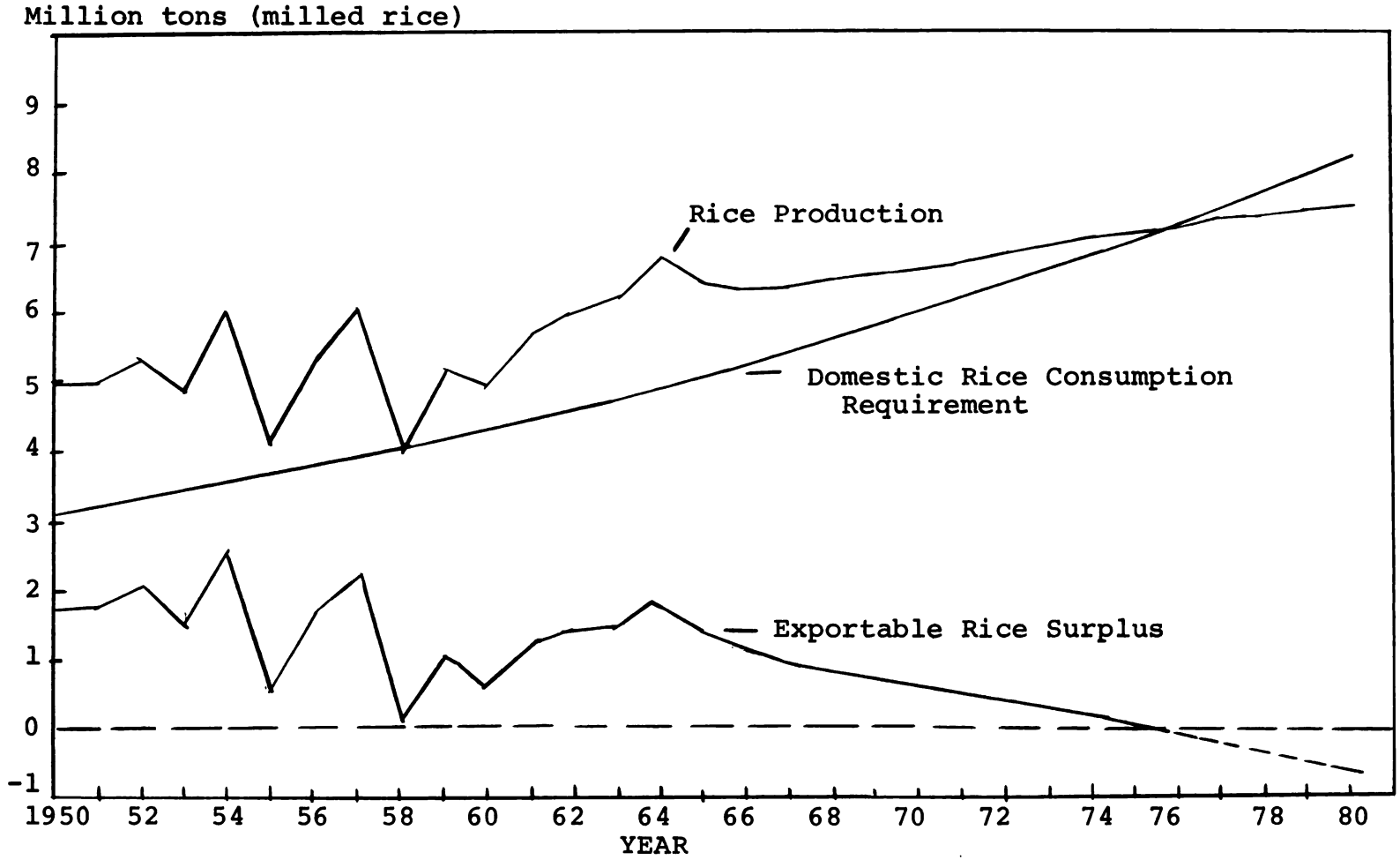
[39]Edward Van Roy, op. cit., p. 480.

[40]Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand 1966, (Bangkok: 1968), p. 178.

FIGURE 2.5

ESTIMATE AND PROJECTION OF RICE PRODUCTION, CONSUMPTION AND EXPORTABLE SURPLUS, THAILAND, 1950 - 1980



Source: Edward Van Roy, "The Multhusian Squeeze," Asian Survey, VII (November, 1967), pp. 469-473.

conclusion is also supported by an empirical evidence -- a study handled by the Division of Agricultural Economics in Bangkok which indicated that the co-efficients of both price and income elasticity of demand for rice are negative. It means that the people consumes less rice when the rice prices and their income increase and vice versa.[41]

Thai Rice Exports

Significance of Rice Export Trade

Rice exports earn a large amount of foreign exchange. In the early 1950's, over 50 percent of the total value of exports was derived from rice exports.[42] In recent years, however, its relative importance has declined since there has been a growing importance of other export crops like corn, sorghum and casava. Despite the decline in its importance rice exports itself still is the largest total export value each year; and in 1965 it accounted about 33 percent of total foreign exchange earned.[43]

The quantity of rice available for export to a large extent is dependent upon variables such as the

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[41]Thailand, Division of Agricultural Economics, A Study of Rice Production and Consumption in Thailand, (Bangkok: 1967), p. 31.

[42]S. Y. Lee, "Post War Rice Trade of Thailand," Far Eastern Economic Review, XVI (January - June), 1954, p. 653.

[43]Sopin Tongpan, op. cit., p. 14.

production of the year concerned, the domestic requirements and the amount of carryover stocks as well as the foreign market prices. Since rice export is a major earner of foreign exchange, the balance of trade of the economy of Thailand varies directly with the rice export value. Beginning from 1952 up to the present, Thailand has had an unfavorable balance of trade each year. The ratio of exports to imports dropped from 84 to 57 during the period of 1952-1966. At the same time the ratio of rice export to total import declined from 50 percent in 1952 to 16 percent in 1966.[44] The fact indicates that for every 100 baht[45] of commodities imported only 16 baht were compensated for by rice export in 1966.

Most Thai rice is exported to neighboring countries in Asia including Malaysia, Hong Kong, Indonesia, Japan and the Philippines. Also, many countries in Africa, Europe, America and Oceania are Thai rice importers. Essentially, Thailand is a major rice exporting country even though Burma and the United States on some occasions were the leading exporters in the world market. Developments in recent years in the rice export of Thailand are linked to a high degree with the Thai Government's trade policy

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[44]Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966, (Bangkok: 1968), pp. 126-127.

[45]Exchange rate: U.S. $1 is equal to Baht 20.83.

and the formation in 1960 of the Rice Syndicate. The issue of rice trade policy has based upon two basic reasons:[46] (1) the government wishes to reserve sufficient rice for home consumption so that the price of rice will not go up and lead to a higher cost of living; in other words rice should be neither over nor under exported but the annual surplus must be exported in an orderly manner and at as high price as possible; (2) the government at the same time encourages rice export for the purpose of increasing its revenue, since rice premium, a sort of export duty constitutes a large item of public earnings. Also, there had been a tendency for the Government to participate more and more directly in the export trade. About 27 to 45 percent of total rice export during 1960-67 was contracted by the Government although the percentage has declined in 1968-69.[47] From an economic point of view, this kind of Government's intervention probably creates many disadvantages. The discussion on this matter will be deferred.

Trade Pattern and Demand for Rice Exports

From experience, it is observed that the volume of rice exports has increased rapidly since its major contribution to the foreign exchange has been realized. Available

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[46]S. Y. Lee, "Selling Thai Rice," Far Eastern Economic Review, XLV (July 1964) pp. 20-21.

[47]For detail see Table 2.2.

information indicates that during the mid-nineteenth century (1857-59) Thai rice exports accounted for only 59 thousand tons. In the early twentieth century up to the World War II period, annual rice exports increased to the average of 1.5 million tons per year.[48] After the war, rice export trade has slightly changed from the average of 1.3 million tons during 1951-59 period to the average of 1.5 million tons per annum. There has been variations ranging from a low of 1.2 million tons in 1954 to a high of 1.9 million tons in 1964 and 1965 and an average of 1.5 million tons in 1966 and 1967 (Table 2.2). Over a long period of time, therefore, Thailand's share of the world exports is said to be unchanged -- approximately 23 percent since 1955 while the other major rice export countries except the United States show a decline in their export shares. In countries like Cambodia and Burma with internal crisis rice production as well as rice export has tended to decline.[49] For the United States, rice has been one of the most rapidly rising agricultural exports. In 1967, this country became the world's largest rice exporter, topping the nearest competitor, Thailand, by 20 percent. During 1968 the U.S. rice exports reached an estimated 7.8 millions, roughly 27 percent of the total world rice exports. And it is indicated

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[48]Sopin Tongpan, op. cit., pp. 12-13.

[49]Ibid, pp. 27-28.

TABLE 2.2

Rice Exports: Private Exports and Government's Exports, Thailand, 1951-1969

Year	Private Exports	Government Exports	Total Rice Exports		Government exports as percentage of Total Rice Exports
	-----(1,000 tons)-----		quantity	value (a) (million baht)	
1950-53 (a)	*	*	1,450	2,467.7	*
1954-59	1,104	156	1,260	3,041.0	12
1960	867	325	1,192	2,569.8	27
1961	1.015	548	1,563	3,598.2	54
1962	865	412	1,277	3,240.0	32
1963	805	574	1,379	3,424.0	42
1964	1,039	794	1,833	4,388.6	43
1965	1,151	700	1,851	4,334.4	38
1966	769	665	1,461	4,001.1	45
1967	792	651	1,443	4,653.1 (b)	45
1968	663	360	1,022	3,864.4 (b)	35
1969	660	326	986	*	33

source: Sopin Tongpan, An Economic Analysis of the Price of Thai Rice, Unpublished Doctoral Dissertation, Ohio State University, 1969, p. 18; 1968-1969, Ministry of Economic Affairs, Bangkok.

(a) Thailand, Division of Agricultural Economics, Agricultural Statistics of Thailand, 1966, Bangkok, 1968, p. 127.

(b) Office of National Statistics, Compilation of Important Statistics of Thailand (in Thai), Bangkok, December, 1969, p. 21.

* no data available.

that the United States is expected to maintain her present status of the leading world rice exporter with exports of approximately 2 million tons within the next five years.[50] It is believed that most rice exporting countries will face problems of over supply because most rice importing countries plan to reduce purchases by becoming more nearly self-sufficient in rice production. Therefore, within the next five years, it is expected that world rice situation will have adjusted from the pattern of relatively high prices and scarce supplies exhibited during the past decade to one of generally adequate exportable supplies and significantly lower prices.[51] This depressed producer prices is expected to dampen the increase in rice production in Thailand, a major exporting country. As a consequence, there will be problems of rice export trade as well as domestic rice policy for the economy of Thailand.

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[50]Quentin M. West, "Trends and Development in Foreign Trade," Paper presented at the International Marketing Workshop, New Orleans, Louisiana, (May 1969), pp. 10-11.

[51]Ibid, p. 11.

CHAPTER III

TIME-SERIES ANALYSIS OF RICE PRICES

In this chapter, an attempt has been made to investigate and describe the long-time price behavior and seasonal price patterns of Thai rice in both domestic and export markets. A description of price relationships within and between different market levels -- the domestic, export, and the world market, will be also presented.

Long-Time Price Movements

Since trading in rice or paddy in Thailand is almost completely free of the government regulation, the price levels of rice and paddy are determined by the supply of and demand for rice. Otherwise, the determination of rice prices must involve other factors outside the rice economy especially the fixed price regulation which is exercised by some institutions; such a phenomena represents the situation in some other countries like Burma and United Arab Republic in which fixed producer prices are regulated by the government. In the case of Thailand, farmers are suppliers of paddy and their supplies obviously change from year to year depending, to the large extent,

upon weather conditions. Similarly, on demand side, it is believed that the demand for rice in Thailand is increasing because of a rapid population growth. An increasing but steady demand associated with annual variation in rice supply produces, to some degree, variability in price of rice and paddy.

Trends in Domestic Prices and Production of Paddy

Considering of paddy price over a long period of time, there is a lack of data on farm price level since prices received by the farmers in Thailand have not yet been officially compiled. The best alternative, therefore, is the wholesale prices of paddy delivered alongside mills in Bangkok and Thonburi. Using prices at wholesale level, to some extent, may represent the prices received by the farmers. Actually, the average wholesale price of paddy represents the price paid by the rice millers in the cities, particularly, in Bangkok. This price, therefore, is the price received by the local and/or regional middlemen and probably by the farmers less the marketing costs. The farm price is assumed to vary with the wholesale price level and to differ by transportation costs and some profit margins. At present, these market margins tend to decrease since there has been a rather high

degree of competition among rice mills as well as a considerable improvement in transport facilities.[1]

Bangkok is important as the central market for the whole country both for domestic and export trade. For the purpose of this study in an attempt to trace out the historical variation in paddy prices, Bangkok price is, therefore, used to reflect the prices of various levels of domestic trade. Specifically, in this study we assume that prices at farm and retail levels vary in the same direction as price in Bangkok -- i.e., the wholesale price.

From Figure 3.1, it may be seen that, over the last 18 years, the average paddy price exhibited year to year variation but with a slight and steady upward trend. At the same time, the trend in rice production also showed an upward movement. Incidentally, year to year change in both price and production during some specific periods appeared related to each other. Particularly, during the period 1956-1958 while production severely declined and price jumped up sharply, and in 1959-1960 price moved slightly downward while production increased. Nevertheless, changes in price during the period 1954-56, 1960-62 and 1965-66 appeared not related to annual production since

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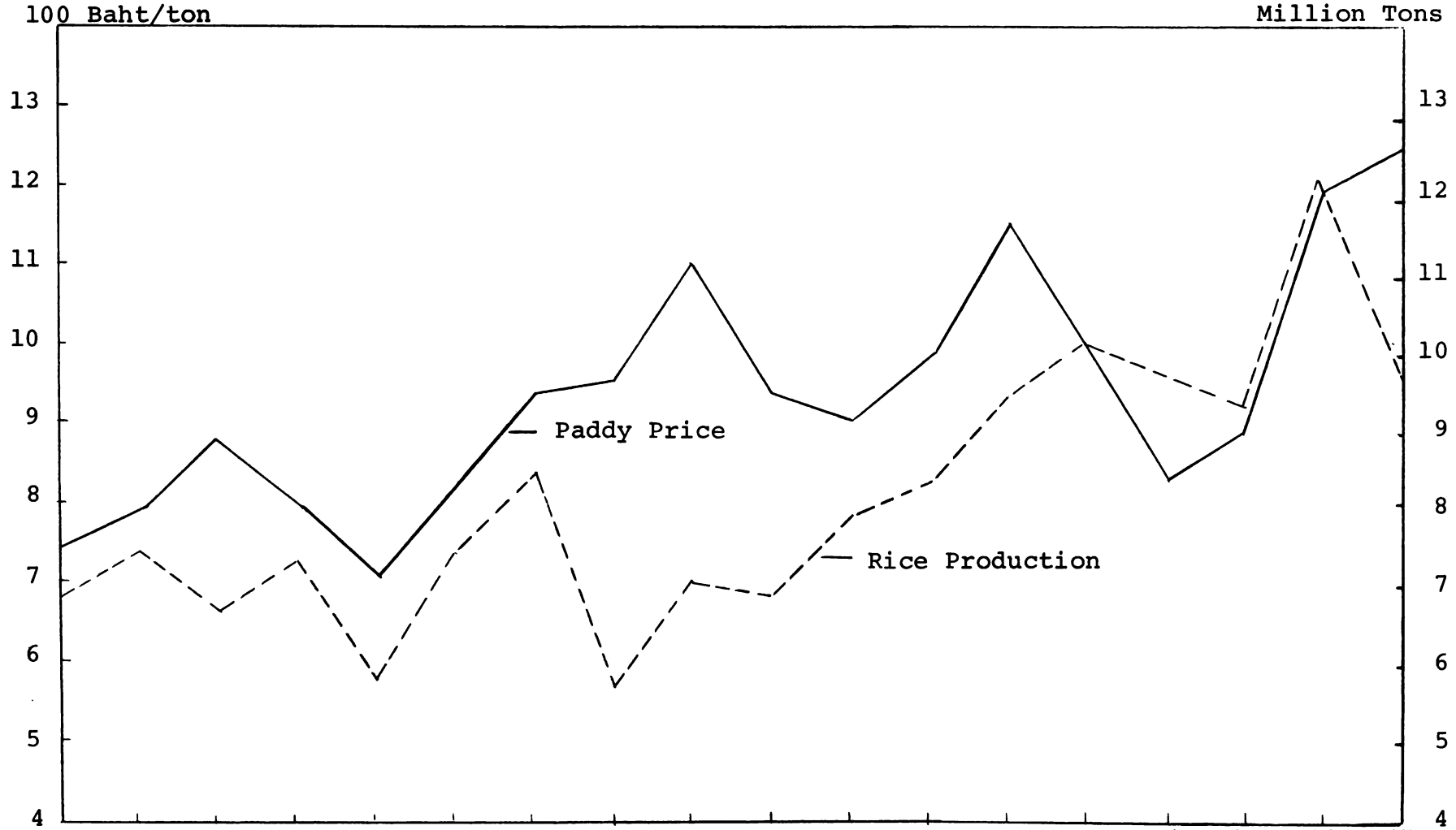
[1]Chaiyong Chuchart and Sopin Tongpan, The Determination and Analysis of Policies to Support and Stabilize Agricultural Prices and Incomes of the Thai Farmers. Kasetsart University, Bangkok, pp. 46-47.

