

AN ABSTRACT OF THE THESIS OF

LINCHONG RACHAPAETAYAKOM for the M. S. in Agricultural Economics
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Title SOME IMPACTS OF THE RICE EXPORT TAX ON THE RICE ECONOMY
IN THAILAND

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(Major Professor)

This study concerns the rice export tax of Thailand as it affects the farm price and farm production of rice. A retail, farm and export market model was constructed, fitting the rice export tax within its framework. Further, an econometric analysis of the Thai rice market, using the limited information technique, by Dr. John A. Edwards of Oregon State University, Professor of Agricultural Economics, is included in chapter III of this thesis.

The objectives of this thesis are: 1) to construct an economic model of the retail and export rice markets, fitting the rice export tax within its framework; 2) to report empirical estimates of the price elasticities of demand in both domestic and export markets, and of total farm supply; and 3) to comment on the advantages and disadvantages of rice export tax as an economic policy in Thailand.

The rice export tax stabilizes the price of rice in the domestic market by placing the rate of rice export tax equal to

the change in the domestic price of rice. At the same time, it causes lower rice prices at the farm level, lowering the farm income and depressing the optimum production.

The findings are: 1) The rice export tax depressed the farm price not more than six percent of the rice export tax levied on the exporter. The other 94 percent, the foreign buyer pays to the government of Thailand in the form of higher prices for Thai rice. 2) Price elasticity of demand in the export market is -0.268 . The elasticity of demand for Thai rice in the world market with respect to the change in the supply of other countries (excluding Thailand) is -3.864 . Price elasticity of demand for Thai rice in the world market with respect to the changes in the world population is $+3.864$. Price elasticity of domestic demand is -0.911 . Income elasticity of domestic demand is $+0.421$. Price elasticity of the total supply in the farm market is $+0.509$. 3) Because the removal of the rice export tax will cause a steep rise in the domestic price of rice, and since the government has to adjust Thailand's economy to any price change that occurs in the world and domestic markets, it would be preferable at the present time to retain the rice export tax. But, at the same time, the government should return a large share of the rice export tax revenue to the farmers in the form of definite government services, so that a farmer could increase his production, and consequently his income. The rice export tax should then be gradually removed so that Thailand can speedily improve its agricultural economy to the standard level of developing countries.

SOME IMPACTS OF THE RICE EXPORT TAX

ON

THE RICE ECONOMY IN THAILAND

by

LINCHONG RACHAPAETAYAKOM

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in Charge of Major

Redacted for privacy

Head of Department of Agricultural Economics

Redacted for privacy

Dean of Graduate School

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Typed by Linchong Rachapaetayakom

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INTRODUCTION

The term "export taxation" pertains to the acquisition of a part of the export returns of a domestic supply by a government or its agency. In brief, the history of Thailand's rice export taxation has evolved from a government monopoly of the rice trade (during and after World War II) to a system of fluctuating rice export taxes and quotas, instituted in 1954. (Further details will be discussed in chapter I). The rice export tax, or rice premium--as it is officially called--actually "consists of a set of premia levied separately on each of the numerous export grades of rice " (14, p. 164). The system of physical restriction, by limiting or by eliminating the exportation of rice, is known as the "quota" system.

This thesis will attempt to accomplish three main objectives. They are: 1) to construct an economic model of the retail and export rice markets, fitting the rice export tax within its framework; 2) to report empirical estimates of the price elasticity of demand in both domestic and export markets and of total farm supply, and 3) to comment on the advantages and disadvantages of the rice export tax as an economic policy in Thailand, a country whose agricultural economy is largely dependent upon the size and value of its rice crop.

CHAPTER I

RICE ECONOMY IN THAILAND

The Importance of Rice in Thailand

Rice plays a central role in the economy of Thailand; in fact, it is "the backbone of its economy" (13, p. 1). In 1960, about 76.5 percent of the population were rice farmers (13, p. 14), and 35 percent of the total value of Thailand's exports came from rice (13, p. 24). The value of the rice money crop in 1961 comprised 14.7 percent of the Gross National Product (GNP) (Table 1).

In Thailand, rice is the most important single dietary item (Table 2); however, in spite of its solid economic basis in domestic demand, the gross income generating capacity per unit of land producing rice is the lowest in baht¹/rai² (Table 3). Many factors contribute to this condition, but chief among them, according to Dr. Sawaeng Kulthongkham, past president of the Agricultural Economic Society of Thailand is that "... the market price has been regulated at an artificially low level by a government policy of export taxation" (13, p. 41-46).

A United Nations' survey of future population estimates shows that the population explosion in Asia and the Far East is critical;

¹ Baht is Thai currency: approximately 20.80 baht equals \$1 U.S. Money.

² Rai is the Thai's land measurement; one rai equals 0.395 acres.

Table 1 Value of Rice Production as Compared to GNP, Thailand,
1951 to 1961¹

Year	Rice	GNP	Rice as a Percent of GNP
-- million baht --			
1951	6,006.8	28,219.8	21.3
1952	4,818.2	29,548.5	16.3
1953	5,321.2	32,164.5	16.5
1954	4,709.9	31,997.3	14.7
1955	6,331.9	39,334.0	16.1
1956	7,219.8	40,928.9	17.6
1957	5,690.3	41,514.0	13.7
1958	5,969.9	42,210.1	14.1
1959	5,986.5	46,674.2	12.8
1960	7,103.9	53,014.6	13.4
1961	8,426.5	57,133.2	14.7

¹ Preliminary

Source: (17, p. 10-11)
(17, p. 37-38)

Table 2 Average Amount of Food Intake (Gram) Per Caput
Per Day in Ubol Province and in Thailand

Survey	Rice	Animal Foods	Vegeta- bles	Fruits	Fats	Misc.	Total
I	400.0	68.0	82.0	6.0	1.4	27.4	584.8
II	524.6	86.5	91.8	34.5	1.4	8.7	747.5

Source: Survey I -- Interdepartmental Committee on Nutrition for National Defence: Nutrition Survey, October-December, 1960. The Kingdom of Thailand, p. 217.

This survey covered 93 families of 13 vil-
lages in 4 zones of the whole Kingdom.

Survey II-- M. M. Anderson, F. A. O. Nutrition Adviser
to Thailand: Summary Classification of
Food Consumed by Households in 10 villages
of Ubol Province, November, 1961 to February,
1962; an unpublished Field Progress Report.

Ubol Province is located in the Northeastern
Zone of Thailand.

Table 3 1961-1962 Average of Yields, Wholesale Price, and Values for Selected Agricultural Crops in Thailand

Crop	Yield (kg/rai)	Wholesale Price (baht/kg)	Value (baht/rai)
Tobacco ^a	212.33	12.40	2,544.33
Tobacco ^b	93.00	13.73	1,277.00
Chili	190.33	7.07	1,338.33
Cassava flour	659.00	1.60	905.00
Rubber	80.00	10.40	834.67
Peanuts	210.00	3.70	780.67
Kenaf	200.67	3.04	611.67
Sugar cane	5,233.33	0.11	592.25
Castor	176.67	2.86	529.00
Cotton	128.33	2.07	503.00
Mung Bean	181.00	2.36	424.00
Corn	319.33	1.04	334.33
Rice (Paddy)	227.00	0.99	222.00

a. Local tobacco

b. Virginia tobacco, 1962 only

Source: O. J. Scoville and Alfred Thieme, Jr., Agricultural Development in Thailand, USOM/Bangkok, June, 1964, Appendix, Table 5.

this causes considerable concern to the United Nations Department of Economic and Social Affairs (Table 4). The study also has shown that over one-half of the world's population live in Asia and the Far East. The people of this area basically are rice consumers (13, p. 79). Thailand has an estimated annual increase of population of 2.91 percent (Table 5). The average consumption of rice in Thailand during the period 1953-1962 was 283 lb./per person/per year (Table 6).