FIGURE 3.1

ANNUAL WHOLESALE PRICE OF GRADE NO. 1 PADDY AND ANNUAL RICE PRODUCTION, THAILAND, 1950-67



Source: Production, Agricultural Statistics of Thailand, 1966, Bangkok, 1968, p. 46
Price, FAO, Production Yearbook, Vol. 21, 1967, p. 58.

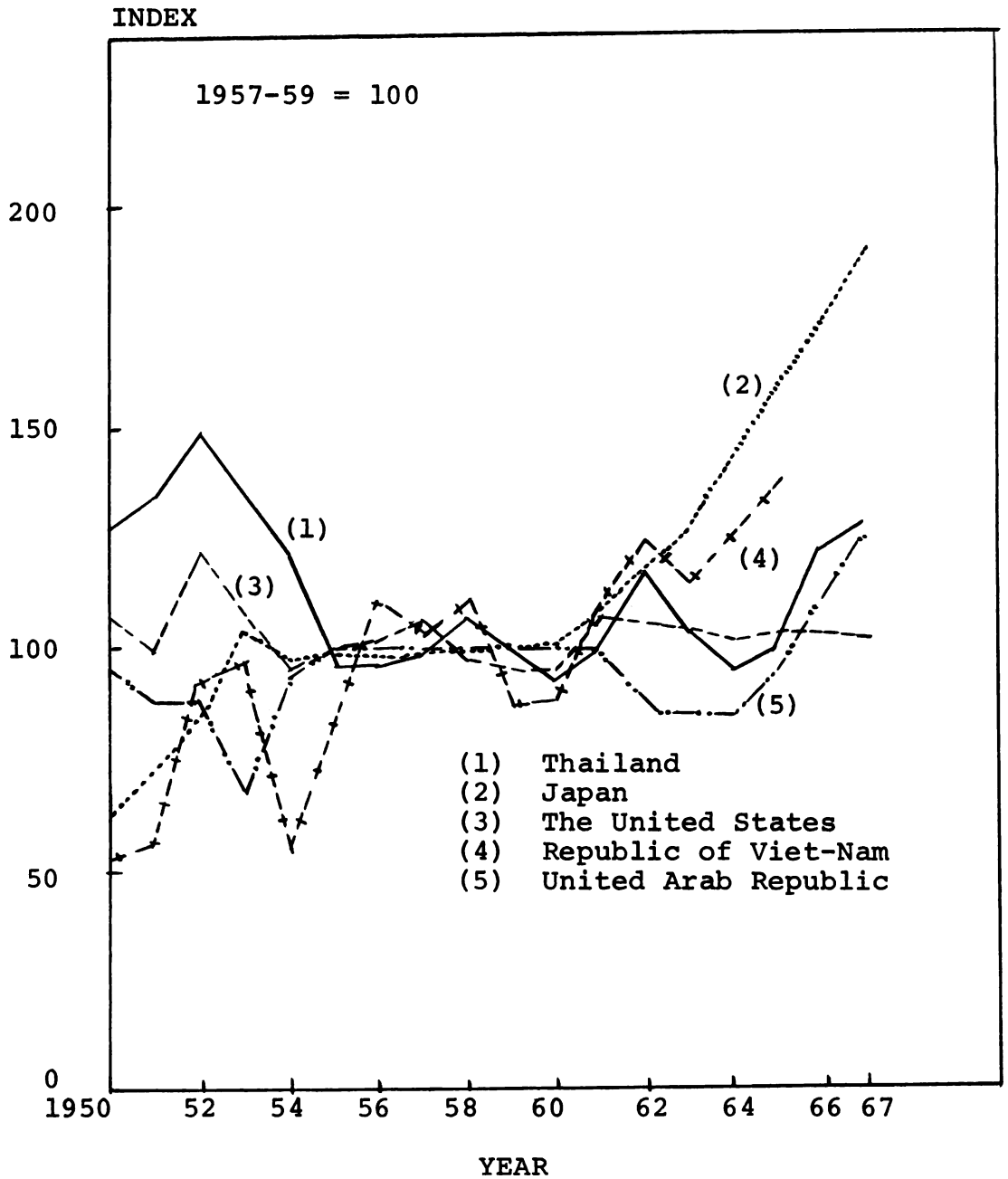
price and production moved into the same direction. It is also observed that during the periods of good production such as the period of 1952-53 and 1963-64, the price showed a sudden decline. Generally, during the 18 year period, year to year fluctuation in price of paddy seems partially explained by annual rice production; but largely subject to other factors.

Prices in Other Major Rice Exporting Countries

The purpose of studying prices in other exporting countries is to observe how the variation in their prices relates to the price in Thailand. The average world price of rice should be partly explained by export price from every exporting country. Therefore, price in each individual rice exporting country is assumed to be related to the single world price. As a consequence, prices of paddy or rice in individual producing countries by definition must exhibit the same direction as well. Specifically, price fluctuation in one country is assumed to respond more or less to that of other countries. Figure 3.2 presents the annual paddy price indices in some major rice producing countries -- Thailand, Japan, the United States, Republic of Vietnam and United Arab Republic. It is noticed that these price fluctuations over the entire period of 1950-67, follow a rather similar pattern but differ in degree of variation.

FIGURE 3.2

PADDY PRICE INDICES IN THAILAND, THE UNITED STATES, JAPAN, REPUBLIC OF VIET-NAM, AND UNITED ARAB REPUBLIC, 1950 - 67.



Source: Appendix Table A.4

However, Burma is an exception since minimum fixed-prices set by the government remain the same over time. (Appendix Table A.4). In other words, the minimum price index of paddy in Burma is constant at 100 percentage point and is excluded from Figure 3.2. In this connection, Burma's paddy price may not be related to prices in other countries unless the fixed-price regulation is eliminated. The same situation also existed in the United Arab Republic, particularly during the period of 1953-54 to 1961-62, price fluctuations in this country were manipulated in the opposite direction to prices in major free trade countries (Figure 3.2). But, fixed-price regulation in the case of United Arab Republic was flexible during some periods.

Trends in Thai Export Prices and the World Rice Prices

Since prices in individual rice producing countries, to some degree, are related to the world price, it is no surprise that export prices also depend heavily on the world price. Among the principal rice exporting countries like Burma and Thailand rice production and export are generally undertaken on a relatively large scale and under a rather high degree of competition.[2] Fluctuation in the world price obviously affect variation in both domestic and export prices of rice producing countries. However,

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[2]Ibid, p. 24.

in the case of Thailand, the world price effect on domestic prices seems not to be severe since domestic prices are protected, to some degree, by the rice export tax (rice premium) regulation. This mechanism is used directly as a price barrier between domestic and export prices in an attempt to keep domestic prices low but responsive to the prices in the world market.[3] Comparison of indices of export prices among Thailand, Burma and the world market is presented in Figure 3.3. It may be seen that world export price index showed considerable fluctuation from year to year during the period of 1957-61. After 1961, the index was stable until 1964 then gradually increased to the extreme in 1967. Export price indices of Thailand and Burma were manipulated in the same direction, apart from the fact that the degree of variation of Thai export prices appear greater than that of Burma. However, both indices tend to keep their fluctuations closely around the world price index. Export price series from any individual exporting country, therefore, is likely an export price indicator of each other.

Seasonal Price Patterns

An important characteristic of agricultural prices is their tendency to exhibit regular seasonal fluctuation;

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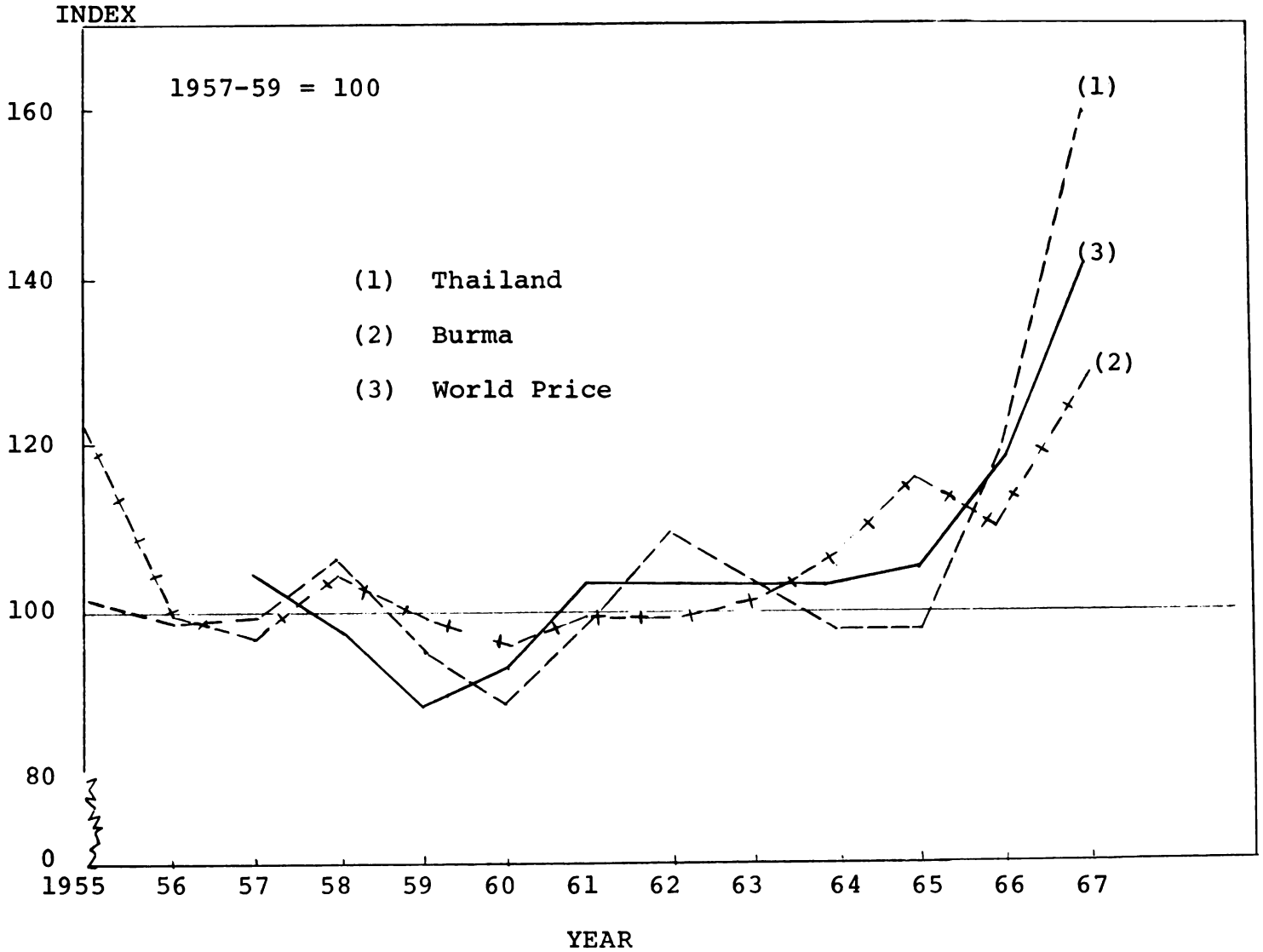
[3]Discussion in detail will be presented in Chapter V.

FIGURE 3.3

RICE: INDICES OF ANNUAL EXPORT PRICE IN THAILAND, BURMA, AND THE AVERAGE WORLD EXPORT PRICE INDEX, 1955-67.



Source: Appendix Table A.5

and knowledge of these seasonal price movements is essential in making production and marketing decisions.[4] Most crops are harvested only once a year with the time depending upon the availability of inputs used and weather conditions. Factors that cause seasonality in most agricultural prices are nothing but the impossibility or high cost of production during certain seasons of the year.[5] Within a year, demand for most agricultural products tends to remain fairly stable but supplies fluctuate due to the differences in production and storage costs between seasons. As a result, prices and production levels tend to move in opposite directions. In other words, in seasons of smaller supplies price tends to be high and vice versa.[6] This seasonal factor associated with the varying locations of rice production spread the season of harvest over a period of 5 to 6 months, from October to March of crop year. However, because of the problems of financial position, small scale production, and the lack of storage facilities many farmers dispose of most of their rice supply immediately after harvest. As a result, the peak market period is reached and followed by a severe decline in price during

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[4]Richard G. Heifner and Robert P. Ferguson, Seasonality in Michigan Agricultural Prices, 1958-1967. Agricultural Economics Report No. 18, MSU, Dec. 1968. p. 2.

[5]Ibid, p. 1.

[6]Ibid, p. 5.

the post-harvest period of the year; and after that the supply begins to decline from month to month and becomes succeedingly low during the period of November to early January. Because of the seasonal variation in market supply of rice, the seasonality in price of rice is, therefore, presented accordingly. These seasonal patterns in both price and quantity of rice, however, will be discussed in detail in the appropriate succeeding sections.

Seasonal Domestic Price Calculations

In order to measure seasonality in prices, seasonal price indexes are calculated using the ratio-to-moving average technique.[7] Calculations are performed using a special computer program.[8] The data for the analyses consisted of monthly price series of paddy and white rice 5% broken as well as quantity supplied both in domestic central market and export market. Data were assembled from various publications available from Thai Government agencies and the Food and Agriculture Organization of the United Nations.

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[7]For detail, see Foote, Richard and Karl A. Fox, Seasonal Variation: Methods of Measurement and Test of Significance, U.S.D.A. Agricultural Handbook No. 48, September, 1952.

[8]For detail, see Heifner, Richard and Jacqueline Mussell, Program Description SEASON, Dept. of Agricultural Economics, Michigan State University, Agr. Econ. 954, Revision, August, 1966.

The measurements are based on data from the period 1950 through 1966 except for some series of exports which included only the 1956-66 period. Most of the domestic price series are estimates of average wholesale prices assembled by the Department of Internal Trade, Bangkok. The export prices are monthly averages of market quotations.

In interpreting the results, it is suggested that the seasonal indexes for each set of data consist of two indicators of variations in seasonal patterns. The first indicator is a figure which contains three irregular but roughly parallel lines running from left to right. The central line represents the average index of seasonality as calculated from data collected. The upper and lower lines bound an area of uncertainly about the index. Technically, the upper and lower bounds are one standard deviation above and one standard below the mean respectively.[9] The second indicator is the trends in the trend values for the index for individual months which are reported in the last line in the appropriate Table in Appendix B. The trends in index values represent the changes in the seasonal pattern over time. Their values show the annual changes in the index for various months. A positive trend value for a particular month indicates the over time the seasonal index for that month increases. Conversely, the seasonal

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[9]Richard G. Heifner and Robert P. Furguson, op.cit., p. 2.

index is decreasing if the trend value for that particular month appear to be negative. However, if the trend value is positive during the months when the index is below 100 and negative for the months when index is above 100, it indicates that seasonality is diminishing. On the other hand, if the trend is positive for months when index is above 100 and negative for months when index is below 100, it is the evidence that seasonal index has been increasing over time.[10]

Seasonal Variations in Paddy Supply

The seasonal variations in paddy supply are represented by the seasonal pattern of the paddy market in Bangkok, the only location where seasonal data are available. Even though the quantity bought by Bangkok and Thonburi millers was relatively small compared with total production, it still shows significant seasonality (Figure 3.4). The figure shows that the quantity of paddy reaching Bangkok and Thonburi markets attains its peak during the harvesting period -- January to March and reaches a trough during the months of September to November. The quantity supplied during the peak periods have averaged about 61 percent above annual average amounts. In contrast, the average amounts during the lower supply period was about

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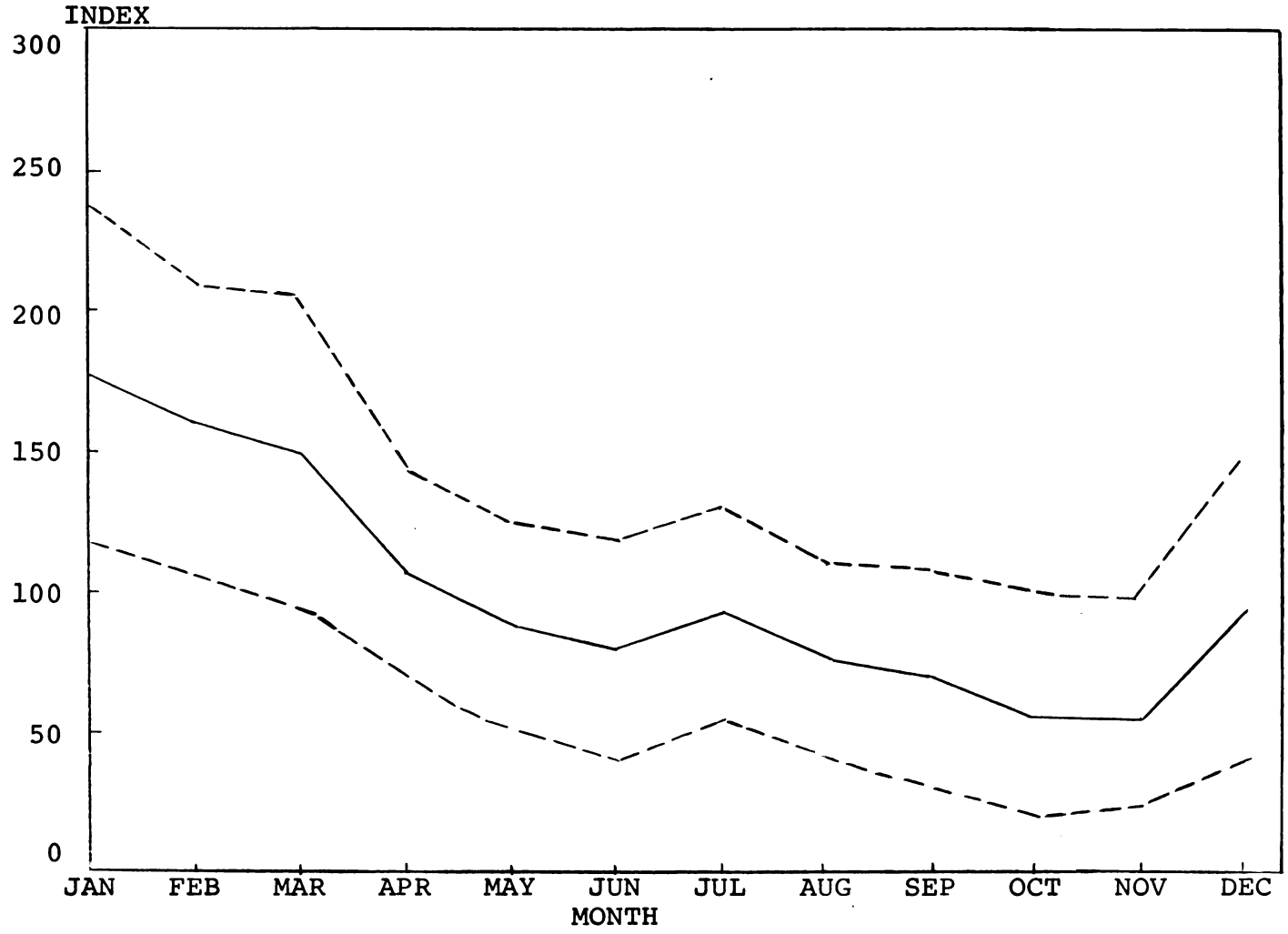
[10] Ibid, p. 3.

FIGURE 3.4

INDEX OF SEASONALITY IN QUANTITY OF PADDY BOUGHT
BY BANGKOK AND THONBURI MILLERS, THAILAND



Source: Appendix Table B.1

62 percent below the annual average. However, the trend values indicate that the seasonal variation in paddy supply in Bangkok and Thonburi markets has been increasing over time (Appendix Table B.1).

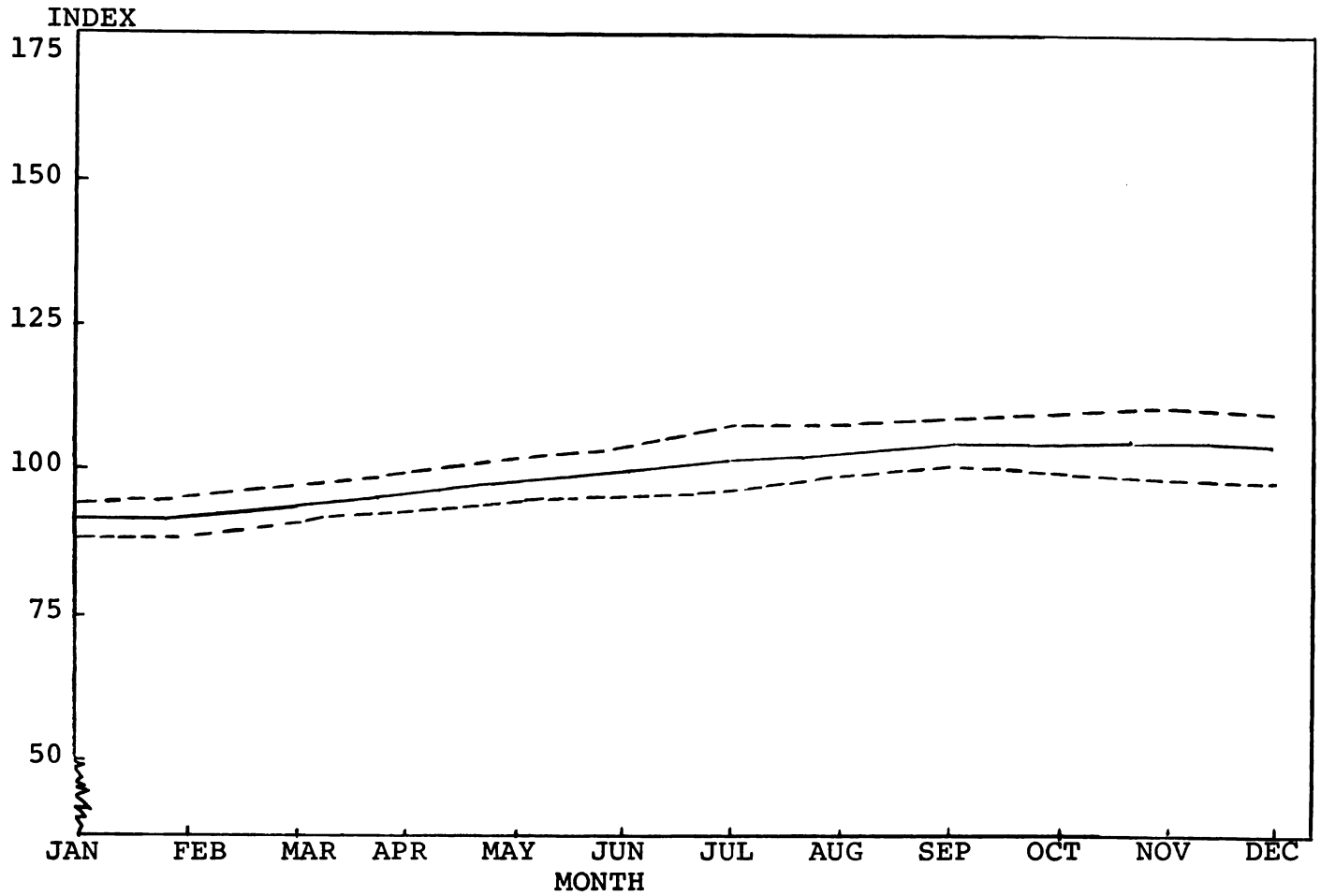
Domestic Seasonal Price Variations

Figure 3.5 shows that there is very small seasonal variation in the price of paddy at Bangkok market. The peak during the period of September to December is about 4 percent above the annual average. The harvest season -- January to March is about 7 percent below the annual average index. According to the trend values, there is no evidence that seasonal pattern in paddy prices at wholesale level in Thailand is changing significantly. (Appendix Table B.2).

In addition to paddy price, the seasonal pattern in prices of white rice (100-5%) in Bangkok were also investigated. Figure 3.6 shows that the prices of rice exhibit a rather smooth seasonal pattern with a peak in the month of December and then reaches a trough in January. However, a gradually increasing seasonal index obviously exists. The peak of seasonality is about 6 percent above annual average contrasts with a 9 percent below average trough. The trend values do not give evidence that there are significant changes in seasonal pattern in the prices of white rice (100-5%) at wholesale rice market level (Appendix Table B.3).

FIGURE 3.5

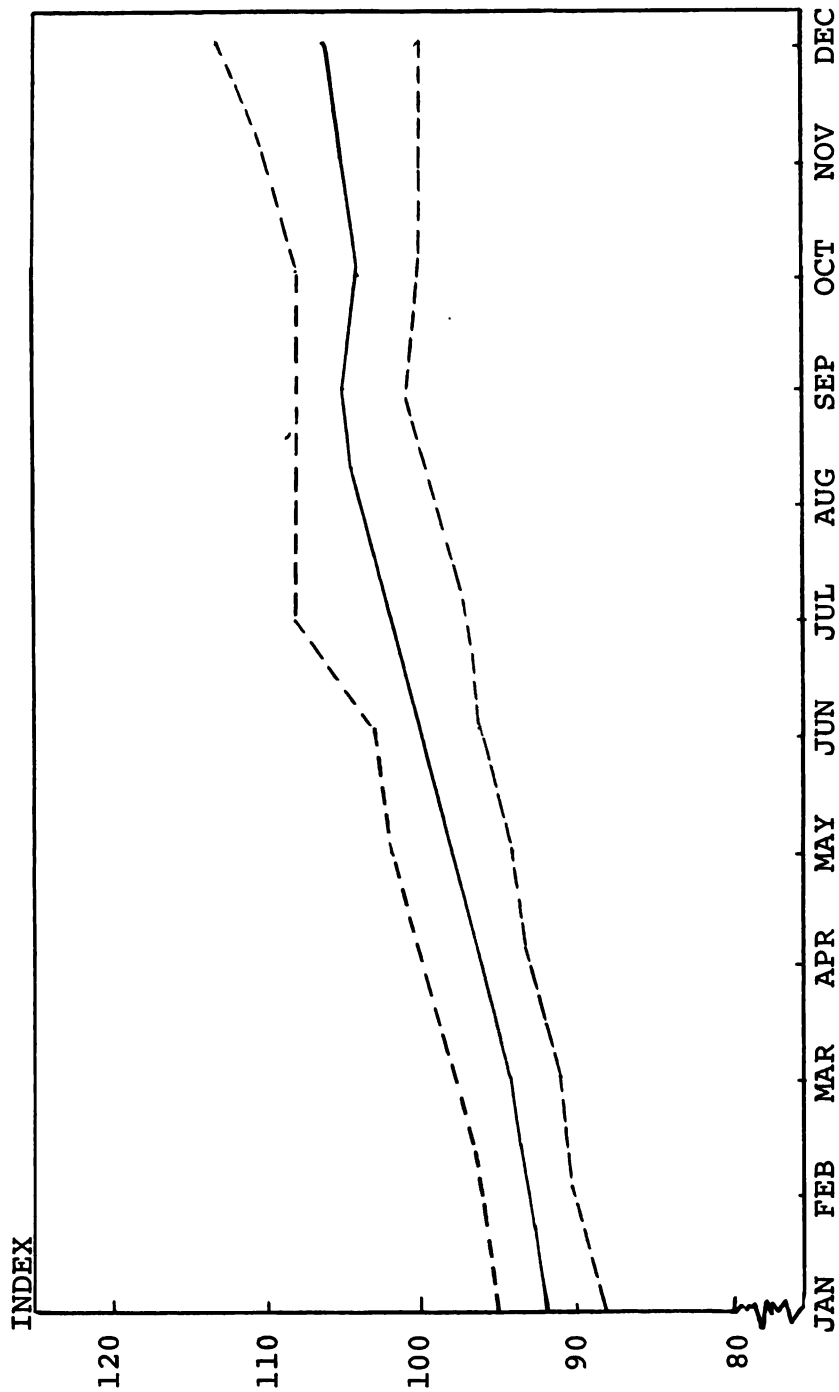
INDEX OF SEASONALITY IN PRICE OF PADDY (NO.1) DELIVERED ALONG-SIDE MILLS IN BANGKOK AND THONBURI, THAILAND



Source: Appendix Table B.2

FIGURE 3.6

INDEX OF SEASONALITY IN PRICE OF RICE (100% WHITE RICE)
IN BANGKOK, THAILAND



Source: Appendix Table B.3

Seasonality in Quantity and price of Rice Exports

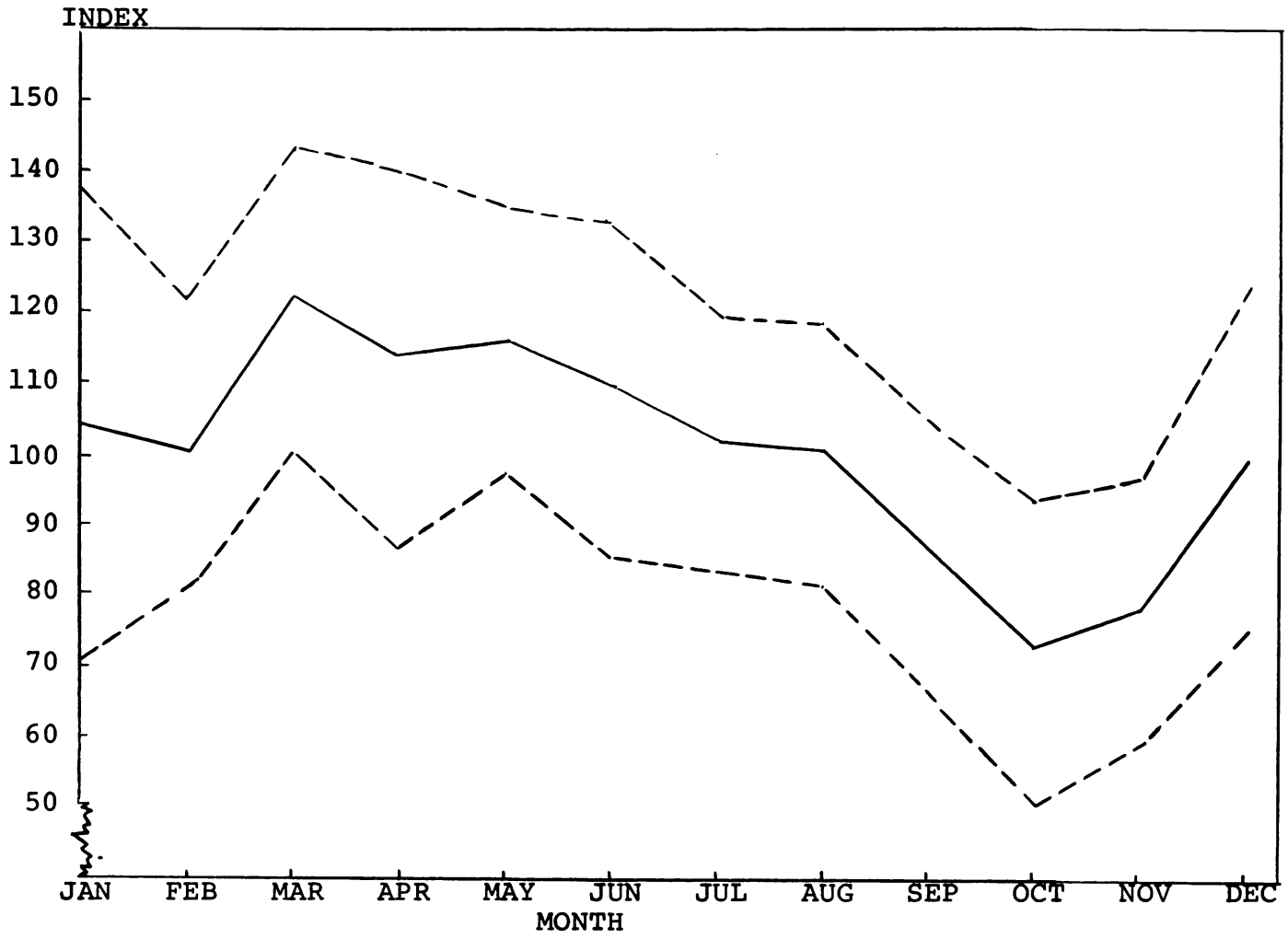
Domestic utilization of rice for food, seed, feed and other industrial uses is relatively stable, rice exports therefore depend upon annual rice production. Figure 3.7 shows a considerable seasonality of rice export over the period of 1956-66, -- a seasonality with a seasonal peak in March at 122 and a seasonal low at 73 in October. Trend values indicate that the seasonal pattern is changing significantly (Appendix Table B.4).

Associated with the seasonal pattern in quantity of rice (all grades) exported is the variation in quantity of a specific grade of rice export -- white rice 5% broken. The seasonal pattern for the specific is similar to that of the overall quantity. However, slightly greater variations are presented (see Figure 3.8). The variations in quantity of rice 5% broken exported, therefore, should be a representative of total Thai rice exports. Also, there is evidence that the seasonality in 5% grade rice export has been increasing significantly (Appendix Table B.5).