Rice is not only important to Thailand's food consumption, for a recent bulletin (December 1966) of the Food and Agricultural Organization of the United Nations has pointed out that "world rice stocks are extremely low and demand is strong. A relatively high volume of international trade is expected next year and world prices are likely to remain high. In the longer run, current trends suggest a growing gap between the supply and the demand for rice in developing countries unless steps are taken to accelerate the expansion of production" (8, p. 18).

Rice production and trade of Thailand dominate its economy by the sheer percentage of the population involved within its framework (80%), but crop production of rice has increased little since 1953, (Table 7). A brief summary of Thailand's rice economy will show some of the reasons for lagging rice production.³

³ The facts and figures of this account have been summarized from chapters I-III of Robert J. Muscat's Development Strategy in Thailand, New York; Prager Press, 1965.

Table 4 Population Estimates for Asia and the Far East and
the Rest of the World, 1920-1980. (Millions)

Year	Asia and the Far East (Revised)	Rest of the World (Unrevised)	World Total (Unrevised)
1920	991	887	1,810
1930	1,074	988	2,013
1940	1,181	1,087	2,246
1950	1,317	1,179	2,495
1960	1,572	1,372	2,914
1970	1,906	1,601	3,477
1980	2,268	1,880	4,223

Sources: Department of Economic and Social Affairs, United Nations, New York, 1959: Population Series No. 31 Future Population Estimates by Sex and Age, Report IV, the population of Asia and the Far East, 1950-1980, p. 5

Table 5 Estimated Population of Thailand 1947-1963

Year	Total	Increase	% Increase
1947	17,969,000	539	2.99
1948	18,508,000	555	2.91
1949	19,063,000	572	2.91
1950	19,635,000	589	2.91
1951	20,224,000	607	2.91
1952	20,831,000	625	2.91
1953	21,456,000	643	2.91
1954	22,099,000	643	2.91
1955	22,762,000	663	2.91
1956	23,445,000	683	2.91
1957	24,148,000	703	2.91
1958	24,873,000	725	2.91
1959	25,619,000	746	2.91
1960	26,388,000	769	2.91
1961	27,180,000	792	2.91
1962	27,993,000	813	2.91
1963	28,835,000	843	2.91

Source: National Office, Office of the Prime Minister, Thailand:
Statistical Yearbook, Thailand. 1963, No. 24, p. 40.

Table 6 Estimated Per Caput Rice Consumption Per Year in
Thailand 1953-1962.

Year	Quantity Available Domestic Consumption		Population (1,000)	lb./caput
	Ton (1,000)	Pound (1,000)		
1953	2,085	4,670,400	21,456	218
1954	2,287	5,122,880	22,099	232
1955	3,264	7,311,360	22,762	321
1956	3,553	7,958,720	23,445	339
1957	2,316	5,187,840	24,148	215
1958	3,263	7,309,120	24,873	294
1959	2,978	6,670,720	25,619	260
1960	3,289	7,367,360	26,388	279
1961	3,856	8,637,440	27,180	318
1962	4,401	9,858,240	27,995	352
Average	-	-	-	283

Source: (13, p. 23)

Table 7 Thailand: Principal Crops, Indices of Production and area sown (1950 = 100)

Year	Production of Principal Crops		Area Planted to Principal Crops	
	Rice	Other Crops	Rice	Other Crops
1950	100	100	100	100
1951	108	141	108	110
1952	97	155	97	112
1953	121	185	111	116
1954	84	240	100	123
1955	108	263	104	127
1956	122	368	109	140
1957	82	390	92	153
1958	106	406	105	160
1959	104	480	110	182
1960	115	551	107	221
1961	116	452	110	227

Source: Agricultural Statistics of Thailand, various issues.

Rice is a Subsistence Crop in Thailand

Thailand is considered an underdeveloped country as far as its agricultural sector is concerned. This sector is characterized by an overwhelming number of small rice farmers who raise rice as a subsistence crop first and foremost. The rice that remains from the farmers' own family needs is the surplus that is sold to meet domestic and export demand.

The normal rhythm of rice farming consists of 120 days of labor, i. e. planting and harvesting; these days are not consecutive, and occur over a period of seven to eight months, with peak labor intervals between May-June, and November-December. The per capita income from farming for the entire agriculture population, as indicated by the 1953 agriculture economic survey, was \$48, or 959 baht. This includes the value of its own agricultural products consumed by the producing farm family. Per capita cash income to farm families averaged \$33, or 662 baht for the entire agriculture population. Some agricultural areas exceeded these levels of income. Others, particularly the Northeast, experience significantly lower per capita incomes. When the season is slack and/or the rice crop is poor, members of the farm family travel to urban sectors of Thailand to work as cheap domestic or unskilled laborers. When labor is needed in the rice field, however, Thai rice farmers will leave their urban employment and a money wage to bring in their subsistence crop. In some villages, different varieties of rice are sown with staggered ripening dates so that the

entire village can help harvest each crop. This type of cooperation is found chiefly in the Central Plain flood area, which has the highest rice yield/per rai in Thailand. The Central Plain is "subject to annual flooding which, while it is excellent for rice cultivation, (provided the flood comes at the right time and does not exceed the right height), prevents the growth of any other crop " (14, p. 31).

In Northeast and Northern Thailand, the yield of rice per/rai is much lower, for the soil is poor, and flash floods are common. In the past, a typical Thai farmer of that region would rather produce a subsistence crop of rice than grow other crops, such as corn or kenaf which are entirely subject to commercial marketing.

Diversification to Other Crops

When farmers are willing to risk fluctuating marketability-- their numbers are steadily growing in the Northeast, some sections of the Central Plain, and the Southeast--the agricultural sectors of these regions present a breaking away from the traditional yearly cycle that revolves around rice production. The European common market has provided an outlet for kenaf, a coarse fibre especially suited for making bags. Japan's burgeoning poultry industry has provided a market for corn.

Transportation Difficulties

Rice production in the Northeast and Northern Thailand has, until recently, been seriously handicapped by lack of adequate transportation.

Although a major artery, Friendship Highway, has been built by the Thai government, with the assistance of the United States, there is still a lack of small, feeder roads to provide trucking transportation to the major highway and railroad.

Irrigation Projects and New Agricultural Techniques

Although wet rice takes little nutrient from the soil, even in the fertile flooded plain of central Thailand the soil is beginning to show the effects of continual output with little input to replace nutrients taken out by rice cultivation. Modern methods of fertilizing and insect control are needed. In the upland zone, particularly, modern techniques of irrigation and government control of uninhibited deforestation are lacking. The benefits from full irrigation from the Chac Phraya project will be open to debate and will take many years to come to fruition if modern methods of agricultural techniques are not instituted at the same time.

Multiplicity of the Supply of Sellers Services

Four groups: exporters, millers, middlemen, and farmers participate in the rice trade of Thailand. The exporter buys his rice from millers. The latter have increased in number since the post war years, investing in small, often mobile, upcountry mills. It is cheaper to transport milled rice than paddy, and farmers do not mill their rice, even for home consumption. Millers obtain their rice from middlemen, who

finance the farmer through loans and advances, and provide storage facilities for the farmer's surplus crop. The farmer has the lowest bargaining position in this hierarchy, and it is he who loses most by the high cost of seller supply. Thus he becomes a part of the "low productivity--low income--low investment circle" that is characteristic of agricultural underdevelopment (14, p. 28). In view of the problems listed above, there seems to exist little incentive for rice producers to increase rice production. In addition, the rice economy of Thailand bears another implicit cost--the rice export tax imposed by Thailand's government.