Seasonality in export price in this analysis is represented by the seasonal movements of rice (5% broken) export price since data on average export price during the period covered by this study are not available. Seasonal variations in export price usually reflect seasonality in quantity of rice exported. Figure 3.9 shows that

FIGURE 3.7

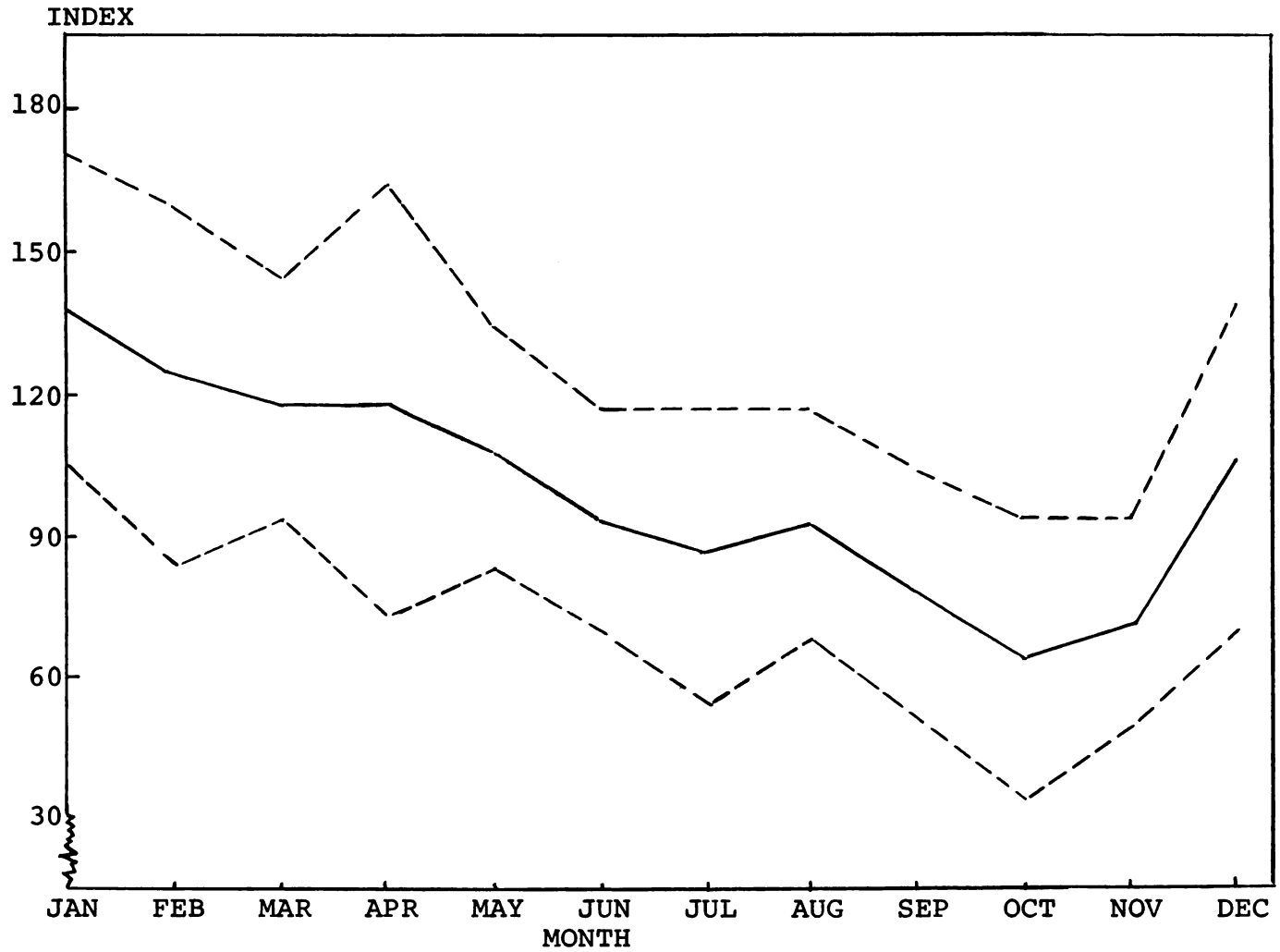
INDEX OF SEASONALITY IN QUANTITY OF RICE (ALL GRADES) EXPORTS, THAILAND



Source: Appendix Table B.4

FIGURE 3.8

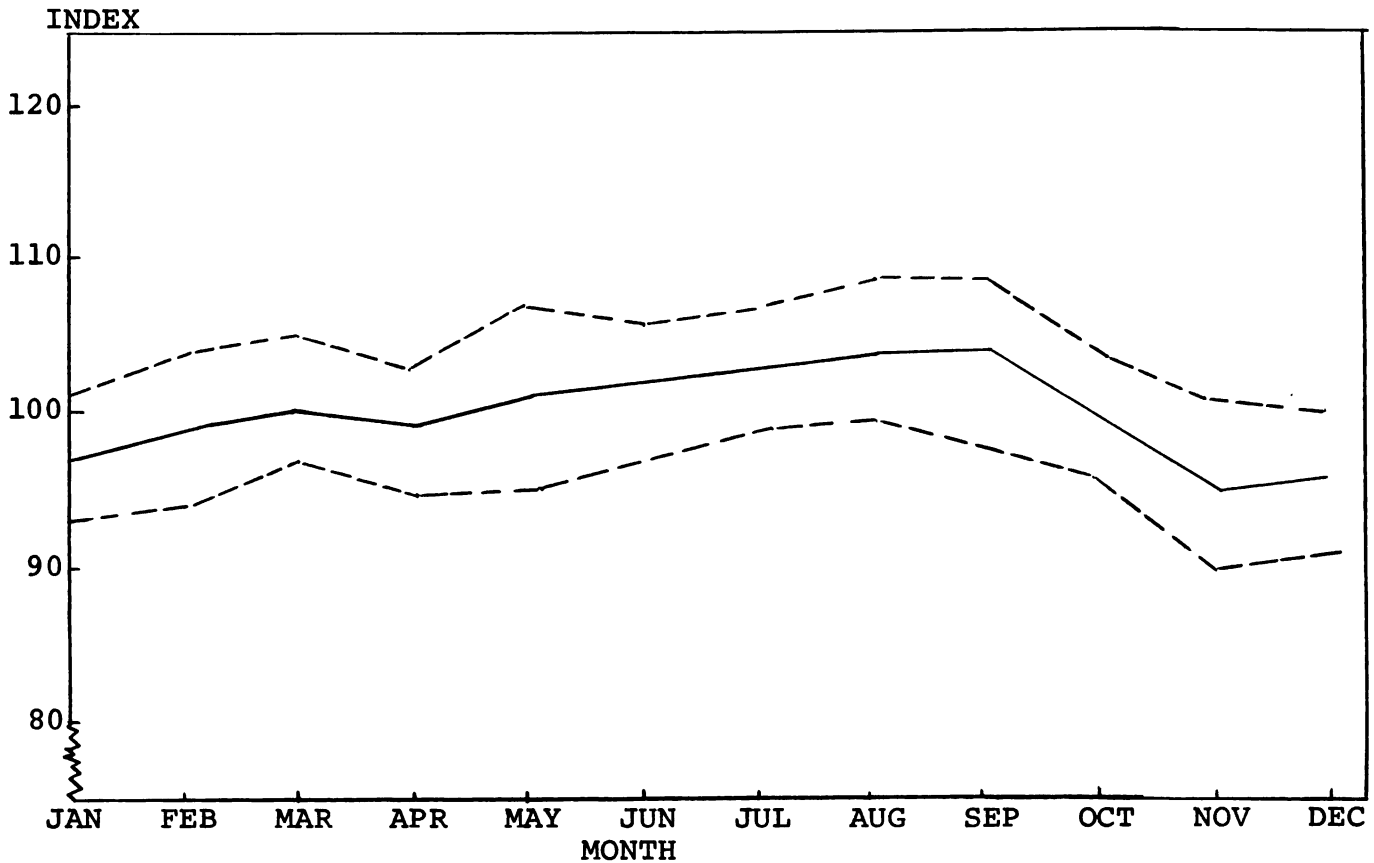
INDEX OF SEASONALITY IN QUANTITY OF RICE
(5% BROKEN) EXPORTS, THAILAND



Source: Appendix Table B.5

FIGURE 3.9

INDEX OF SEASONALITY IN EXPORT PRICE OF RICE
(5-7%), (F.O.B. BANGKOK), THAILAND



Source: Appendix Table B.6

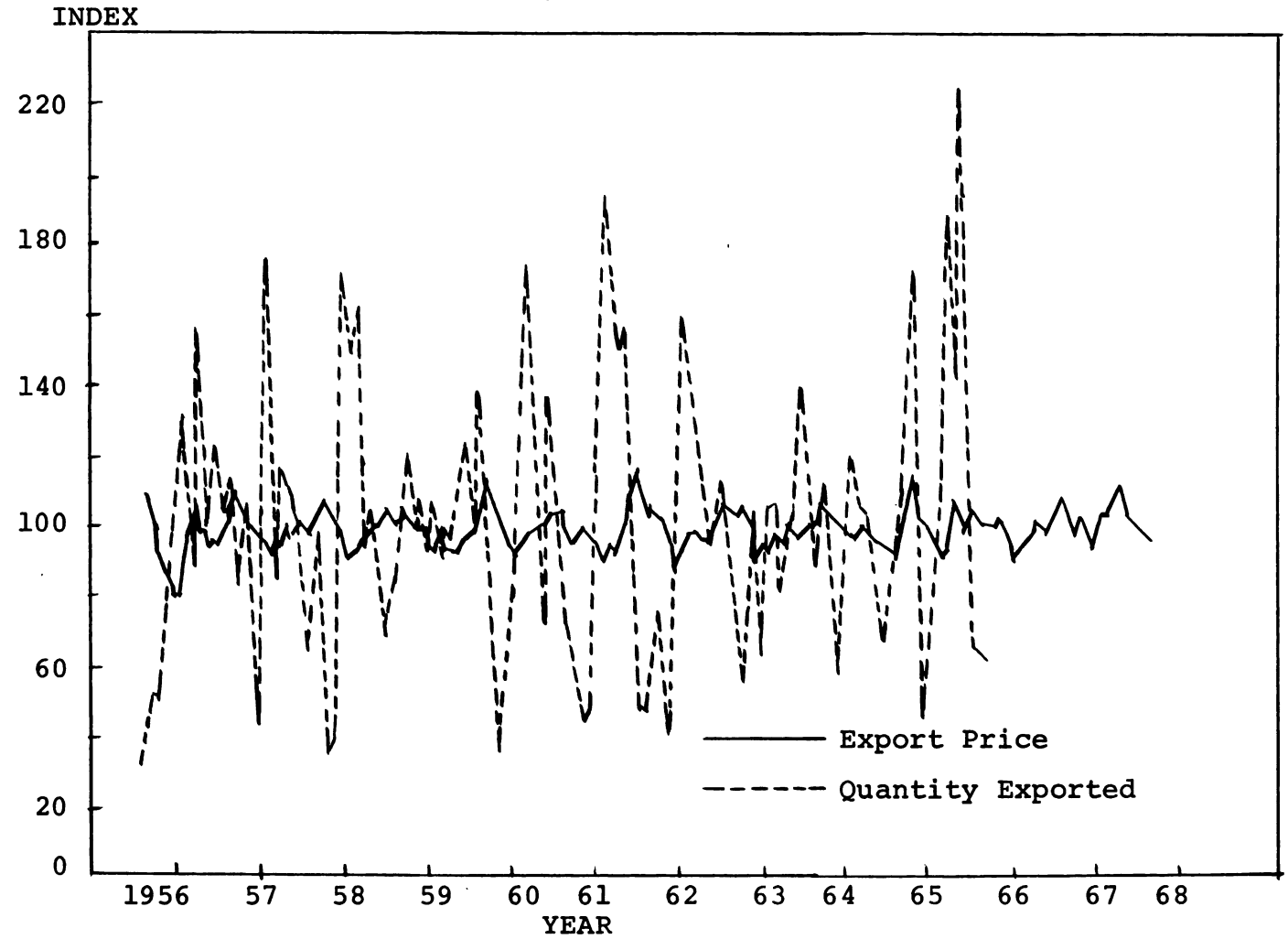
the seasonal variation in the price of rice (5% broken) ranges from an average of 96 from the seasonal low during November to January to the seasonal high of about 104 during August to September. It is observed that seasonal pattern in export price does not exactly correspond to the seasonality in quantity of rice exported which was previously mentioned. It means that a seasonal high in price does not exactly imply a seasonal low in quantity exported and vice versa. This is because of the fact that the variation in export prices of individual exporting country is not absolutely explained by only the quantity of export of that particular country but it is also explained by other factors affecting the world market. Figure 3.10 shows the relationship between export price and quantity exported of rice (5-7% broken). It illustrates that the price-quantity export relationship for some periods such as early 1963, 1964 and 1966 did not follow our assumption on the law of demand. Also, it is noticed that the quantity of exports exhibits a high degree of variation over time but the price is rather stable.

The estimated trends indicate some evidence that the seasonal movements in price, particularly of rice (5-7% broken) exports has been changing over time (Appendix Table B.6).

FIGURE 3.10

INDICES OF PRICE AND QUANTITY OF RICE (5-7%) EXPORTS, THAILAND 1956-68.

(MONTHLY BASIS, 1957 - 59 = 100)



Source: Appendix Table B11, B.12

Relationships Between Domestic Price, Export Price, and the World Export Price

Relationship Between Domestic Paddy Price and White Rice Price

Figure 3.11 shows the relationship between the wholesale prices of white rice (100%) and the wholesale price of paddy (no. 1) in Bangkok market. It indicates that over the period 1950-66 these two price levels exhibited a close relationship and moved in the same direction.

Relationship Between Domestic Paddy Price and Quantity of Rice Exports

Figure 3.12 presents the relationship between paddy price and exports. From the figure, it appears that during the period from 1952 to 1965 rice export and paddy price had a negative relationship with each other. The negative relation held in the case of quantity exported and export price.

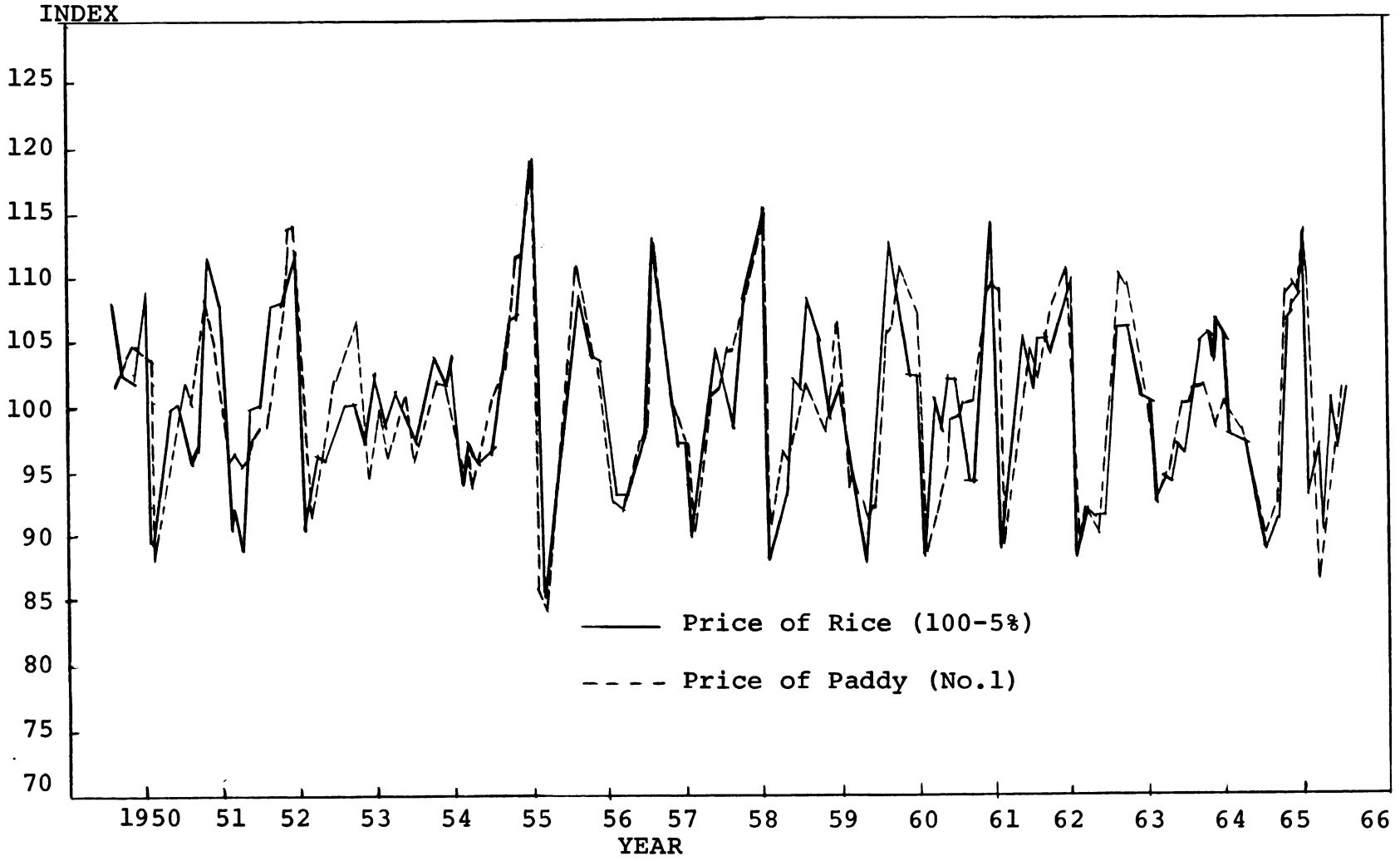
Relationship Between Domestic Price of Rice (100-5%) and the World Price

An attempt was made to correlate the domestic wholesale price of rice particularly the average price of rice 100% and 5% with the average world price. This relationship affects the workability of the rice export tax policy which is designed to protect and isolate variation in domestic prices from fluctuations in the world price

FIGURE 3.11

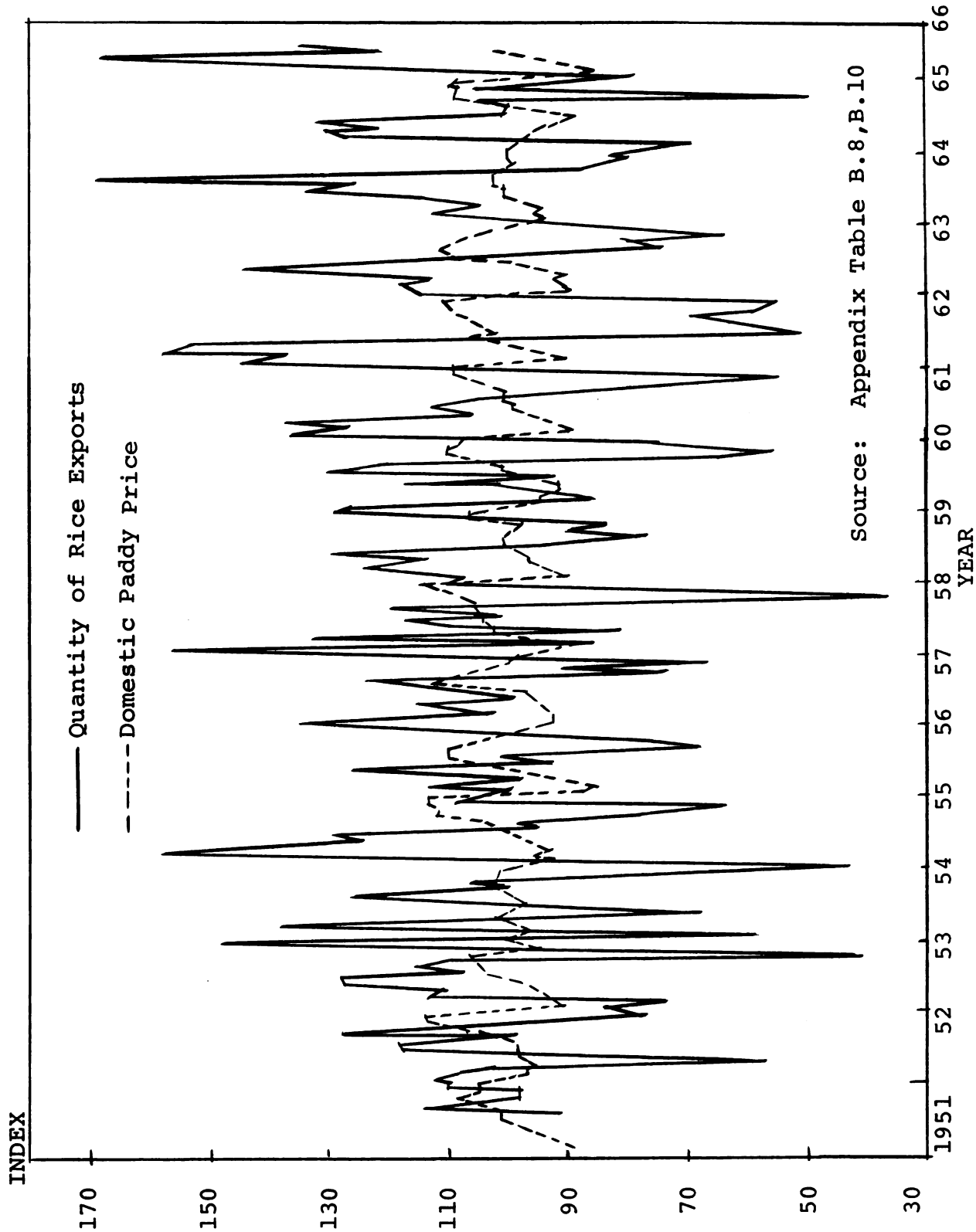
INDICES OF DOMESTIC PRICE OF RICE(100-5%) AND PADDY(N).1) PRICE, THAILAND, 1950-66.

(MONTHLY BASIS, 1957 - 59 = 100)



Source: Appendix Table B.8, B.9

FIGURE 3.12
INDICES OF PRICE OF PADDY(NO.1) AND QUANTITY OF RICE (ALL GRADES) EXPORTS, THAILAND, 1951 - 66 (MONTHLY BASIS, 1957-59 = 100)



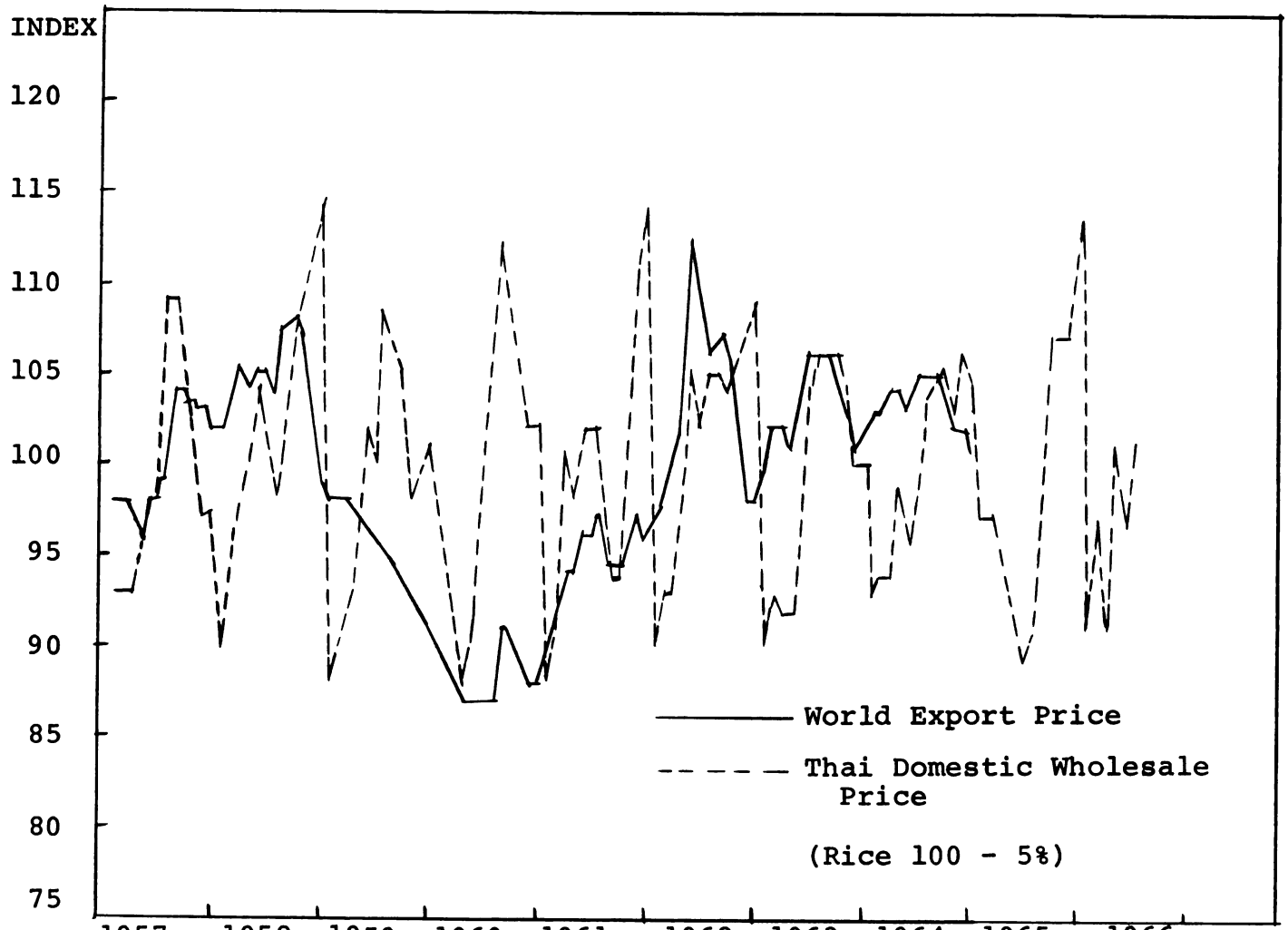
and thereby, from changes in the world demand for and supply of rice. Figure 3.13 shows that during 1957-66, the domestic wholesale price moved in the same direction as the world price. Particularly from 1958 to 1962-63 both world and domestic prices almost moved in the same line, apart from the fact that domestic price did not fall while there was a severe decline in the world price during 1959-60. This may be a contribution of the rice export tax policy which attempted to make domestic price less responsive to any effect from outside world particularly during a price depressing period.

Relationship Between Thailand's Average Export Price and the World Export Price

Figure 3.14 illustrates the relationship between the export price index of Thailand and the world market. The figure shows a considerable year-to-year fluctuation in both Thai export and the world price. In general, the world index and the Thai index of export prices during 1956-63 tend to move in the same direction with slightly greater variations in those of Thai rice export. Since the data on the average export price from Thailand are not available for the period after 1963, the determination of the relationship between prices of these two markets could not be further presented.

FIGURE 3.13

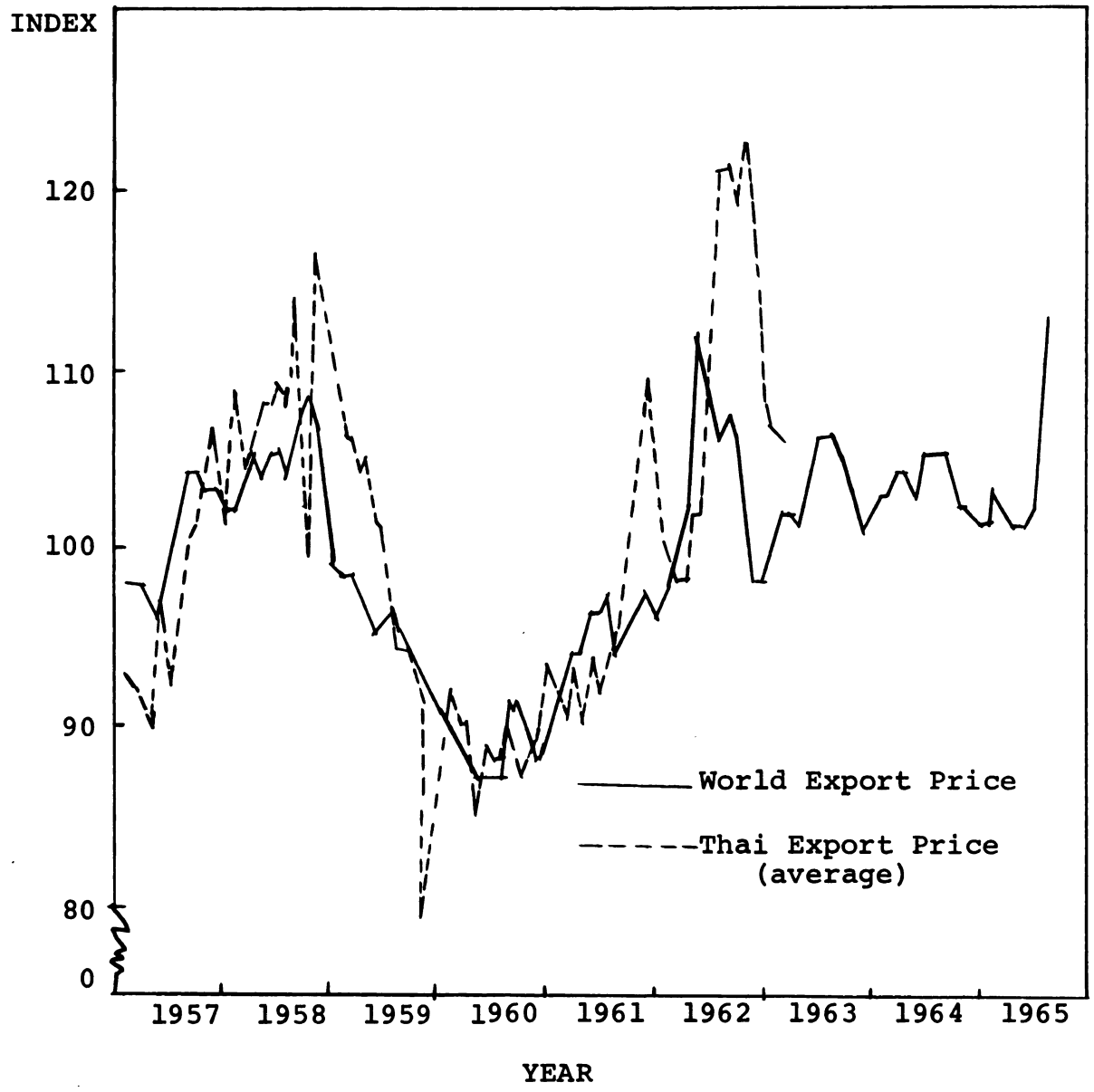
INDICES OF THAI DOMESTIC WHOLESALE PRICE OF RICE (100 - 5%) AND THE AVERAGE WORLD EXPORT PRICE, 1957-66 (MONTHLY BASIS, 1957-59 = 100)



Source: Appendix Table B.9, B.14

FIGURE 3.14

INDICES OF THAI AVERAGE EXPORT PRICE (WITH PREMIUM) AND THE AVERAGE WORLD EXPORT PRICE, 1957-65 (MONTHLY BASIS, 1957-59 = 100)



Source: Appendix Table B.13, B.14

In conclusion, the analysis of time-series of prices and quantities of rice in both domestic and export market reveals increasing trends in both price and production of paddy on annual basis. The seasonal variations in domestic prices of rice and paddy are rather small in terms of degree of variation and of change over time. But seasonality in domestic market supply, quantity exported and export prices has been increasing significantly over time. Domestic price relationships between the paddy and rice market level are closely related and move in the same direction. Also, the Thailand export price and the world price on a monthly basis tend to move in the same direction with greater variations in that of Thailand.

CHAPTER IV

DEMAND AND SUPPLY OF RICE

Introduction

Agricultural price analysis centers around the analysis of demand and supply of farm products and has been developed since the early 1920's.[1] This kind of analysis involves the statistical measurements of demand and supply for a particular farm product for purposes of theoretical application and public policy implication. Also, the knowledge of demand and supply patterns can be of value in production planning and orderly marketing of agricultural commodities. Statistically, the analysis is designed to measure price-quantity relationships of a particular commodity under some specified economic assumptions. Since the statistical demand and supply analysis involves the development of several disciplines -- economic theory, probability theory, and statistics, an analysis based on knowledge of these requirements is likely to provide an accurate and specific result.

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[1]Karl A. Fox, Econometric Analysis for Public Policy (Ames: The Iowa State University Press), 1958, p. 3.

This chapter is an anlysis of the economic and statistical models for measuring the price-quantity relationships in the specified demand and supply equations for rice in Thailand. Also, an attempt has been made to estimate the elasticities of demand and supply of rice in the economy. However, before presentation of the models, the justification of factors relevant to the models, the sources of data and the data themselves, the period covered in this study as well as the statistical assumptions in this analysis will be discussed in the chapter.

The Data

The data used in this analysis are secondary data selected mainly from Thai government and Food and Agriculture Organization of the United Nations publications. Particularly, the harvested rice acreage, production, and personal income in baht per capita utilized in the analysis were taken from the Agricultural Statistics of Thailand, 1966 prepared and published by the Division of Agricultural Economics, Ministry of Agriculture in Bangkok. The price series -- the wholesale price of white rice (100%) and the wholesale price of paddy (grade No. 1) in Bangkok market were obtained respectively from the price records of the Department of Internal Trade, Ministry of Economic Affairs, Bangkok, and of the United Nations in the FAO, Production Yearbook, 1967-68. The wholesale price of white rice (100%)

is expressed in term of baht per metric ton of milled rice marketed in Bangkok. The wholesale price level is used to reflect the movement of retail price of rice in Bangkok since retail data on rice prices which are more relevant to the consumer demand equation are not available. Similarly, the wholesale price of paddy in Bangkok market is used to represent the price received by the farmers when supply equation is being estimated, since no farm price data are officially compiled in Thailand today. However, the only relevant point is whether wholesale and retail as well as farm price move together. The wholesale price of paddy (No. 1) is also expressed in baht per ton of paddy delivered along-side mills in Bangkok. Those series on rice production, wheat imports, harvested rice acreage are measured on per capita basis -- i.e., kilograms per capita for rice (on paddy term) and wheat. Rice exports in million tons and rice export tax in baht per metric ton of rice exports are also utilized in this analysis and were taken from the records prepared by the Department of foreign Trade in Bangkok.

Period Covered in the Analysis

Annual data for the calendar years 1952 through 1966 for most series of data were used in this study. Exceptions are those series on annual production and harvested acreage which are measured based on crop year basis. The

period of study is limited by the availability of data -- i.e., no data are available on the rice export tax for the period prior to 1952, but data on rice production and personal per capita income are not available for the period after 1966. Therefore, the period covered is restricted from 1952 to 1966 or seventeen observations. However, the observation period is long enough to average out the effect of many nonmeasurable factors which reduce the precision of the statistical estimates.

The Method

This section includes a discussion of application of statistical procedures to the economic and commodity relationships in the Thailand's rice economy. The justification of both statistical and economic models is presented.

The Statistical Model

The statistical estimation of the hypothesized model involves two stochastic equations which are solved using a two - stage least squares estimation procedure for estimated demand equation and an ordinary least squares for estimated supply equation. The procedure is underlined by the following statistical assumptions:[2]

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[2]Lester V. Mandersheid, "Assumptions regarding Disturbances and Properties of Estimators," Class notes, Agricultural Economics 835, Summer 1969, Michigan State University, p. 1.

1. Serial independence: It is assumed that within the model there is zero correlation between any two disturbances, or there is no serial correlation of disturbances, $E(U_t U_s) = 0$, for all $t \neq s$.

2. Homoscedasticity: The variance of each disturbance term is equal for all observations, or there is finite and constant variance for all observations.

3. Identification: The number of observations equals or exceeds the number of parameters to be estimated and the equations can be separated into a valid demand and supply equations.

4. The independent variables are measured without error; and there is no exact linear relationship between any set of explanatory or predetermined ("independent") variables.

5. Zero mean: The average disturbance is zero, $E(u) = 0$.

6. The disturbance term is distributed according to the normal distribution, $U \sim N(0, \sigma^2 I)$. This is not necessary for estimation but needed for hypothesis testing.

In the system of equations, the equation (1.2) is specified as the supply equation and represents the first stage of two-stage least squares analysis of demand. In the equation, the endogeneous variable is estimated as a function of the predetermined variables in the system. The lagged values of variables determined within the system are

also considered as "independent." The equation is fitted using the ordinary least squares method. Then, the estimated values of endogeneous variable from the first stage are included as an independent variable in the demand equation (equation 1.1) which is solved by ordinary least squares as the second stage. More specifically, the supply equation is estimated by applying ordinary least squares method and represents the first stage of the two-stage least squares analysis which is used for the estimate of demand equation for rice in Thailand.

The two-stage least squares is considered to produce asymptotic unbiased, asymptotic efficient and consistent estimates of structural coefficients.[3] However, the procedure assumes that the model is correctly specified.[4]

Within the model, the structural regression coefficients are estimated with variables in logarithmic form. Using a logarithmic equation is primarily based on a belief that the relationships between the variables were multiplicative and more stable in percentage than in absolute terms. Also, by this transformation, the price flexibilities and the demand and supply elasticities are obtained directly without cumbersome adjustments.

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[3] Ibid, p. 1.