History and Nature of the Rice Export Tax

The internal and external rice trade in Thailand were comparatively free from government intervention before World War II. There were some paternalistic efforts to establish cooperative paddy marketing societies (mostly futile), and an effort toward "Thaification" of rice merchandising which was cut short by the War. "Wartime and post-war inflation, the ability of Thailand to resume large-scale rice exports when production in most Far Eastern Countries had dropped far below pre-war levels, and the reparations obligations imposed on Thailand by the Allies" were the chief causes for the government's establishing a monopoly over its rice trade (14, p. 103).

This policy was a two-fold measure by which the Thai government accomplished: 1) fulfillment of its contractual commitments to the International Emergency Food Council, (first as an indemnity, and

later for a price), and to bilateral government to government contracts; and 2) control over the price of rice to domestic consumers as an anti-inflationary measure and as a security measure to ensure a sufficient supply of rice to domestic consumers. James C. Ingram describes the method by which the government implemented its policy as follows:

... the Thai government declared a monopoly on the rice trade at the end of the war. This monopoly enabled the government to appropriate a large part of the high prices received for rice exports. Surplus rice had to be sold to the government Rice Office at prices fixed in baht. Mills were allowed to sell for local consumption, but the entire surplus over domestic needs had to be sold to the government, which resold it to foreign buyers. Internal transit of rice and paddy was strictly controlled [to prevent black market operations] and provincial surpluses of milled rice were delivered to warehouses in Bangkok (11, p. 88-89).

The government continued its monopolistic policy over the rice trade long after the primary reason for its inception had ceased. It became, however, merely a paper transaction by which "the government simply bought milled rice from the mills at a price substantially below the export price, and then sold it to the shippers. The shippers got their rice directly from the mills and often were themselves the millers" (1, p. 330). The government expended little effort, and the revenue was conveniently collected and profitable.

The government monopoly ended in 1954, but domestic prices of rice were prevented from rising to the world market level by the imposition of a rice export premium levied on the exporters. "From 1955, the tax levies on the rice trade have included not only

a small, fixed municipal tax, a milling tax, and an export duty tax, but what is called a rice premium.⁴ The rice premium or export tax is subject to quick rate changes that are determined by the Ministry of Economic Affairs. The primary consideration in changing the premium level (in addition to its permanent feature as a source of revenue) is to ensure an adequate supply of rice for the domestic market at a reasonable price" (1, p. 332). Quotas are imposed when the higher premiums on rice exports do not halt the exportation of rice. At other times encouragement is given to sell rice in the world market. But in November 1966, the government suspended the rice export quotas entirely because of a steep rise in world market prices (8, p. 20). The government, also at times when demand is strong and supply is tight, has limited quotas to certain fixed amounts. In February 1962, the amount was fixed at 1,000 ton/per exporter. Government permits were required before the exporter could sell more rice on the world market. In March, of the same year, "rice millers were obliged to deliver 15 tons to the government at fixed prices for every 100 tons they sold for export" (13, p. 21).

Hypotheses of the Effects of Thailand Rice Export Taxation

Some economists, such as James C. Ingram and Robert J. Muscat in their studies of Thailand's economic growth, have been quite outspoken in their condemnation of the rice export tax. Ingram states: (11, p. 92)

⁴ Rice premium is synonymous with rice export tax in this thesis.

The effect of the post war system has been to reverse the prewar policy of reducing the tax on the farmer, who now bears an extremely heavy tax.

Robert J. Muscat is more explicit in his objection to the Thai system of export taxation: (14, p. 105-7)

In 1960, rice exports amounted to 1.2 million tons and were valued at 2,580 million baht. The premium (plus another small export tax) generated about 890 million baht in government revenue, equivalent to a little more than one-third the value of rice exports. With the Bangkok wholesale price about two-thirds of the international price, this premium was equal to half the export volume, valued at domestic prices, or 600,000 tons. Now the total rice crop available for sale in 1960 (i.e., the 1959/1960 harvest was 7.0 million tons of paddy, equivalent to 4.62 million tons of milled rice, of which 1.21 million tons were exported and 3.41 million tons consumed domestically (ignoring stocks remaining from the previous year). We may estimate the non-rice producing consumers at 9.6 million persons or 37 percent of the population. If all sections of the population consumed on the average the same annual volume of rice per capita, the non-rice producing consumers bought from the producers 1.26 million tons of the 3.41 million retained in the country. By reducing the domestic price, the premium relieved these consumers of the need to pay an additional price equivalent to half the value of the rice they did acquire. Thus the producers were subject to an implicit tax which represented an income transfer to the urban and non-rice producing population on the order of 630,000 tons. Finally, the value of the rice retained by the producers (the residual of 2.15 million tons) was also depressed by the same proportion. The exchange value of their retained portion was reduced by the equivalent of 1.07 million tons at domestic prices. This value is significant as real income only to the extent that the increased exchange value of their supply would actually bring additional rice onto the market. The sum of the actual one and two implicit taxes is, of course, equal to half of the total (milled) crop at domestic prices, or 2.36 million tons.

The burden of this taxation on the largest segment of the population is staggering in magnitude. Fortunately it represents income transfers based on the potential incremental return to rice farming, due to increases in international price in relation to domestic baht price since World War II, and is not a burden in the sense of a tax imposed on and reducing a given income. As should be

clear, the actual and implicit taxes imposed by government greatly exceed any margin of "exploitation" which may be extracted from the rice producers by the marketing system. The premium is bête noire of Thai agriculture. Besides criticizing its income distribution effects, those who have campaigned against the premium cite it as the main stumbling block in the way of a revolution in rice productivity.

Eliezer B. Ayal, on the other hand, feels that curtailing the expansion of rice production would have a beneficial effect on Thailand's economy. He agrees with Muscat, however, when he remarks: " The rice export tax discourages rice production ... the price depressing effect also reduces the income and purchasing power of the farmers, thus the tax is a vehicle for the transfer of investible funds to the government " (1, p. 352). But then, Ayal states that the economy of Thailand would benefit by:

... the irreversible process of change in the structure of the economy which sooner or later results in an upward trend in per capita income ... By encouraging capital, entrepreneurs, and labor to move away from rice production to other economic activities, the rice export tax enhances structural change also through the encouragement it provides to urban non-rice industries by: a) increasing the supply of entrepreneurs to the urban sector; b) helping keep the wage level low which reduces production cost, and c) favoring the demand for non-rice products because of its smaller income effect, compared to income and sales taxes, on those not engaged in rice production. (1, p. 359)

In view of these economists' opinion, perhaps it might be well to quote Melvin M. Wagner and Sopin Tongpan's remarks in their paper on "The Structure of Thai Rice Prices: Some Preliminary Findings"

This research ... was undertaken in the hope of helping to separate facts and relationship from value judgements. For a number of reasons, of course, economic research cannot answer once and for all the question of what to do about

the rice premium. One reason is that economists, as economists (and particularly farang⁵ economists), cannot answer the many questions of value judgement involved--for example, the desirability of shifting income from consumer to producers ... I feel very strongly that we need more research...(20, p. 2).

Wagner and Tongpan further discuss the elasticity of the world demand for Thai rice in the world market as:

Some economists believe that the world demand for Thai rice is perfectly elastic or nearly so; that is, that just as the quantity of rice which an individual farmer sells is such a small proportion of the total rice available for sale that the farmer can increase the quantity he sells many times without affecting price, so also can Thailand increase its sales without affecting price...(20, p. 9-10).

This thesis will present further economic research to determine the elasticity of the world demand for Thai rice in the world market and also to determine the effect of the rice export tax on the farm price under certain assumptions.

In order to study in detail the effect of the rice export tax and its effect on the retail and export market of Thailand, an economic model has been developed in chapter II. In addition, the effects of the rice export tax on farm, on retail and export prices, and on the level of rice production will be analyzed within the framework of the model.

⁵ farang is a Thai word meaning foreign.

CHAPTER II

THE MARKET MODELS

In this chapter, an economic model of the domestic retail and export market for the rice crop of Thailand will be discussed. Equations representing demand and supply in each market will be developed and used in the analysis. Market equilibrium will be determined on the basis of the relationships. The resulting model will be used in analyzing the effects of the rice premium on the market.

The Retail Market

Assume that the demand for rice by consumers in Thailand can be represented by the function in equation (1) below:

$$(1) \quad Q^{dr} = b_{10} + b_{11} P^r$$

where Q^{dr} is the quantity demanded by domestic rice consumers and P^r is the price of rice in the domestic retail market. Assume, further, that there are certain costs (e.g., transportation, milling, storage, labor, etc.) involved in selling rice in this market, and that these costs depend upon the volume of rice moving through the market.

This function is given in equation (2):

$$(2) \quad P^{sr} = b_{20} + b_{21} Q^{dr}$$

The question of interest here is: what price can the sellers of rice in the domestic market afford to pay for the rice which they sell?

The answer to this equation is, obviously, the difference between the price which they can obtain from a given volume of sales and the cost of selling that volume, i.e.,

$$(3) \quad p^f = p^r - p^{sr}$$

Solving (1) for P^r and substituting the result together with (2) into (3) gives:

$$(4) \quad p^f = -\left(\frac{b_{10} + b_{11}b_{20}}{b_{11}}\right) + \left(\frac{1 - b_{11}b_{21}}{b_{11}}\right) Q^{dr}$$

Equation (4) is the derived demand for rice in the farm market arising from demand in the domestic retail sector. These relationships are illustrated in figure 1

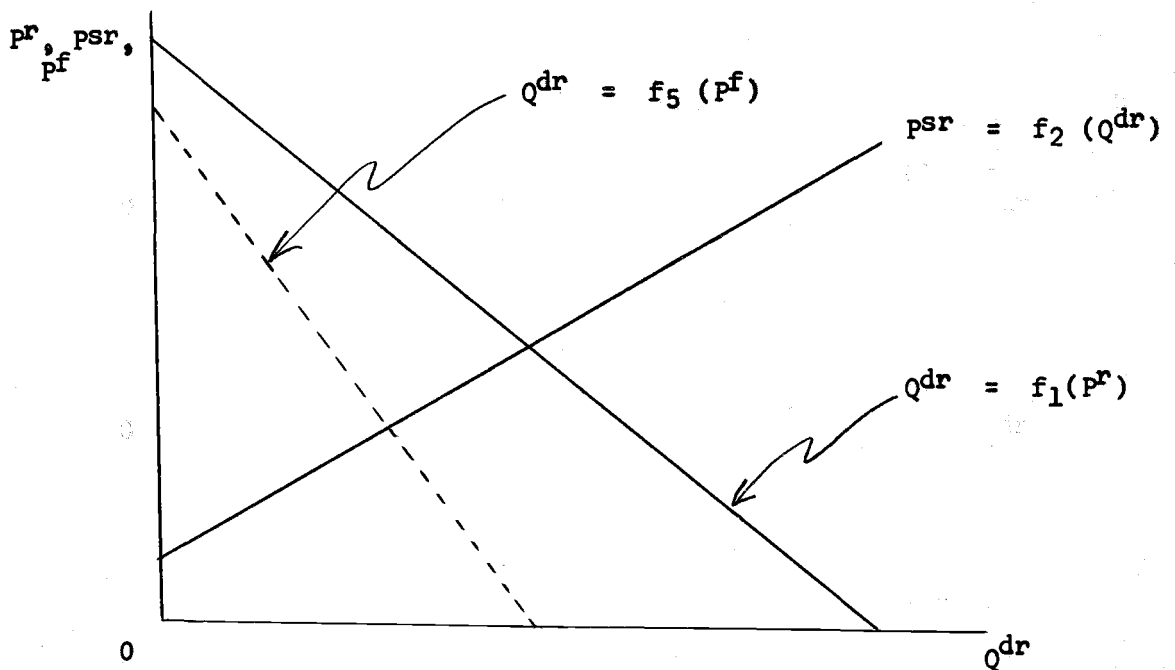


Figure 1

The Export Market

In a similar manner, the derived demand for rice at the farm level arising from the export market demand can be developed from the retail export demand function and the cost of selling export function. The major difference in analysis lies in the specification of the export demand function itself.

Figure 2 represents the world market for rice, excluding Thailand. Q^{dw} and Q^{os} are functions of the world price, P^e , represents the demand of all countries, excluding Thailand, for rice in the world market and the supply in that market of all countries except Thailand. At any price greater than P_0^e (see figure 2), supply exceeds demand; consequently, Thailand would not be able to sell any rice at such a price. The same is true if $P^e = P_0^e$, for at this price, world demand equals world supply. At any price less than P_0^e , however, demand exceeds supply and Thailand would be able to sell an amount of rice equal to this difference. Thus, the demand for Thailand's rice in the world market can be determined by subtracting Q^{os} from Q^{dw} . If these two functions are as in equation (5) and (6), then

$$(5) \quad Q^{dw} = c_{10} + c_{11} P^e$$

$$(6) \quad Q^{os} = c_{20} + c_{21} P^e$$

The demand for Thai rice is given in equation (7)

$$(7) \quad Q^e = Q^{dw} - Q^{os} = (c_{10} - c_{20}) + (c_{11} - c_{21}) P^e$$

Given the functional relationship (equation (8)) between the cost of selling in the export market, P^{se} , and the volume sold,

$$(8) \quad P^{se} = c_{30} + c_{31} Q^e$$

the derived demand for rice arising from the export sector can be derived in the same manner as above. This demand function is presented in equation (9) :

$$(9) \quad Q^e = \left(\frac{c_{10} - c_{20} + c_{30} [c_{11} - c_{21}]}{1 - c_{31} [c_{11} - c_{21}]} \right) + \left(\frac{c_{11} - c_{21}}{1 - c_{31} [c_{11} - c_{21}]} \right) P^f$$