[4] Gail L. Cramer, Economic Relationships in the Oil of Peppermint and Oil of Spearmint Industries. Unpublished Master's degree Thesis, Michigan State University, 1964, p. 86.

In any statistical analysis, however, the variables included in the model are generally chosen at the discretion of the investigator.[5] In this analysis, it also appears that some variables relevant to the supply and demand of rice are excluded from the model. The largest problem is the lack of reliable data and the fact that some variables are indeterminate. Nonetheless, from an economic standpoint the variables included in the hypothesized model in this analysis are believed sufficient for estimating demand and supply of rice in the economy of Thailand.

The Economic Model

$$(1.1)\quad \text{Log}Y_{1t} = a_{11} + b_{11}\text{log}Y_{3t} + b_{12}\text{log}Y_{4t} + b_{13}\text{log}X_{1t} + b_{14}\text{log}X_{2t} + b_{15}\text{log}X_{3t} + b_{16}\text{log}X_{4t} + U_{1t}$$

$$(1.2)\quad \text{Log}Y_{3t} = a_{21} + b_{21}\text{log}Y_{2t-1} + b_{22}\text{log}X_{3t} + b_{23}\text{log}X_{5t-1} + U_{2t}$$

Where:

Y = endogeneous variables
X = predetermined ("independent") variables
Y_1= average annual wholesale price of white rice (100%) in baht per metric ton in Bangkok deflated by the Wholesale Price Index (1958 = 100)

Y_2= average annual wholesale price of paddy (no. 1) in baht per metric ton in Bangkok deflated by the Wholesale Price Index (1958 = 100)

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[5]Lee F. Schrader, Late Summer Onion Supply Response in the United States. Unpublished Master's degree Thesis, Michigan State University, 1958, p. 23.

Y_3= annual production of rice (on paddy basis) in kilograms per capita
Y_4= annual wheat and wheat flour imports (on wheat basis) in kilograms per capita
X_1= annual rice exports in millions of metric tons.
X_2= income per capita in Thai baht deflated by the Wholesale Price Index (1958 = 100)
X_3= trend; 1952 = 1; 1953 = 2; etc.
X_4= average annual rice export tax in baht per metric ton of rice exports deflated by the Wholesale Price Index (1958 = 100)
X_5= annual harvested rice acreage in rai per capita

Discussion of the Results of Analyses

Estimated Demand Equation

$$\text{Log } Y_{1t} = -4.6030 + 0.2726 \log Y_{3t} + 0.0905 \log Y_{4t}$$
$$(1,4027) \quad (0.2877) \quad (0.2270)$$
$$+ 0.1170 \log X_{1t} + 0.1466 \log X_{2t}$$
$$(0.1085) \quad (0.2351)$$
$$+ 0.0477 \log X_{3t} + 0.0028 \log X_{4t}$$
$$(0.0736) \quad (0.0613)$$

(values in parentheses are standard errors of regression coefficients)

$R^2 = 0.81$

Standard error of estimate($S_{y.x}$) = 0.0004

In the economic model of demand for rice in Thailand, the wholesale price of rice is expressed as a function of the estimated quantities of rice produced, the quantities of wheat imported, the quantities of rice exports, the personal income per capita, trend, and level of rice export tax levied. It appears that these explanatory variables explains 81 percent of the variations in wholesale

price of rice (100%) in Bangkok market. This is determined by the multiple coefficient of determination(R^2) which is 0.81, and the low standard error of estimate($S_{y.x}$), 0.0004. Accordingly, it leads to the conclusion that the effects of these explanatory variables on domestic wholesale price of rice particularly white rice (100%) are important. On an individual basis, the estimated quantity of rice produced seems to have the greatest influence on price change. An increase in rice production by 1 percent results in an increase in wholesale price of rice by 0.2726 percent holding the other explanatory variables in the equation constant. The quantities of wheat imported has less effect on price of rice, it results in an increase in rice price by only 0.0905 percent when the quantity of wheat import increases by 1 percent, given that all other independent variables are unchanged. The positive coefficient for quantity of rice exported indicates that holding the other variables constant an increase in rice exports by 1 percent will increase the domestic wholesale price of rice by 0.1170 percent. This evidence is consistent with a theoretical assumption that an increase in rice exports will result an increase in domestic price since an increase in rice exports means a decrease in domestic rice supply. Similarly, the coefficient for personal income on per capita basis indicates that an increase in per capita income by 1 percent results an increase in price of rice by

0.1466 percent given that there is no change in other variables in the equation.

The coefficient of the trend also indicates an over time increase in the wholesale price level of rice (100%) in Bangkok. The positive sign of the coefficient of the rice export tax levied implies that given the other variables in the model constant, an increase in rice export tax by 1 percent will result an increase in domestic wholesale price of rice (100%) by 0.0028 percent.

The price-quantity relationship of the rice industry appears inconsistent with the economic theory of demand since a change in price of rice is associated with a change in quantity of rice in the same direction. No one would expect the positive sign between these two variables -- the price and quantity of rice produced. However, there is the possibility of multicollinearity among quantity of rice produced; rice exports and income in the model. Then, the estimated rice production coefficient may inefficiently estimated. The coefficient is relatively small compared to its standard error, and it is insignificant from statistical point of view. In other words, the price flexibility coefficient or the slope of demand equation does not deviate significantly from zero.

The computed price flexibility of demand for rice is 0.27. It means that 1 percent change in quantity of rice will result a change in the price of rice by approximately

0.27 percent. In term of price elasticity of demand, this implies that the demand for rice particularly rice (100%) is rather elastic and of the wrong sign.[6] Again, no one would expect an elastic demand for most farm products particularly rice since rice is a staple food of the people in Thailand. And certainly one would expect a negative sign.

Estimated Supply Equation

$$\text{Log}Y_{3t} = -4.1770 + 0.5455\log Y_{2t-1}$$
$$(5.1031) \quad (1.7367)$$
$$+ 0.0232\log X_{3t} + 0.02562\log X_{5t-1}$$
$$(0.0996) \quad (0.5415)$$

(values in parentheses are standard errors of regression coefficients)

$R^2 = 0.12$

Standard error of estimates$(S_{y.x}) = 0.004$

Statistically, the supply equation seems to be less reliable because of a very low coefficient of determination(R^2) of 0.12.

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[6]The price flexibility can also be considered as a reciprocal of price elasticity given that the cross flexibilities between a particular commodity and its substitute or complimentary products are zero. For detail see James P. Houck, "The relationship of Direct Price Flexibilities to Direct Price Elasticities," Journal of Farm Economics, Vol. 47 No. 3 (August, 1965), pp. 789-792.

The variables used to explain the variations in the quantity of rice produced include the average annual wholesale price of paddy (No. 1) in Bangkok with one year lag, trend, and the annual harvested acreage lagged one crop year. Using one-year lagged price assumes that the past year's price should determine the following year production. Similarly, the past year harvested acreages are included on the ground that it would influence acreage in the following crop year through the availability of land, irrigation, equipment, etc.

The trend is also used to reflect change over time of unmeasured variables such as technological and institutional changes, etc. The regression coefficient of price indicates that an increase in price of paddy by 1 percent results an increase of rice production by 0.5455 percent given that the trend and acreage variables are constant. Also, if we hold the price and the trend variables constant, an increase in previous year's harvested acreage by 1 percent will increase rice production by 0.2562 percent. The trend coefficient indicates that rice production has decreased over time holding the price and acreage variables unchanged, but the coefficient is insignificant at any reasonable probability level.

The elasticity of supply of rice is inelastic, 0.54. It implies that price-production response of rice is not very high in the Thai economy. However, because of the

exclusion of other unmeasured variables, since trend is not a useful one, the specification of supply model is rather poor and the equation is less reliable than the demand function for predictive purposes.

Alternative Estimate of Supply Equation

An alternative model for estimating the supply equation is constructed as a supplement to the supply model described in the last section. The model is the same as the previous model except that the current year harvested acreage rather than the acreage with one year lag is introduced. The equation is also fitted using ordinary least squares. The purpose of this alternative is to observe whether the new variable could better explain the variations in annual production of rice. The equation is presented below in the economic model:

$$\text{Log}Y_{3t} = a + b_1 \log Y_{2t-1} + b_2 \log X_{3t} + b_3 \log X_{5t} + U_t$$

Where:

Y_2 = average annual wholesale price of paddy (no. 1) in baht per metric ton in Bangkok deflated by the Wholesale Price Index (1958 = 100)

Y_3 = annual production of rice (on paddy basis) in kilograms per capita

X_3 = trend; 1952 = 1; 1953 = 2; etc.

X_5 = annual harvested rice acreage in rai per capita

In the model the annual production of rice is expressed as a logarithmic function of the past year wholesale price, the trend, and the current year harvested rice acreage. The results of the supply equation are as follows:

$$\text{Log}\hat{Y}_{3t} = -2.4019 + 0.0453\log Y_{2t-1} - 0.1037\log X_{3t} - 1.0832\log X_{5t}$$

$$\qquad\qquad (4.8713) \qquad (1.6218) \qquad\quad (0.0470) \qquad\quad (0.3675)$$

(values in parentheses are standard erros of regression coefficients)

$R^2 = 0.74$

Standard error of estimate($S_{y.x}$) = 0.0012

As a whole, the supply equation is statistically much more reliable than that of the previous section. Much of this reliability is attributed to the inclusion of current year harvested acreage as an explanatory variable. The equation explains 74 percent of the variation in the annual quantities of rice produced. The coefficient of the price of rice in the equation, which may be considered an estimate of supply elasticity implies that the supply of rice is relatively inelastic. The supply elasticity coefficient is 0.04, considerably different from the 0.54 of the previous equation. If other explanatory variables remain unchanged, however, the negative coefficient associated with the trend indicates that rice production has decreased over time but the decrease is relatively small and insignificant in size. The negative sign between the quantity of rice

produced and the harvested acreage implies that yields have not increased during the period while prices have increased.

With the alternative results of estimated supply then, an alternative estimate of demand equation using the same model as of the previous estimate is also derived. The price flexibility of demand in this case is 0.27 exactly the same as 0.27 of the previous demand equation. The multiple coefficient of determination is 0.34.[7] The equation of demand is rather less reliable than the previous one.

Conclusions and Policy Implications

General Conclusions

The objective of this analysis is to measure price-quantity relationships of supply and demand of rice in the Thai economy. Particularly, the estimates of the production and price in the rice economy are of the most interest.

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[7]The alternative estimated demand equation is as follows:

$$\text{Log}^{Y}_{1t} = \underset{(4.2737)}{-5.1156} + \underset{(0.5279)}{0.2678}\log^{Y}_{3t} + \underset{(1.0539)}{0.3583}\log^{Y}_{4t} + \underset{(0.3535)}{0.2151}\log^{X}_{1t} + \underset{(0.5974)}{0.2038}\log^{X}_{2t} - \underset{(0.2881)}{0.0150}\log^{X}_{3t} + \underset{(0.1520)}{0.0282}\log^{X}_{4t}$$

(values in parentheses are standard errors of regression coefficient)

$R^2 = .34$; Standard error of estimates$(S_{y.x}) = 0.0014$

A supply equation and demand equation for rice have been constructed and estimated using the two-stage least squares estimation procedure.

The results of analysis of demand are: (1) About 81 percent of the variation in the price of rice is explained by the association of the variables including estimated quantity of rice produced, quantity of wheat imports, quantity of rice exports, personal per capita income, trend, and quantity of rice export tax levied; (2) The price flexibility of 0.27 of demand implies that the demand for rice in Thailand is highly elastic and possibly of wrong sign; (3) Each of the following variables, estimated quantity of rice produced, quantity of wheat imports, quantity of rice exports, per capita income, trend and rice export tax has influenced the wholesale price of rice in Bangkok. Among these variables, estimated quantity of rice produced has greatest effect on price change.

The estimated supply equation is less reliable although the alternative estimate yields a better explanation of the variation in the quantity of rice produced annually. However, the analysis provides evidence that the rice supply in Thailand is responsive to prices. The elasticity of supply is found to be relatively inelastic but the equation is less reliable than the demand equation for predictive purposes.

Policy Implications

As shown in the price analysis section, the demand for rice particularly rice (100%) which is the best quality of rice in Thailand is elastic; but the supply of rice is found relatively inelastic. The analysis is based on an assumption that the point elasticities of demand and supply are constant throughout the demand and supply curves. Furthermore, it is assumed that the estimated elasticities will hold not only for the range of data generated in the sample period but will also hold for the range of data generated by the policy adopted by the Thai government. This is an important assumption; if untrue, policy mistakes will be made. Therefore, policy makers should be continually aware of the need to review results to determine if the assumptions remain valid. And if not, policies will need reconsideration.

The policy implication is that the Thai rice industry should place emphasis on measures that influence further increase in the production of rice of good quality. However, if the supply and demand elasticities of rice are not constant, this policy implication is relevant only on the elastic portion of the demand curve associated with either elastic or inelastic supply of rice. In this case, a great increase in rice production will not result a severe decline in price. And under rice increasing policy, technical assistance programs should be emphasized for

stimulating rice expansion. The programs include the stimulation of more intensive cultivation, expansion in irrigation projects, credit availability, the adaptive researches for higher yielding and better quality varieties of rice, farm input subsidies, and market improvement. At the same time, however, farm diversification should also be encouraged.

Although the supply of rice is inelastic farmers still respond to price. Accordingly, price incentive programs can be applied in this economy. The price incentive programs in the forms of farm input subsidies and price support can encourage rice expansion in general.

The estimated elasticity of demand for rice is positive. However, a positively sloping demand is rarely found and it is not significant in this case since the standard error of the price flexibility is greater than the value of price flexibility itself. Therefore, a downward sloping demand curve is still expected to prevail in Thailand.

With respect to the arguments that Thailand's rice economy will be characterized by the presence of either a rice deficit or a rice surplus within this decade, it appears that the problem is less serious than it would be if both inelastic demand and supply are present. The situations can be illustrated in the following diagrams.

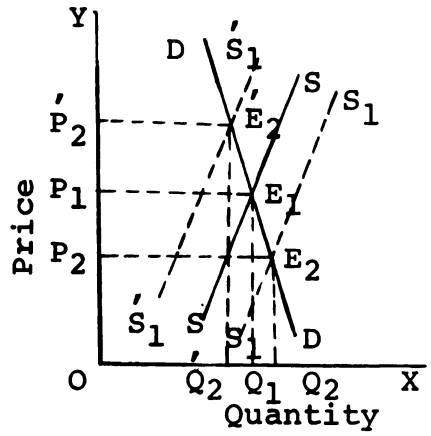

Diagram A

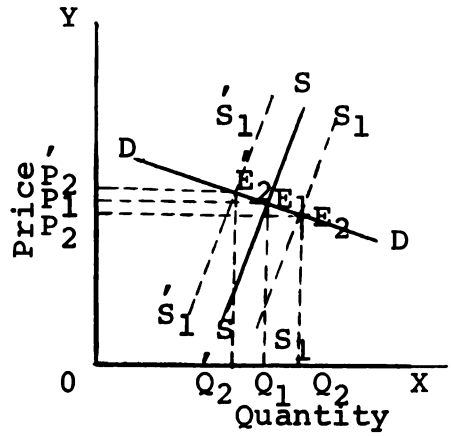

Diagram B

Diagram A represents a situation with the presence of inelastic demand (DD) and inelastic supply (SS) of rice. An increase in rice supply from SS to S_1S_1 or from OQ_1 to OQ_2 will result a greater decrease in price from OP_1 to OP_2. It means that, the presence of greater rice supply and therefore rice surplus will result in a severe decline in price of rice. Conversely, the rice deficit or short rice supply will result a great increase in price. In the diagram, it is indicated that if a rice supply decrease from SS to $S_1'S_1'$ or from OQ_1 to OQ_2', the price will increase in a greater proportion or from OP_1 to OP_2'. As a consequence, the presence of rice deficit or rice surplus will result a greater variation in price of rice. However, a different condition is presented in diagram B. In diagram B, the presence of inelastic supply (SS) associated with a relative elastic demand (DD) of rice indicates that an increase in rice production from SS to S_1S_1 or from OQ_1 to OQ_2 results a small decrease in price from OP_1 to OP_2. On the other hand, if there is a decrease in rice supply

from SS to $S'_1S'_1$ or from OQ_1 to OQ'_2 an only small increase in price will follow. Therefore, either directions of rice production -- the rice deficit or the rice surplus will not cause a drastic variation in rice price in this case.

However, some argue that policy to increase rice production will create a problem of over supply of rice in the rice producing countries because of the green revolution which is assumed to take place in most rice importing countries particularly in Asia during this decade.[8] Practically, this is a long-time potential rather than the immediate future since there are many arguments that the rate of adoption of new high yielding varieties of rice is very poor in most Asian countries because of the differences in geographic conditions and rice consumption patterns.[9] As a consequence, the problem of over supply or highly competitive market of the rice industry will be slow to occur or probably will be eliminated in Thailand since farmers are considerably responsive to price, at the same time a rapid population growth in this country has been evident. Therefore, the recommendation for Thailand is that the policy of high production and exports as well as

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[8]For detail see J. Norman Efferson, "Recent Developments in the Rice Industry of Thailand," Rice Journal, (April, 1967), pp. 36-37.

[9]Ibid, pp. 36-37.

the expansion of new markets should be continued for further improvement of the rice economy and of the country as a whole. Also, this policy regularly, will benefit the consumers because the increase in rice production will result in a lower price for rice and less money will be paid for their rice consumption assuming that the upward sloping demand for rice is not significant.