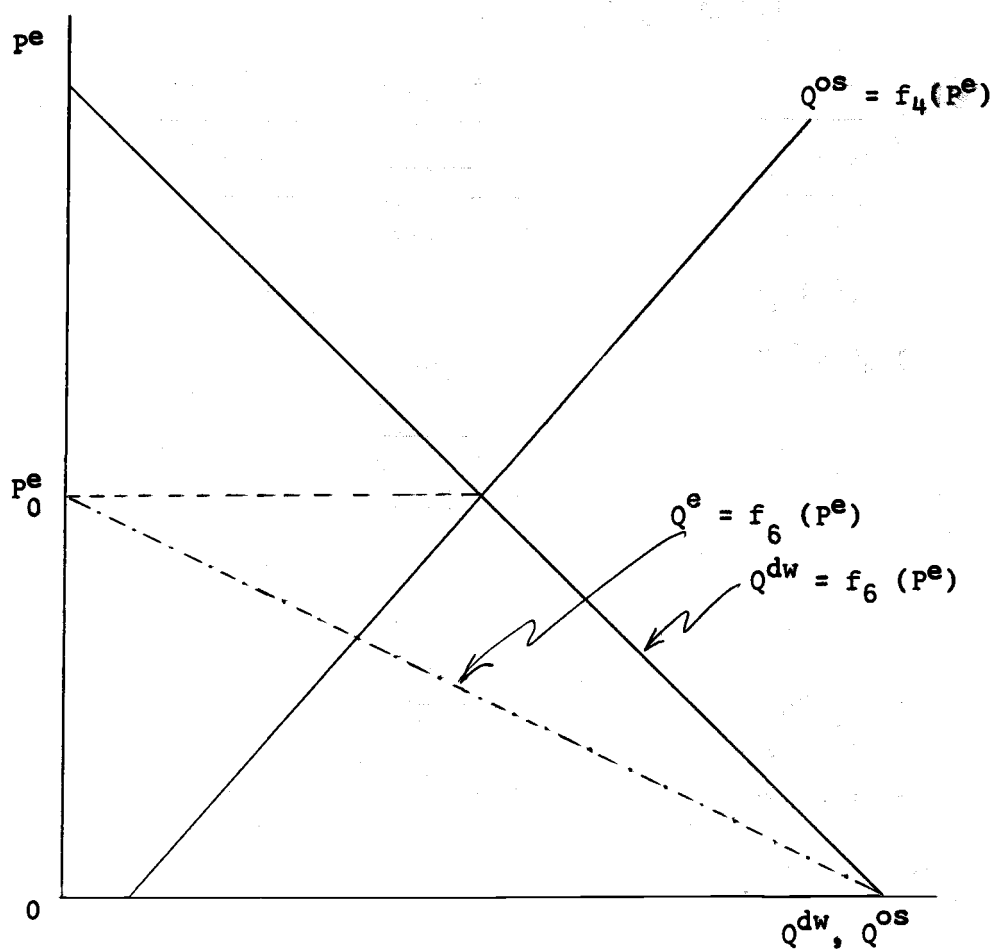


Figure 2

The Farm Market

The demand for rice at the farm is equal to the sum of the derived demands from the domestic retail and export markets, i.e.

$$(10) \quad (Q^f)^d = Q^{dr} + Q^e$$

Substituting from (4) and (9)

$$(11) \quad (Q^f)^d = B_0 + B_1 P^f$$

$$\text{Where } B_0 = \left(\frac{c_{10} - c_{20} + c_{30} [c_{11} - c_{21}]}{1 - c_{31} [c_{11} - c_{21}]} \right) + \left(\frac{b_{10} + b_{11} b_{20}}{1 - b_{11} b_{21}} \right)$$

$$\text{and } B_1 = \left[\frac{c_{11} - c_{21}}{1 - c_{31} [c_{11} - c_{21}]} + \frac{b_{11}}{1 - b_{11} b_{21}} \right]$$

The supply of rice at the farm level is assumed to be an increasing function of the farm price (equation (11)).

$$(12) \quad (Q^f)^s = A_0 + A_1 P^f$$

Equilibrium is established in the market when

$$(13) \quad (Q^f)^d = \bar{Q}^f = (Q^f)^s$$

where \bar{Q}^f is the equilibrium volume of rice sold to both retailers and exporters. Substituting (11) and (12) into (13) and solving for P^f gives the equilibrium farm price, \bar{P}^f :

$$(14) \quad \bar{P}^f = \frac{A_0 - B_0}{B_1 - A_1}$$

Substitution of \bar{P}^f into either (10) or (11), (9) and (4) gives the equilibrium volume of total, export, and retail sales, respectively. Appropriate substitution of these equilibrium values enables one to determine the equilibrium values of P^r , P^{sr} , P^e , and P^{se} as well. These relationships are illustrated in figure 4

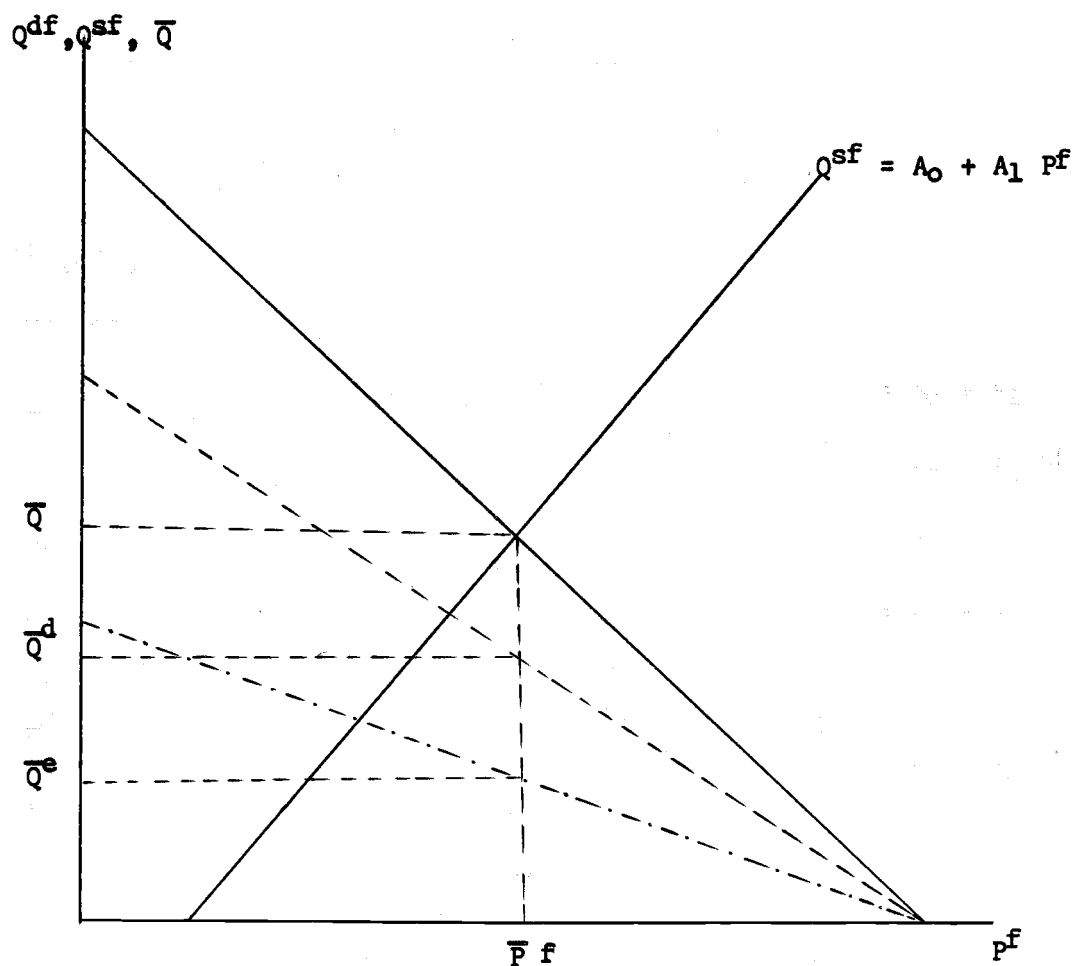


Figure 3

THE EFFECT OF THE RICE EXPORT TAX

Suppose that the government imposed a tax on the exporters of Thai rice. Such a tax (T) is equivalent to an autonomous increase in the costs of selling in the export market and can be represented by the positive number Δc_{30} . Since the equilibrium prices and quantities above are the function of c_{30} , it follows that any change in c_{30} will change these equilibrium values. The purpose of the discussion in the following pages is to indicate these changes.

From equation (14) above, the equilibrium farm price is:

$$(15) \quad \bar{P}^f = \frac{A_0 - B_0}{B_1 - A_1}$$

Where

$$B_0 = \left[\frac{c_{10} - c_{20} + c_{30}(c_{11} - c_{21})}{1 - c_{31}(c_{11} - c_{21})} \right] + \left[\frac{b_{10} + b_{11}b_{20}}{1 - b_{11}b_{21}} \right]$$

$$\text{then, } \frac{\Delta B_0}{\Delta c_{30}} = \left(\frac{c_{11} - c_{21}}{1 - c_{31}[c_{11} - c_{21}]} \right)$$

$$\text{and } \frac{\Delta \bar{P}^f}{\Delta c_{30}} = \frac{\Delta \bar{P}^f}{\Delta B_0} \cdot \frac{\Delta B_0}{\Delta c_{30}}$$

$$\frac{\Delta \bar{P}^f}{\Delta c_{30}} = \left(\frac{-1}{A_1 - B_1} \right) \left(\frac{c_{11} - c_{21}}{1 - c_{31}[c_{11} - c_{21}]} \right), \text{ or}$$

$$(16) \quad \Delta \bar{P}^f = \left(\frac{-1}{A_1 - B_1} \right) \left(\frac{c_{11} - c_{21}}{1 - c_{31}[c_{11} - c_{21}]} \right) T$$

The magnitude and direction of the change in $\Delta \bar{P}^f$ as a result of the rice export tax (T) depends upon the signs and magnitudes of the several parameters of the demand and supply functions in the market. Consequently, the effect of the tax on the equilibrium farm price is an empirical question the answer to which depends upon obtaining estimates of the several parameters involved. This will be discussed further in chapter III. Meanwhile, it is worth noting that it is conceivable that $\Delta \bar{P}^f$ can be either positive or negative, i.e., in the absence of information concerning A_1 , B_1 , c_{11} , c_{21} and c_{31} . Therefore, there is reason to believe that the export tax will result in an increase in \bar{P}^f in rare instances.