CHAPTER V

SUMMARY AND SUGGESTIONS FOR FUTURE STUDY

Summary

The general purpose of this study is to develop information concerning marketing and pricing of rice in Thailand over the past two decades. Most attention has been given to observation of price behavior, and an analysis of price-quantity relationships of demand and supply of rice and their contributions to the agricultural policy implications in this country.

Since rice is the most important crop, being both a staple food of the people and major foreign exchange earner, public interest in the role of the rice industry in the economy has been increasing steadily. Particularly, consideration has been given controversies relating to price of rice and the potential production and exports of rice. As the economy continues to grow and change, moreover, the equitable solution of these conflicts in pricing and production of rice is rarely found. Many arguments and proposals for better planning in agricultural policy have been developed with evidence that the direction of

movement of Thailand's rice economy will be toward some undesirable production dilemma -- i.e., a rice deficit as a result of rapid population growth or a rice surplus as a result of a decrease in rice exports because many rice importing countries succeed in eliminating rice imports sometime during this decade. Accordingly, it is necessary that the information concerning the current situation of the rice economy particularly, the price, production, and marketing of rice is needed for policy judgment and better planning for the rice industry.

The information developed in this study including the explanation of production and marketing, price behavior, and the analysis of demand and supply of rice is based on an analysis of secondary data obtained from publications of the government of Thailand and the United Nations.

The findings in this study reveal that rice production in this country has increased considerably over the last 60 years and particularly during the last decade; but there has been evidence of relatively low yield per unit of land with downward trend until recent years when an upward trend in rice yield has presented. The degree of competition in the rice market has increased as a result of the development of improved transportation and the relocation of the rice mill industry. At the same time, the increase in degree of competition among road, river, and railroad transportation is observed. Domestic demand for

rice is also found to increase in volume because of the increase in population; accordingly, a slight decline in rice exports is apparent. The market outlook for the next few years can be characterized by two different views -- the presence of rice deficit or a rice surplus but no resolution has been found. However, with the presence of the relatively elastic demand and inelastic supply of rice in this country the problem is less serious than it would be if both demand and supply are inelastic. Therefore, either rice deficit or rice surplus will not cause a serious change in the price of rice in Thailand.

The analyses of seasonality in price and quantity of rice in both domestic and export markets indicate that the seasonal variation in market supply of rice in Bangkok has significantly increased. However, the seasonal price pattern of either paddy (no. 1) or rice (100%) is rather small. The quantity exported and export price each exhibits a significant increase in its seasonal pattern. On annual basis, moreover, the long-time movements in both domestic price of paddy and export price of rice are found to increase slightly over the past two decades.

In order to examine to what extent the variations in price and quantity of rice produced are affected by some economic variables, an analysis of statistical demand and supply of rice is formulated using ordinary least squares procedure for the supply model and two-stage least

squares for the demand model. In the supply model, the annual quantity of rice produced is estimated as a logarithmic function of the past year's price, trend, and past year's harvested acreage. The result is not reliable with only 12 percent of the variation in quantity of rice produced explained by the price, trend and harvested acreage. Although an alternative estimate of supply equation improved its reliability, the equation is still less reliable than the demand equation for predictive purposes; and a better specification of the model is needed. The indicated elasticity of supply is 0.54 and 0.04 respectively for the two equations.

In the estimated demand equation for rice, about 81 percent of the variation in the price of rice at wholesale level in Bangkok is explained by the association of the explanatory variables including estimated quantity of rice produced, quantity of wheat imports, quantity of rice exports, personal income per capita, trend, and export tax. Among these variables, the estimated quantity of rice produced seem to have the greatest effect on price. The other variables are minor in their importance in explaining the variation in price. Also, neither a positive sign nor the small price flexibility of demand for rice is expected. But the price flexibility of demand of 0.27 implies that the demand for rice particularly rice (100%) in Thailand is highly elastic and its positive sign seems to violate

the "law of demand." However, this is not significant from statistical point of view because of its relatively high standard error and the possibility of multicollinearity among estimated quantity of rice produced, quantity of rice exports, and income in the demand model.

Based on these results it is suggested that the direction of Thailand's rice production policy should be toward an increase in rice production through the expansion in rice acreage and/or more intensive cultivation. However, this recommendation bases on an assumption that the price elasticity of demand for rice in Thailand is constant throughout the entire length of the demand curve. Generally, the different portions of a single demand curve may consist of many different point elasticities of demand. The policy implication on increasing rice production is then relevant only on the elastic portion of the demand. In this connection, it is necessary that technical assistance in terms of better seeds, more use of fertilizer and farm mechanization, and expansion of irrigation projects will be of value for stimulation of increased rice production. The price incentive program in the forms of input price subsidization and minimum price support will not only stimulate rice expansion but also is a mechanism to quarantee a minimum floor prices and thereby income for farmers in the industry. Furthermore, a readjustment in rice export tax policy and the allocation of public funds with greater

emphasis on increasing agricultural productivity is urgently needed. What is done for the improvement in the agricultural sector will indirectly benefit the consumers because rice will cost less and consumer expenses on food items will be reduced.

A policy of increasing rice exports is also recommended. A greater rice output resulting from increased rice production will cause a decline in export prices; and it is necessary that market expansion must be done through a lower price and other nonpriced methods -- i.e., advertising, product differentiation, etc. At the same time, a policy on market stabilization in terms of market area must be maintained.

In concluding this study, it is hoped that this information will provide, producers, consumers, and policy makers, knowledge of the situation that exists in the rice economy of Thailand; and that this information helps in the development of better rice policies and improved agricultural planning.

Suggested Further Study

In future studies of supply and demand of rice in Thailand, the overall results of this study may be improved if there are some changes in the model. Particularly, the variables included in the supply equation should be better specified for improved statistical estimates. The effects

of the weather and technological change should be analyzed through an analysis of the variation in yield per unit of land. Further studies on cost of production and the production function of rice are also suggested. Another area for future study is analysis of the role of expectations on supply, in other words, a study of farmers' decision making process, which will provide empirically useful information related to the theory of expectations. Also, a similar study on other farm products is recommended for better planning of Thailand's agriculture. However, the most crucial priority is the need for better organization of the statistical compilation system with greater emphasis on up-to-date publication with better quality control and reliability.

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APPENDIX A

TABLE A.1

RICE PRODUCTION, RICE SUPPLY FOR DOMESTIC UTILIZATION, RICE ACREAGE AND MIDYEAR POPULATION, THAILAND, 1950-67.

Year	Rice Production[1] (kgs/capita)	Rice Supply for Domestic Utilization[2] (kgs./capita)	Rice Acreage[3] (rai/capita)	Midyear Population (millions)
1950	305	236	1.70	19.6
1951	361	254	1.80	20.2
1952	317	204	1.54	20.8
1953	383	314	1.72	21.4
1954	258	190	1.25	22.1
1955	320	240	1.47	22.8
1956	355	273	1.61	23.4
1957	232	138	1.11	24.1
1958	281	210	1.30	24.9
1959	266	200	1.29	25.6
1960	295	228	1.34	26.4
1961	302	213	1.30	27.2
1962	332	263	1.39	28.0
1963	347	274	1.38	28.8
1964	323	226	1.26	29.7
1965	301	208	1.21	30.6
1966	381	308	1.38	31.5
1967	283	217	-	34.2

Source: 1950-66, Agricultural Statistics of Thailand, 1966 (Bangkok, 1968), pp. 46-176.
1967, Rice, FAO, Production Yearbook, Vol. 22, 1968, p. 77; population, Office of National Economic Development Board, Bangkok.

1. Total rice production (on paddy basis) divided by midyear population.
2. Total rice production minus rice exports for a particular crop year divided by midyear population, (on paddy basis).
3. Harvested area

\- no data available

TABLE A.2

WHOLESALE PRICES OF WHITE RICE (100%), PADDY (No. 1); PER CAPITA INCOME, AND WHOLESALE PRICE INDEX, THAILAND, 1950-1967.

Year	White Rice (100%) Price (baht/ton)	Paddy (No.1) Price (baht/1,000 kgs.)	Per capita Income (baht)	Wholesale Price Index (1958 = 100)
1950	-	745	1,191	76
1951	1,738	787	1,253	82
1952	1,912	872	1,264	87
1953	1,718	799	1,335	82
1954	1,705	705	1,277	79
1955	1,880	817	1,530	92
1956	1,858	935	1,555	95
1957	1,771	947	1,526	95
1958	1,998	1,095	1,539	100
1959	1,791	937	1,635	92
1960	1,636	901	1,807	92
1961	1,754	977	1,842	100
1962	1,990	1,147	1,948	106
1963	1,803	993	2,007	99
1964	1,678	828	2,109	92
1965	1,645	881	2,207	96
1966	1,800	1,197	2,499	110
1967	2,189	1,245	2,465	118

Source: Paddy price, FAO, Production Yearbook, Vol. 21-22, 1967-1968;

per capita income 1950-1966, Agricultural Statistics of Thailand, 1966;1967, National Income of Thailand, (1967 edition), p. 5.

Wholesale Price Index, Department of Commercial Intelligence, Bangkok, base year period was formerly 1948;

white rice (100%) price, Department of Internal Trade, Bangkok.

- no data available

TABLE A.3

RICE EXPORTS, WHEAT AND WHEAT FLOUR IMPORTED IN WHEAT EQUIVALENT, AND RICE EXPORT TAX, THAILAND, 1950 - 67.

Year	Rice Exports (million tons)	Wheat & Wheat Flour Imported in Wheat Equivalent[1]		Rice Export Tax[2]	
		Total (tons)	Per capita (kgs.)	Total (million)	Average (baht/ton)
1950	1.42	15,639	8	-	-
1951	1,47	18,239	9	-	-
1952	1.55	18,238	9	362	233.55
1953	1.36	24,288	11	695	511.03
1954	1.00	28,585	13	718	718.00
1955	1.24	33,328	14	441	355.65
1956	1.27	37,116	16	842	663.00
1957	1.57	41,497	17	840	535.03
1958	1.13	36,924	15	812	718.58
1959	1.09	35,455	14	756	693.58
1960	1.20	32,381	12	745	620.83
1961	1.58	35,700	13	872	551.90
1962	1.27	37,200	13	753	592.91
1963	1.42	41,100	14	819	576.76
1964	1.90	39,300	13	1,238	651.58
1965	1.90	35,100	11	1,192	627.37
1966	1.51	61,000	19	995	658.94
1967	1.44	81,000	24	944	655.56

Source: Rice exports 1950-66, Agricultural Statistics of Thailand, 1966 (Bangkok: 1968); 1967, Sopin Tongpan op. cit., p. 106.

1/ 1950-60, computed from data in Agricultural Statistics of Thailand, 1966; 1961-66, FAO Trade Yearbook, 1967, p. 102; 1967, Internation Wheat Council, World Wheat Statistics, 1969, p. 34. Conversion rate: 1 metric ton(2,240.6 lbs) wheat = 36.7437 bushels; 1 metric ton(2,240.6 lbs) wheat flour = 50.6598 bushels wheat; 1 metric ton wheat flour = 1.3787 metric ton wheat.

2/ Bank of Thailand, Bangkok, (calendar year).
- no data available

TABLE A.4

PADDY PRICE INDICES IN THAILAND, THE UNITED STATES, BURMA, JAPAN, SOUTH VIET-NAM, AND UNITED ARAB REPUBLIC, 1950-67 (1957-59 = 100)

Year	Thailand[1]	United States[2]	Burma[3]	Japan[4]	South Vietnam[1]	United Arab Rep.[5]
1950	128	106	100	62	52	96
1951	134	100	100	72	56	88
1952	149	122	100	84	90	88
1953	136	108	100	104	97	67
1954	121	95	100	97	54	94
1955	96	100	100	99	81	100
1956	96	101	100	97	110	100
1957	98	107	100	99	103	100
1958	106	97	100	99	110	100
1959	98	95	100	100	87	100
1960	92	94	100	101	88	100
1961	100	107	100	107	110	100
1962	117	105	100	118	124	88
1963	102	104	103	127	115	85
1964	85	102	103	144	125	85
1965	89	103	103	159	137	94
1966	123	103	-	173	-	111
1967	128	102	-	190	-	125

Source: Computation based on data in FAO, Monthly Bulletin of Agricultural Economics and Statistics, IX, July, 1960, p. 55; FAO, Production Yearbook, Vol. 22, 1968, pp. 540-542.

1 wholesale price; 2 average producer price; 3 government minimum producer price; 4 government - fixed producer price (Husk); 5 government-fixed producer price.

- no data available

TABLE A.5

RICE: INDICES OF ANNUAL EXPORT PRICE IN THAILAND, BURMA, AND THE AVERAGE WORLD EXPORT PRICE INDEX, 1955 - 1967

(1957-59 = 100)

Year	Thailand[1]	Burma[1]	Average World Price Index[2]
1955	101	123	-
1956	99	100	-
1957	99	97	104
1958	106	104	98
1959	95	99	89
1960	89	96	93
1961	98	99	103
1962	109	99	103
1963	103	101	103
1964	98	107	103
1965	98	116	105
1966	119	110	118
1967	159	128	141

Source: 1 Computed from data in FAO, Production Yearbook, 1963-68, Vol. 17-22.

2 FAO Average Price Index, FAO, Monthly Bulletin in Agricultural Economics and Statistics (various issues); FAO, Rice Report, 1963-67; FAO, Commodity Review (various issues).

Thailand: white rice 5-7% broken, government standard f.o.b. Bangkok.

Burma: f.o.b. Rangoon, prices under bilateral agreements with Ceylon.

APPENDIX B: STATISTICS ON SEASONALITY

TABLE B.1

QUANTITY OF PADDY BOUGHT BY BANGKOK AND THONBURI MILLERS, THAILAND, 1950-66
(1,000 TONS)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	99.00	76.70	95.70	85.60	73.90	62.30	63.90	82.90	75.60	66.40	50.20	81.70
1951	113.30	76.70	95.60	47.30	43.30	39.40	51.30	64.60	55.90	42.80	38.90	83.00
1952	82.90	79.90	37.90	47.80	48.70	40.60	43.90	48.30	46.60	49.00	50.70	36.40
1953	46.70	31.80	46.00	37.60	25.30	24.10	27.50	26.60	20.40	12.30	16.70	28.10
1954	27.30	17.70	24.90	17.00	5.90	7.40	11.70	19.90	27.60	23.00	14.40	5.20
1955	18.70	23.60	26.00	17.60	5.30	8.50	11.50	6.90	3.50	4.10	1.40	14.40
1956	20.00	16.30	18.50	6.30	8.40	8.40	9.90	11.10	11.60	16.00	10.90	16.10
1957	20.50	23.70	23.50	16.20	14.30	11.40	19.80	10.60	6.00	5.20	3.90	6.00
1958	9.30	8.10	10.20	6.20	3.10	4.60	2.50	1.30	1.00	0.20	0.10	8.00
1959	19.60	13.40	10.60	3.30	5.40	3.80	5.10	1.70	3.70	4.00	6.50	5.50
1960	8.50	12.90	9.20	8.30	7.70	4.80	4.20	6.50	5.00	3.60	3.30	5.80
1961	10.60	12.80	13.00	5.20	4.00	2.90	3.60	4.80	1.60	0.60	4.80	12.10
1962	16.00	5.80	7.60	4.90	5.50	2.70	2.40	0.40	0.50	0.20	0.20	0.50
1963	4.00	5.10	4.30	1.30	1.80	0.80	2.70	1.60	1.70	1.60	2.40	0.70
1964	5.20	3.60	2.20	3.80	1.60	4.70	5.50	2.30	1.60	0.60	0.80	1.60
1965	4.40	3.60	0.60	3.80	5.00	4.50	2.30	1.30	2.60	2.40	1.20	1.20
1966	12.70	13.60	14.70	13.20	9.80	4.70	4.60	3.00	2.10	1.20	1.80	6.80

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	176.1	155.9	147.8	104.6	86.7	78.8	91.1	74.7	69.2	59.2	59.3	93.5
STD DEV	59.9	50.8	54.8	36.8	36.9	38.3	37.8	33.8	38.0	39.2	36.5	53.8
TREND	4.7	4.9	0.6	3.3	4.4	2.7	1.5	-4.4	-4.3	-4.8	-2.7	-5.0

TABLE B.2

MONTHLY WHOLESALE PRICE OF PADDY(NO.1) DELIVERED ALONG-SIDE MILLS IN BANGKOK AND THONBURI, THAILAND, 1950-66 (BAHT/TON)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	720	705	715	765	815	830	815	825	835	845	845	845
1951	720	740	785	813	838	870	870	890	970	945	945	945
1952	875	890	875	915	920	920	925	955	985	1050	1050	935
1953	820	843	850	855	855	880	885	888	886	810	780	820
1954	790	775	800	815	805	785	795	825	845	850	850	850
1955	820	850	850	885	930	990	1015	1055	1135	1140	1165	1180
1956	915	890	955	985	1040	1085	1110	1095	1060	1040	985	915
1957	895	890	895	915	930	945	1085	1040	1005	1000	1000	1005
1958	940	965	1035	1090	1110	1155	1165	1180	1195	1195	1220	1245
1959	960	995	995	965	960	965	950	930	895	880	940	930
1960	815	825	810	800	810	860	900	905	995	995	995	995
1961	850	850	890	915	965	980	1008	1013	1040	1100	1165	1185
1962	990	1025	1090	1150	1240	1185	1220	1225	1260	1255	1255	1165
1963	985	1005	1005	970	990	1055	1120	1120	1085	1055	1010	965
1964	910	895	865	890	890	875	885	880	870	835	840	840
1965	820	813	805	808	813	795	818	913	1015	1055	1083	1128
1966	1005	968	1038	1165	1218	1300	1444	1359	1439	1527	1580	1529

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	91.9	92.4	94.1	96.2	98.1	99.8	102.3	103.3	105.4	104.9	105.1	103.7
STD DEV	3.4	3.8	2.5	3.1	3.4	3.9	5.3	3.3	3.7	4.8	5.6	5.6
TREND	0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2

TABLE B.3

MONTHLY WHOLESALE PRICE OF RICE(100-5% WHITE RICE)
IN BANGKOK, THAILAND, 1950-66
(BAHT/METRIC TON)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	1467	1425	1500	1567	1617	1734	1792	1709	1709	1725	1750	1834
1951	1525	1534	1617	1700	1717	1717	1675	1709	1875	1959	1925	1925
1952	1634	1692	1667	1808	1892	1917	1959	2067	2084	2084	2125	2025
1953	1692	1800	1767	1725	1725	1717	1717	1717	1692	1650	1675	1742
1954	1642	1667	1700	1684	1667	1659	1675	1734	1767	1750	1733	1784
1955	1625	1692	1700	1717	1750	1800	1883	1942	2017	2017	2125	2292
1956	1667	1684	1759	1850	1950	1950	1992	2025	1934	1900	1859	1725
1957	1667	1659	1659	1692	1709	1725	1925	1934	1892	1817	1784	1800
1958	1692	1775	1859	1917	2034	2000	1967	2025	2133	2159	2192	2225
1959	1709	1742	1775	1767	1883	1809	1925	1867	1825	1675	1675	1675
1960	1584	1517	1459	1425	1492	1659	1725	1825	1784	1717	1717	1733
1961	1492	1550	1692	1659	1734	1775	1750	1675	1692	1859	2042	2134
1962	1700	1784	1809	1925	2092	2025	2092	2092	2067	2100	2084	2109
1963	1734	1775	1734	1725	1759	1875	1909	1892	1884	1850	1767	1742
1964	1600	1617	1609	1659	1617	1642	1742	1759	1750	1700	1742	1709
1965	1559	1550	1525	1500	1475	1450	1509	1625	1792	1825	1900	2034
1966	1692	1664	1781	2037	2002	2106	2244	2192	2294	2468	2561	1987

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	91.5	93.0	94.3	96.3	98.4	99.5	102.5	103.6	104.6	104.0	104.9	106.2
STD DEV	3.3	3.4	3.6	3.4	4.0	3.5	5.1	4.8	3.6	3.7	4.8	6.6
TREND	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	0.0	-0.0	0.1	0.1

TABLE B.4

QUANTITY OF RICE (ALL GRADES) EXPORTS,
THAILAND, 1951-66 (1,000 METRIC TONS)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1951	120	186	174	128	109	90	120	150	132	121	119	136
1952	142	135	125	70	117	140	137	109	141	109	102	90
1953	98	85	133	125	140	143	120	127	119	42	94	142
1954	53	66	119	94	61	78	87	106	88	97	85	59
1955	45	114	163	137	123	129	99	103	83	69	61	102
1956	90	105	89	96	125	92	107	95	77	89	126	146
1957	170	131	141	157	133	138	142	159	93	115	79	113
1958	182	96	142	83	107	110	90	102	53	29	41	90
1959	85	90	95	91	110	80	77	71	84	78	90	124
1960	123	87	92	101	120	92	133	125	74	66	78	102
1961	170	155	168	134	135	144	139	112	100	88	77	139
1962	187	169	189	177	156	55	56	62	62	50	47	67
1963	108	116	115	131	155	138	124	101	90	99	80	121
1964	123	159	151	163	175	203	192	160	128	131	122	126
1965	115	104	194	198	183	202	155	154	164	78	169	134
1966	121	140	196	237	163	170	129	98	83	48	15	60

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	103.9	101.2	121.6	113.9	116.2	109.5	102.3	100.7	85.9	72.7	78.0	98.5
STD DEV	32.8	20.5	21.1	26.6	18.8	23.3	18.1	18.7	19.3	21.8	19.1	23.4
TREND	1.0	0.8	0.6	3.6	1.8	0.8	-0.0	-1.7	-2.0	-1.7	-1.2	-1.4

TABLE B.5

QUANTITY OF RICE(5%) EXPORT, THAILAND, 1956-66 (1,000 METRIC TONS)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1956	15.80	32.40	52.50	66.60	78.70	11.20	10.60	16.80	15.70	16.90	21.00	28.50
1957	32.50	22.00	29.90	25.70	33.70	27.40	26.20	27.80	20.40	25.00	12.30	9.20
1958	35.30	16.00	20.70	18.80	16.70	14.50	10.80	16.20	11.70	5.90	7.00	28.70
1959	25.10	27.60	16.30	18.60	17.00	12.80	14.90	14.30	19.60	15.70	16.80	14.90
1960	16.80	14.50	15.00	15.20	16.50	13.30	17.20	13.20	6.50	4.10	7.30	8.30
1961	12.70	11.30	14.70	7.00	13.20	11.70	7.70	8.00	6.50	5.30	6.10	12.50
1962	22.70	19.00	17.40	17.60	10.30	5.60	5.10	6.80	7.10	3.50	4.80	9.30
1963	13.50	11.80	9.60	8.40	9.50	9.50	7.60	5.30	3.90	7.50	4.50	7.50
1964	7.40	5.90	6.90	9.00	10.00	7.30	6.70	8.20	6.20	4.20	7.00	8.10
1965	7.20	7.00	6.00	5.00	5.40	7.30	8.00	10.10	10.10	4.40	7.00	8.00
1966	10.40	17.90	12.40	18.30	5.20	4.60	6.90	1.60	1.60	0.60	0.60	0.20

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	138.2	124.0	118.4	118.2	108.4	93.2	85.7	92.0	78.0	64.1	70.9	105.0
STD DEV	33.2	40.1	25.6	45.7	25.7	23.4	31.3	24.7	25.6	29.6	22.1	34.4
TREND	-4.4	5.3	0.6	6.3	-3.6	-1.2	3.4	2.7	2.3	-1.7	0.8	-0.5

TABLE B.6

MONTHLY RICE(5-7%) EXPORT PRICE (f.o.b. BANGKOK), THAILAND, 1956-68 (£/METRIC TON)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1956	43.20	43.10	45.00	46.10	47.00	48.00	49.00	48.00	41.00	40.00	37.00	37.10
1957	46.00	46.50	46.90	47.20	46.90	48.30	52.00	56.00	54.80	52.50	52.20	52.00
1958	51.20	52.20	53.80	53.00	53.80	53.90	53.80	54.50	56.00	54.50	50.90	47.90
1959	47.50	48.00	48.50	48.50	49.50	49.50	48.80	48.50	47.20	45.50	45.50	45.50
1960	44.00	43.00	41.50	41.50	41.50	43.50	44.20	51.00	48.50	46.00	44.50	44.50
1961	45.50	48.00	48.00	49.00	50.50	50.20	51.00	48.00	49.00	50.00	49.50	49.50
1962	48.50	51.20	51.50	59.00	63.50	59.00	57.00	57.50	57.00	52.00	48.00	49.50
1963	51.50	51.50	50.00	49.20	52.80	54.20	53.80	53.00	53.00	51.00	47.50	48.00
1964	48.50	47.80	48.20	48.50	48.00	49.50	50.50	51.00	49.50	49.00	48.50	46.50
1965	47.50	47.80	47.00	46.20	46.20	45.80	46.50	50.00	57.00	51.80	52.20	51.20
1966	50.20	52.00	60.00	56.50	59.00	60.00	60.50	62.00	63.00	64.70	59.00	63.50
1967	65.50	68.20	73.80	73.50	77.00	86.00	86.00	84.00	90.00	90.00	86.00	92.00
1968	94.50	101.00	98.00	90.00	86.00	83.20	83.20	81.50	79.50	72.50	72.20	75.00

INDEX OF SEASONALITY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
INDEX	97.2	99.0	100.0	99.3	100.9	101.6	103.0	104.3	103.5	99.8	95.4	95.5
STD DEV	4.0	5.0	4.7	3.9	5.9	4.4	4.0	4.8	5.2	3.8	5.3	4.7
TREND	0.0	0.3	0.6	-0.0	-0.1	0.1	-0.4	-0.8	0.4	0.4	0.2	0.6

TABLE B.7

INDICES OF QUANTITY OF PADDY BOUGHT BY BANGKOK AND THONBURI MILLERS, THAILAND, 1950-66

(MONTHLY BASIS 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	0	0	0	0	0	0	85	109	100	90	70	118
1951	167	115	147	74	70	64	86	109	98	79	71	151
1952	151	149	71	91	91	79	91	107	107	113	120	90
1953	119	85	130	114	84	85	101	102	84	54	80	143
1954	149	102	143	94	32	43	72	124	169	141	88	32
1955	113	148	181	139	47	77	99	61	33	41	14	147
1956	206	166	180	56	70	67	79	86	87	114	74	107
1957	132	149	150	108	100	84	156	92	57	55	45	76
1958	135	140	190	129	69	105	51	24	17	3	2	141
1959	341	228	177	53	81	55	81	30	64	67	105	87
1960	135	199	137	122	116	73	63	97	73	52	50	91
1961	169	208	218	92	71	49	56	76	28	10	85	211
1962	232	106	146	95	111	63	72	143	19	8	10	28
1963	226	279	223	64	83	35	115	68	79	74	105	29
1964	192	127	77	134	58	174	203	86	61	24	30	57
1965	164	144	24	145	185	166	76	35	55	42	19	18
1966	192	201	215	196	146	67	0	0	0	0	0	0

Source: Computed from monthly data obtained from Department of Internal Trade, Ministry of Economic Affiars, Bangkok.

TABLE B.8

INDICES OF WHOLESALE PRICE OF PADDY(NO.1) DELIVERED ALONG-SIDE MILLS IN BANGKOK AND THONBURI, THAILAND, 1950-66 (MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	0	0	0	0	0	0	102	103	104	105	104	104
1951	88	90	94	97	99	102	100	101	109	105	104	104
1952	96	97	95	98	98	98	99	102	106	113	114	102
1952	90	92	94	96	98	103	104	105	106	97	94	100
1954	97	96	99	101	99	96	97	100	102	102	101	100
1955	94	96	93	95	97	100	101	104	112	111	113	113
1956	87	84	90	94	100	107	110	109	106	104	100	93
1957	92	92	93	95	97	98	112	107	102	100	99	98
1958	90	92	97	101	101	104	104	104	106	107	110	114
1959	89	94	96	96	97	100	101	100	98	98	106	106
1960	94	95	93	91	92	97	101	101	110	110	108	107
1961	90	89	93	95	99	99	100	100	101	105	109	109
1962	89	91	95	99	106	101	104	105	108	109	110	104
1963	89	91	92	90	94	102	109	110	108	106	102	98
1964	94	95	94	98	100	100	102	102	102	98	100	100
1965	99	98	96	95	93	89	90	98	108	109	108	109
1966	92	86	89	97	98	101	0	0	0	0	0	0

Source: Computed from monthly price obtained from Department of Internal Trade, Ministry of Economic Affairs, Bangkok.

TABLE B.9

INDICES OF WHOLESALE PRICE OF RICE(100 - 5% WHITE RICE)
IN BANGKOK, THAILAND, 1950-66

(MONTHLY BASIS, 1957 - 59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1950	0	0	0	0	0	0	108	103	102	102	103	108
1951	90	91	96	100	100	99	96	97	106	111	108	107
1952	90	92	89	96	100	100	102	108	108	108	111	106
1953	90	97	96	96	98	99	100	100	100	97	99	103
1954	98	99	101	99	98	97	98	102	104	102	101	104
1955	94	97	96	96	96	97	100	103	107	107	111	119
1956	86	87	91	96	101	104	107	109	104	103	102	96
1957	93	93	93	95	97	98	109	109	106	100	97	97
1958	90	95	98	100	104	101	98	101	107	109	111	114
1959	88	90	92	94	102	100	108	106	105	98	100	101
1960	97	93	90	88	92	102	106	112	109	103	102	102
1961	88	91	100	98	102	102	99	94	94	102	111	114
1962	90	93	93	97	105	102	105	105	104	106	107	109
1963	90	93	92	92	95	103	106	106	106	105	100	100
1964	93	94	94	98	96	98	104	105	105	103	106	105
1965	97	97	96	94	92	89	91	98	107	107	108	113
1966	91	97	91	101	97	101	0	0	0	0	0	0

Source: Computed from monthly price obtained from Department of Internal Trade, Ministry of Economic Affairs, Bangkok.

TABLE B.10

INDICES OF QUANTITY OF RICE(ALL GRADES) EXPORTS, THAILAND, 1951 - 1966

(MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1951	0	0	0	0	0	0	90	114	103	98	98	110
1952	112	108	101	57	95	117	118	97	127	96	88	77
1953	84	73	114	110	127	128	107	116	110	40	92	148
1954	58	74	137	107	68	90	106	126	100	106	89	59
1955	44	110	158	134	123	128	95	97	81	71	64	108
1956	97	113	96	103	129	91	100	86	67	75	104	118
1957	134	100	105	115	98	104	108	122	72	91	65	94
1958	157	86	132	81	110	116	100	119	64	36	50	111
1959	107	116	123	113	130	91	84	77	91	84	96	131
1960	126	85	89	98	118	92	131	118	66	56	66	84
1961	137	125	135	106	106	112	106	85	75	65	55	102
1962	145	137	158	152	137	50	54	64	67	57	55	75
1963	114	117	112	124	142	112	107	86	74	80	63	93
1964	91	113	104	110	116	133	125	168	86	86	79	81
1965	75	69	127	130	121	131	100	99	104	49	105	85
1966	78	92	134	167	121	136	0	0	0	0	0	0

Source: Computed from monthly export data in FAO, Monthly Bulletin of Agricultural Economics and Statistics, (various issues).

TABLE B.11

INDICES OF QUANTITY OF RICE(5%) EXPORT, THAILAND, 1956 - 66

(MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1956	0	0	0	0	0	0	33	52	51	60	86	122
1957	132	85	156	96	125	107	105	112	84	106	55	43
1958	176	85	115	112	106	88	65	96	69	35	41	170
1959	148	162	94	103	90	69	83	84	120	98	106	93
1960	105	90	97	105	122	104	139	109	55	35	66	76
1961	121	174	154	72	137	120	74	72	56	44	49	103
1962	194	165	151	154	91	50	48	69	76	41	59	113
1963	159	138	115	100	111	113	93	70	54	105	63	105
1964	106	83	94	124	138	99	91	111	83	58	102	122
1965	107	102	84	69	74	100	108	126	175	46	69	80
1966	106	189	142	224	67	65	0	0	0	0	0	0

Source: Computed from monthly export data obtained from the Department of Foreign Trade, Ministry of Economic Affairs, Bangkok.

TABLE B.12

INDICES OF RICE(5-7%) EXPORT PRICE(f.o.b. BANGKOK), THAILAND, 1956-68

(MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1956	0	0	0	0	0	0	110	108	91	89	82	82
1957	102	102	101	99	96	97	102	109	106	100	99	97
1958	95	97	100	98	100	100	101	103	107	104	98	93
1959	93	95	97	99	102	103	102	102	100	98	99	100
1960	98	96	92	92	92	97	98	113	106	99	95	93
1961	94	99	99	101	103	102	103	96	98	99	96	94
1962	91	95	94	107	115	107	103	104	103	95	89	93
1963	97	98	96	95	102	105	104	103	104	100	93	95
1964	97	96	97	98	97	100	103	104	102	100	99	96
1965	98	99	97	95	94	93	93	100	113	100	99	95
1966	91	93	106	98	101	101	100	100	100	101	89	94
1967	94	95	100	97	98	107	104	98	102	100	95	101
1968	104	111	109	101	98	96	0	0	0	0	0	0

Source: Computed from monthly export price in FAO, Monthly Bulletin of Agricultural Economics and Statistics, (various issues).

TABLE B.13

INDICES OF THAI AVERAGE EXPORT PRICE (WITH RICE PREMIUM), 1957 - 62

(MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1957	93	76	92	90	93	92	96	100	101	106	106	101
1958	109	104	105	108	108	109	108	114	99	116	113	111
1959	107	106	104	105	101	101	94	94	93	79	91	87
1960	92	90	90	85	89	86	86	91	87	88	90	93
1961	92	90	94	90	94	92	94	96	102	104	109	101
1962	105	98	98	101	106	114	121	121	119	122	117	108

Source: Chaiyong Chuchart and Sopin Tongpan, The Determination and Analysis of Policies to Support and Stabilize Agricultural Prices and Incomes of the Thai Farmers (with special reference to rice premium), Kasetsart University, Bangkok, 1965, p. 67.

Notes: no data available for index calculation for years following 1962.

TABLE B.14

RICE: INDICES OF THE AVERAGE WORLD EXPORT PRICE, 1957 - 1965

(MONTHLY BASIS, 1957-59 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL INDEXES*
1957	98	98	98	96	98	98	100	104	104	103	103	102	104
1958	102	103	105	104	105	105	104	107	108	107	103	99	98
1959	98	98	98	97	95	96	95	95	94	93	92	91	89
1960	90	89	88	87	87	87	87	91	91	89	88	88	93
1961	90	92	94	94	96	96	97	94	95	96	97	96	103
1962	97	99	101	103	112	108	106	107	106	103	98	98	103
1963	100	102	102	101	103	106	106	106	105	103	101	102	103
1964	103	103	104	104	103	105	105	105	104	102	102	101	103
1965	101	103	102	101	101	102	106	113	-	-	-	-	105

Source: FAO, Monthly Bulletin in Agricultural Economics and Statistics (various issues); FAO, Rice Report, 1963-67; FAO, Commodity Review, (various issues).

- no data available

* Annual index is not necessary equal to the average of 12-month indexes.