Equilibrium farm supply is:

$$\bar{Q}^f = A_0 + A_1 \bar{P}^f$$

Therefore

$$\frac{\Delta \bar{Q}^f}{T} = \frac{\Delta \bar{Q}^f}{\Delta \bar{P}^f} \cdot \frac{\Delta \bar{P}^f}{T} = A_1 \frac{\Delta \bar{P}^f}{T}, \text{ or}$$

$$(17) \quad \Delta \bar{Q}^f = A_1 \Delta \bar{P}^f$$

In a similar manner, it is possible to determine the change in the domestic and export prices and quantities as a result of the export tax. as:

$$(18) \quad \Delta \bar{Q}^d = \left(\frac{b_{11}}{1 - b_{11} b_{21}} \right) \Delta \bar{P}^f$$

$$(19) \quad \Delta \bar{Q}^{de} = c_1 (1 + \Delta \bar{P}^f)$$

$$(20) \quad \Delta \bar{P}^r = \left(\frac{1}{b_{11}} \right) \Delta Q^{dr} \quad \text{or} \quad = \left(\frac{1}{1 - b_{11}b_{21}} \right) \Delta \bar{P}^f$$

$$(21) \quad \Delta \bar{P}^e = \left(\frac{1}{c_{11} - c_{21}} \right) \Delta \bar{Q}^{de} = \frac{c_1 (1 + \Delta \bar{P}^f)}{c_{11} - c_{21}}$$

If the value of $\Delta \bar{P}^f$ is known and other values of b_{11} , b_{21} , c_{11} , c_{21} , and c_1 are known, one can also estimate the value of \bar{Q}^{dr} , \bar{P}^{dr} , \bar{Q}^{de} and \bar{P}^{de} .

Further details and estimates will be discussed in chapter III.

CHAPTER III

ECONOMETRIC ANALYSIS

In this chapter, Dr. John A. Edwards, Professor of Agricultural Economics, Oregon State University, Corvallis, Oregon, has kindly consented to allow the author to report his statistical research study on the econometric analysis of the Thai rice market. This study is similar to the market model in chapter II, but it has been carried to greater length and to a depth that is beyond the scope of the author's statistical ability.

As in chapter II, the total quantity supplied at any time (t) is the function of farm price at the time (t) and last year's (t-1) price. The total supply of rice is represented by equation (1) below:

$$(1) \quad Q_t^P = f_1 (P_t^f ; P_{t-1}^f)$$

where Q_t^P is the total quantity supplied at time (t), P_t^f is the farm price at that time and P_{t-1}^f is the previous year's price of rice in the farm market.

The domestic demand for rice in Thailand is represented by equation (2) below:

$$(2) \quad (Q_t^d)^d = f_2 \left(\frac{P_t^d}{I_t^c} ; \frac{Y_t^d}{I_t^c} \right)$$

where $(Q_t^d)^d$ is the quantity demanded domestically at time (t),

and (P_t^d) is the domestic price at time (t) . Assume further that (Y_t^d) is the income of the consumer at time (t) and (I_t^C) is the consumer price index (cost of living) at that time (t) .

Domestic retail supply is a function of the domestic price at time (t) P_t^d , the export price at time (t) P_t^e , and, assuming that the government fixes the ex-mill price of rice, the price of rice in the wholesale market P^W . Other costs of selling, such as labor, land, milling, transportation, etc. should be included in this equation, but the information of these variables is scarce and/or unreliable. Equation (3) represents the domestic supply for rice with the three dots indicating some of the variables mentioned above which were not included in the function.

$$(3) \quad (Q_t^d)^s = f_3 (P_t^d, P_t^e; P^W \dots)$$

At equilibrium, the quantity demanded in the domestic market equals the quantity supplied to the domestic market, or

$$(4) \quad (Q_t^d)^d = Q_t^d = (Q_t^d)^s$$

In the export market, the demand for Thai rice is equal to the difference between world demand and world supply, excluding Thailand. World demand is assumed to be a function of population and price, i.e.

$$(5) \quad (Q_t^{dw}) = f_4 (P_t^e; N)$$

where P_t^e is the price of rice, f.o.b. Bangkok and N is world

population. N itself is a function of time (t); therefore

$$(6) \quad (Q_t^{dw}) = f_4' (P_t^e; t_t)$$

World supply is a function of total world rice production, excluding Thailand, and P_t^e , i. e.,

$$(7) \quad Q_t^{os} = f_5 (P_t^e; Q_t^{pw-T})$$

The demand for Thai rice is, then,

$$(8) \quad (Q_t^e)^d = Q_t^{dw} - Q_t^{os} = f_6 (P_t^e; t_t, Q_t^{pw-T})$$

Equation (9) represents the quantity of export supply $(Q_t^e)^s$ as a function of export price P_t^e , the wholesale price for rice at time (t), P_t^w , the domestic demand price P_t^d , and the rate of rice export tax T as follows:

$$(9) \quad (Q_t^e)^s = f_5 (P_t^e, P_t^w, P_t^d, T \dots)$$

As in equation (3), the three dots indicate missing data.

At equilibrium in the export market, the export demand $(Q_t^e)^d$ equals the export supply $(Q_t^e)^s$ as indicated in equation (10)

$$(10) \quad (Q_t^e)^d = Q_t^e = (Q_t^e)^s$$

Finally, it is assumed that the sum of domestic and export sales equals the quantity supplied by Thai farmers:

$$(11) \quad Q_t^d + Q_t^e = Q_t^p$$

with eight equations and eight unknowns, one can solve for each unknown algebraically. With the tool of market equilibrium in the export and domestic markets, the unknowns may be reduced to six as Q_t^p , P_t^f , P_t^d , Q_t^d , P_t^e , Q_t^e . These unknowns are called endogeneous variables, the values of which are explained by the model. Exogeneous variables, such as Y_t^d , I_t^c , P^w , Q^{pw-T} , T and t are determined outside the model. It should be noted here that the data⁶ used in these calculations come from limited sources. Some of the data are unquestionably incomplete, and some variables have been arbitrarily defined; therefore, the statistical reliability of the estimated parameters (excluding t and Q^{pw-T}) is not as great as one would like to see; this is particularly so of those associated with the endogenous variables. However, in all cases, the signs of the parameter are as expected.

Within these restriction, it has been possible to estimate the three equations, most relevant to assessing the impact of the rice export tax or rice premium. The first equation is the total farm supply of rice in Thailand and is estimated to be:⁷

$$(12) \quad Q_t^p = 0.948085 + 2.75528 P_t^f + 1.64493 P_{t-1}^f \\ \quad \quad \quad (1.8401) \quad \quad \quad (1.4120)$$

⁶ For data used -- see appendix

⁷ Figures in parenthesis below parameter are standard errors. All estimates were obtained by using limited information technique.

The total supply of rice is a function of the farm price at that time and the function of the previous year's farm price. This means that when the farmer makes the decision how much rice he will sell, it depends on the price of rice this year and also last year's price. The elasticity of supply with respect to farm price is +0.509; this indicates that as the price of rice this year increases by one percent, the total quantity of rice supplied this year will increase by 0.509 percent. The positive sign on P^f_{t-1} , indicates that the supply of rice next year will also increase as a result of an increase in this year's price.

The second equation is the export demand equation for Thai rice and is estimated to be:

$$(13) \quad (Q^e)^d = 4.413 - 0.102 P^e + 0.211 t - 2.507 Q^{PW-T}$$

(0.1231) (0.0472) (0.6183)

The export price elasticity of demand is -0.268; the elasticity of demand with respect to the supply of other countries, excluding Thailand, is -3.864, and the elasticity of demand with respect to time is + 3.864. All of these elasticities were computed at the mean.

The third equation is the domestic demand function. It is estimated to be:

$$(14) \quad (Q^d)^d = 4.805 - 1.497 \left(\frac{P^d}{I_c} + \frac{1}{I_c} P^d_t - \frac{P^d}{I_c^2} \cdot I_{ct} \right)$$

(1.4089)

$$+ 0.0377 \frac{Y}{I_{ct}}$$

(0.0196)

where $\frac{\bar{P}^d}{I_c} = 1.8367$, $\frac{1}{\bar{I}_c} = 1.1773$ and $\frac{\bar{P}^d}{I_c^2} = 2.1622$

The above equation can be simplified by substituting these values

$$(15) \quad (Q^d)^d = 2.056887 - 1.761854 P^d + 3.2360 I_c - 0.0775 \frac{Y}{I_c}$$

The price elasticity and income elasticity are calculated at the means. The domestic price elasticity of demand is -0.911 ; and the income elasticity is $+0.421$.

The Incidence of the Rice Premium

As indicated in chapter II, the effect of a change in the rice premium on the equilibrium farm price is:

$$(16) \quad \frac{\Delta \bar{P}^f}{\Delta T} = \frac{C_1}{A_1 - B_1}$$

$$\text{where } C_1 = \frac{c_{11} - c_{21}}{1 - c_{31}(c_{11} - c_{21})}$$

The slope of the export demand function for Thai rice is $(c_{11} - c_{21})$, and is equal to -0.102 in the econometric analyses (chapter III, equation 13). The slope of the exporter's supply function, and c_{31} , is unknown.

A_1 represents the slope of the farm supply function and has been estimated to be equal to $+2.75528$ (chapter III, equation 12)

B_1 is defined as

$$(17) \quad B_1 = C_1 + \frac{b_{11}}{1-b_{11}b_{21}}$$

where b_{11} is the slope of the domestic demand function, estimated to be - 1.761854, (chapter III, equation 14) and b_{21} is slope of the seller's supply function. Substituting these values into (18), the effect of the change in the rice premium on the farm price is represented by the expression below:

$$\frac{\Delta P^f}{T} = - \frac{0.102 + 0.010 c_{31} + 0.180 b_{21} + 0.018 b_{21}c_{31}}{1.762 + 0.641c_{31} + 5.034b_{21} + 1.009b_{21}^2c_{31} + 0.051b_{21}c_{31}^2 + 0.047c_{31}^2}$$

Assuming that the initial value of the tax is zero, then the effect on farm price of a given export tax is:

$$\Delta P^f = \hat{\gamma} T$$

where $\hat{\gamma}$, representing the expression of the right-hand side of equation, is a function of b_{21} and c_{31} .

In the absence of information concerning the values of these parameters, it is, of course, impossible to make any precise statements concerning the probable effects of a tax of given magnitude on the level of the equilibrium farm price. Nevertheless, by assuming given value for the unknown parameters, it is possible to indicate a range of variation in effect. For example, if both b_{21} and c_{31} are equal to zero, i. e., the cost of selling in both domestic and export markets is constant and independent of the volume.

sold, the equilibrium farm price is reduced by 5.79 percent of any rice export tax imposed. The value of $\hat{\gamma}$ for selected values of b_{21} and c_{31} are given in Table 8 below:

Table 8. Value of $\hat{\gamma}$ for selected values of b_{21} and c_{31} *

$b_{21} \backslash c_{31}$	-1.0	-0.8	-0.6	-0.4	-0.2	0.00	+0.2	+0.4	+0.6	+0.8	+1.0
-1.0	-0.024	-	-	-	-	-0.024	-	-	-	-	-0.024
-0.8	-0.019	-	-	-	-	-0.018	-	-	-	-	-0.019
-0.6	-0.005	-	-	-	-	-0.005	-	-	-	-	-0.005
-0.4	-2.748	-	-	-	-	+0.120	-	-	-	-	-2.758
-0.2	-0.059	-	-	-	-	-0.088	-	-	-	-	-0.059
0.0	-0.078	-0.07	-0.07	-0.06	-0.06	-0.058	-0.06	-0.05	-0.05	-0.05	-0.047
+0.2	-0.06	-0.06	-0.06	-0.05	-0.05	-0.050	-0.05	-0.05	-0.04	-0.04	-0.042
+0.4	-0.039	-	-	-	-	-0.046	-	-	-	-	-0.039
+0.6	-0.038	-	-	-	-	-0.044	-	-	-	-	-0.038
+0.8	-0.037	-	-	-	-	-0.043	-	-	-	-	-0.037
+1.0	-0.048	-0.05	-0.05	-0.04	-0.04	-0.042	-0.04	-0.04	-0.04	-0.04	-0.036

* Only selected value of b_{21} and c_{31} has been calculated.

Two points of importance are brought out by examination of the results in Table 8. First, it is possible that, under certain selling conditions, the imposition of an export tax would lead to an increase in price of rice at the farm level. This occurs when $b_{21} = -0.4$ and $c_{31} = 0.00$, then the change in farm price is +0.120 of the rice export tax; when b_{21} is between -0.4 to -0.6 with $c_{31} = 0.00$, the export tax shows some increase in farm price of rice. If b_{21} and c_{31} are not between the range mentioned here, the rice export tax will cause a decline in farm price (Table 8).

Secondly, and perhaps more importantly, if both b_{21} and c_{31} are positive (costs of selling rice increase as the volume sold increases), the farmer will pay part of the tax in the form of a decline in the farm price which he receives. The share which he pays, however, declines as either/or both b_{21} or c_{31} increases, the other remaining constant. If one is willing to accept constant or increasing costs in rice marketing as characterizing the Thai rice markets, one can conclude that, based on the empirical analysis reported above, the farm price of rice in Thailand has not been depressed by more than six percent of any rice premium levied on the exporters.

Who Does Pay the Tax?

The Thai farmer pays the tax in the form of a decline in farm price not more than six percent of the rice export tax; the remaining 94%, foreign buyer pays in the form of higher prices for Thai rice.

Who Gets the Benefit from the Tax?

The domestic consumer gets the benefit from the rice export tax in the form of the low price of rice in domestic market. If the value of $b_{21} = 0$, the domestic consumer benefits by the same amount that the Thai farmer loses to the government of Thailand.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The main objective of this thesis has been directed toward an effort to determine whether or not the rice export tax depresses the farm price of rice, and by so doing, affects rice production in Thailand. By constructing an economic model of the retail, farm, and export market for the rice crop of Thailand, it has been found that at the market equilibrium condition, the price of rice in the domestic market and the price of rice in the export market are the same. The rice export tax was placed within the framework of this model, and it was found that any change in export prices is reflected in a change in farm prices. Dr. Edward's econometric analysis of the Thai rice market shows that the farmer will pay a part of the rice export tax in the form of a decline in farm price.

The following conclusions represent empirical estimates of the price elasticity of demand in both domestic and export markets, and of total farm supply as:

- 1) Price elasticity of demand in the export market is -0.268 .
- 2) The elasticity of demand for Thai rice in the world market with respect to the change in the supply of other countries (excluding Thailand) is -3.864 .
- 3) Price elasticity of demand for Thai rice in the world market with respect to the changes in the world population is $+ 3.864$.
- 4) Price elasticity of domestic demand is -0.911 .
- 5) Income elasti-

city of domestic demand is +0.421. 6) Price elasticity of the total supply in the farm market is + 0.509.

Analysis shows that the farm price of rice in Thailand is depressed by not more than six percent of any rice premium levied on the exporter. The foreign buyer pays 94 percent of the rice export tax. The percentage of the rice export tax to the actual government revenue was 7.34 percent in 1966. This amounted to 900 million baht. Using the percentage figure of the econometric analysis, the farmer pays 54 million baht of this amount. (Table 9)

It may be argued, at this point, that this amount of rice premium that the farmer pays is relatively small in proportion to the total government revenue, but it should be noted that the Thai farmer income is so low (by modern agricultural standards) that any decline in farm price will affect rice production for two reasons. One, the farmer lacks incentive to expand production because his depressed income cannot be stretched to include savings and further investment in his land. His lack of reserve funds brings in to being a second reason for depressed production. The farmer's lack of capital is supplied by middlemen or money lenders who hold a mortgage on the rice producer's future crop. This kind of private investment does not promote increased production because any profit that the small rice farmer might expect to make from a bigger crop is not large enough (due to depressed farm price) to allow him to become independent of such entrepreneurial activity. Thus, the rice farmer is caught in the kind of

Table 9 Government Revenues: Government Revenue from Rice Export Tax, Estimated Incidence of Rice Export Tax and Farmer's Shares of Rice Export Tax, Thailand. 1955-1966.(Million Baht)

Year	Actual Revenue	Revenue from Rice Export Tax	Farmer Paid	Foreign Buyer Paid	% Rice Export Tax to the Actual Revenue
1955	4,185	411	24.66	386.34	9.82
1956	5,081	842	50.52	791.48	16.57
1957	5,199	840	50.40	789.6	16.16
1958	5,616	812	48.72	763.28	14.46
1959	6,055	756	45.36	710.64	12.49
1960	6,786	745	44.70	700.30	10.98
1961	5,690	690	41.40	648.60	12.13
1962	7,986	804	48.24	755.76	10.07
1963	8,587	750	47.88	750.12	9.29
1964	9,589	1,090	65.40	1,024.60	11.36
1965	10,470	800	48.00	752.00	7.64
1966	12,126	900	54.00	846.00	7.34

Source: Food and Agricultural Organization of United Nations, Statistical Yearbook, 1955-1966.

of economic cycle that, in the author's opinion, is not conducive to increased rice production.

It might be reasonable to conclude that direct withdrawal of the rice export tax would raise the farm price. There is no guarantee, however, that this action would result in immediate increased production. It is highly probable that the money lender or middlemen would profit by the slight margin of gain; more importantly, the stabilizing mechanism for keeping domestic prices from rising would be lost, thereby instigating an inflationary price spiral that would harm the total economy. The government also would lose the revenue from foreign buyers.

To protect the domestic economy of both consumer and producer, this author feels that if the rice export tax is removed, it should be done gradually, and only as a consequence of greatly increased rice production. To help the rice farmers, who represent 76.4 percent of the nation's population, accomplish greatly increased production, the only agency that is capable of bringing about this shift is, of course, the Thai government. The government is already performing the important services of research, education, and investment in infrastructure. This author feels that if the government would complete its task by investing the revenue from the rice premium (through the media of the Agricultural Extension Service Center) in small individual farm loans, that this would retire private

investors to seek entrepreneurial activities in other economic sector. Giving the farmer small long term loans with a low rate of interest and, at the same time, dispensing sound agricultural methodology, the Thai government, through its agricultural extension agency could stimulate increased production by awarding bonuses for record-breaking rice crops. Agricultural centers for rice production could give the government vital information on areas that need modern scientific agricultural usages, and also on the local needs for feeder roads to facilitate transportation of crops.

Diversification to upland crops could be stimulated by a government guarantee of a subsistence rice allotment to the farmer, in the event that poor marketing conditions might leave him destitute. In these regions, rigid forestry regulations should halt the deforestation of the vital water-shed of Thailand.

The direct involvement of the government with the indebtedness of individual rice farmers need not be of long duration, for with increased crop productivity and increased world and domestic demand, the loans would be retired as farmer income reached the necessary level for savings and investment. The rice premium and quota system could be dispensed with, for they would no longer be needed; greatly increased rice production would obviate their raison d'être. The healthy balance of Thailand's export and import trade would more than offset the loss of 7.34 percent of its revenue. Better still, the author feels that the initial stimulus of the funds from the

rice export tax will accomplish the structural shift from an underdeveloped, single-crop, farming economy to a healthy, modern, and diversified agricultural economy.

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Appendix Table 1. Rice Production (Paddy and Milled) in Thailand
and the World. 1947-1965

Year	Rice (Paddy) Production Thailand (1,000 quintal)	Rice (Paddy) Production World (1,000 quintal)	Milled* Rice Export (1,000 Metric tons)	Total Export (Excl. Main- land China) (1,000 Metric tons)
1947	5,506	145,200	385.4	2,800
1948	6,835	154,700	811.7	3,850
1949	6,683	153,000	1,215.2	4,100
1950	6,782	150,900	1,508.2	4,250
1951	7,325	152,200	1,612.1	5,000
1952	6,602	161,000	1,413.0	5,000
1953	8,239	170,100	1,342.0	4,400
1954	5,709	188,500	1,001.5	4,616
1955	7,712	199,100	1,236.5	4,861
1956	8,297	215,800	1,263.7	5,605
1957	5,665	211,000	1,570.2	5,649
1958	7,050	226,900	1,143.0	5,035
1959	7,256	227,400	1,091.6	4,976
1960	7,789	239,800	1,202.7	5,519
1961	8,177	245,400	1,575.9	5,817
1962	9,259	248,600	1,266	5,342
1963	10,168	257,500	1,418	6,111
1964	9,640	266,800	1,898	6,379

* Conventional factor from paddy to milled rice is 0.65

Source: F.A.O. Production Yearbook, 1947-1964.

Appendix Table 2. Price rice in the Farm Market, Retail Market,
and Export Market (1947-1963)

Year	Farm Price (Paddy) Baht/kg	Retail Price (Milled) Baht/kg	Export Price (White 5%) Baht/kg
1947	0.793	1.46	3.94
1948	0.796	1.24	3.62
1949	0.753	1.20	3.48
1950	0.745	1.20	2.78
1951	0.787	1.32	2.90
1952	0.872	1.60	3.62
1953	0.799	1.63	4.66
1954	0.705	1.53	3.56
1955	0.817	1.57	2.96
1956	0.935	1.62	2.86
1957	0.947	1.58	2.94
1958	1.095	1.56	3.13
1959	0.939	1.64	2.82
1960	0.901	1.65	2.63
1961	0.977	1.80	2.89
1962	1.147	1.87	3.16
1963	1.008	2.05	2.97

Source: Food and Agriculture Organization of the United Nations.
Statistical yearbook 1947-1963.

Appendix Table 3. Estimate National Income (Million Baht) and
a Cost of Living Index (Clerical Worker and
Civil Servants). 1947-1963

Year	National Income (Y_t)	Cost of Living Index (Clerical Worker and Civil Servants) I_t (1958 = 100) ^t
1947	14,407	74
1948	16,678	74
1949	20,064	71
1950	23,377	59
1951	24,746	65
1952	29,353	73
1953	28,637	81
1954	31,654	80
1955	34,828	84
1956	36,457	89
1957	36,533	94
1958	38,289	100
1959	41,902	95
1960	47,680	94
1961	50,319	101
1962	54,564	105
1963	56,551	105

Source: National Office, Office of the Prime Minister, Thailand:
Statistical Yearbook, Thailand. 1947-1963.