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**THE FERTILIZER SITUATION IN THAILAND--WITH EMPHASIS ON
THE ECONOMICS OF FERTILIZER USE**

**A Paper Prepared by the FAO/FIAC Ad Hoc Working
Party on Economics of Fertilizer Use**

February 1974

The Fertilizer Situation in Thailand

Summary

With 80%-85% of the population living in rural areas, agriculture in Thailand is characterized by a preponderance of small farm units.

Eighty-five percent of all farms have less than 30 rai (6.25 rai = 1 hectare) and the average size farm in Thailand is 15 rai. With such a limited resource base, it is difficult to effect any significant gains in per capita income especially with increasing population.

Thai farmers produced large gains in farm output during the past decade. However, most of the increase resulted from expansion of new lands planted rather than from increased unit output. Yields of major food crops such as rice and maize have shown only moderate increases even with available high yielding varieties, agricultural inputs, and new technology.

Economic incentives and returns to Thai farmers have not been favorable for expansion of the basic food crops. The high cost of inputs, especially fertilizer relative to commodity prices, have discouraged their use by the small farmer. The government's rice policy (rice premium) has in effect encouraged a cheap food policy. However, this policy has insulated the domestic rice market from the world market; hence, the Thai rice farmer has been unable to benefit from the current high world rice prices.

In past years, the government's fertilizer policy of banning nitrogen imports forced Thai fertilizer prices to the highest level in Asia. Although the ban on nitrogen imports has been lifted, the current high world market prices and short supply situation is having a serious impact on fertilizer availability and prices in Thailand.

As a result of poor fertilizer price/crop price relationships, fertilizer use per hectare in Thailand is one of the lowest in Asia.

However, agronomic and economic research has indicated that effective fertilizer use can still be a bargain for Thai farmers even with the close margins.

Thailand's farmers are faced with the general problems common to most developing countries--credit, distribution, low value-cost ratios, low rates of fertilizer use, lack of incentives, preponderance of subsistence farmers, etc. In spite of these problems, Thailand has the potential to be one of the most agriculturally productive nations in Asia. However, for such developments to happen, Thai farmers must resort to more and better use of all agricultural inputs including fertilizer.

Background

The Thailand economy is relatively stable with a growth rate of about 7% annually since 1960. Per capita income during the 1960's grew by about 5%/year. Growth in the economy was achieved with little inflationary pressure. The country was able to build a comfortable foreign exchange reserve and created a stable currency which proved to be an attraction for foreign investors. The economy is relatively free of controls and relies largely upon private rather than public enterprise. The government is interested in industrialization and has been receptive to prospective private foreign investment.

Performance of the total economy is impressive as compared to the targets set in the development plans. The first 6-year plan came to an end in 1966, having attained or surpassed most of its targets by the end of 1965. During the plan period, per capita income increased about 25% despite an 18% increase in population. For the second-plan

period (1966-71), a growth rate of 8.5% annually was set as the target. While in 1967 the gross national product (GNP) rose by only 5.6% as a result of poor rice crops, 1968 and 1969 were favorable years with GNP (in real terms) rising to 9.0% and 9.6% respectively. In 1970, however, GNP rose by 7.5%, down about 2% from the previous year's record (1).

An important aspect of Thai economy is the uneven distribution of the nation's wealth. Per capita income in the northeast region is only about one-third of that in the central Chao Phraya valley. The difference in per capita income between the center and north and south respectively are less marked but still substantial.

Population and Employment

The 1970 census showed a population of 34.15 million, compared with 26.26 million in 1960, indicating a growth rate of 3.3% per annum. The estimated total labor force as of 1968 is about 15.4 million; the agriculture sector accounts for the largest part. Recent estimations indicate that nearly 75% of the labor force is employed in agriculture, 14.1% in trade and services, and 7.6% in mining and manufacturing. The pattern of distribution shows a continuous change with employment in agriculture steadily declining.

The agriculture sector is characterized by a preponderance of subsistence-type farm units with some 80%-85% of the people living in rural areas. Approximately 50% of all farms are less than 15 rai with unit size averaging around 7 rai. With such a limited resource base, it is unlikely that per capita incomes will show any appreciable increase without significant developments in farm efficiency and productivity (tables A1 and A2).

Trade Situation

Thailand is one of the largest rice exporting countries of the world, exporting between 1.5 and 2.1 million metric tons (mt)/year. Of the total export in 1965-68, rice accounted for 31%, rubber 13%, and tin 11%. In 1970, this composition was changed with rice accounting for only 20% and maize export rising to 11% of the total commodity exports. Total rice exports in 1973 are expected to total less than 1.0 million mt compared with 2.1 million in 1972. Together with five other major exports--tapioca products, kenaf, shrimps, tobacco leaves, and teak--these export items accounted for 75% of all merchandise exports. The slow growth of some major exports such as rice and rubber and the rapid growth of new crops such as maize and kenaf over the last few years resulted in a more diversified export pattern (tables A3 and A4).

Imports have shown a strong upward trend. However, it was the slow growth of exports that was responsible for the deterioration of the balance of payments in recent years.

The National Budget

The government spending increased substantially from 1960, and the proportion of total expenditure attributable to the development plan has risen to 44% of the total in 1968-69 or 29% if education is excluded. Highest priority in the development budget was placed on transport and agriculture, including construction of infrastructure such as irrigation. The decreasing proportion going to industry indicates the emphasis placed on free enterprise by the government. The total government spending envisaged in the third development plan period (1972-76) is about twice the expenditure of the second plan period, with the expansion of exports as one of the top priorities.

Future Economic Outlook

Thailand will probably continue to realize modest growth in GNP in the next few years. This should be assisted to a large extent by provision of additional loans from international lending institutions at least within the third plan. There will probably be a rapid rate of expansion and rehabilitation of irrigation systems which will be necessary for increasing agricultural output, particularly export crops. In spite of the improvement of the export sector, an increase in imports is expected resulting in maintaining the existing trade deficit. In view of the decreasing U.S. military activity in the country, which in previous years earned a large amount of foreign exchange for Thailand, the payments situation should prove to be critical to expansion of the economy.

The Agricultural Sector

The productive capacity of the Thai economy is greatly influenced by the performance of agriculture, with rice as the major crop. However, agriculture's share of the GNP declined to some 24% in 1970 compared with 30% in 1965. Within the agricultural sector, the growth of livestock and forestry remained low, but fisheries increased significantly. However, the three subsectors constitute only about 30% of the agricultural value added. Crop production, which grew by 9% in current prices since the early 1960's is, therefore, the most important agricultural subsector. Performance of some of the major agricultural exports, particularly rice, rubber and kenaf have been inconsistent over the past decade.

Climate and Soil

The climate of Thailand is characterized by the presence of a warm, wet summer monsoon lasting from May to November and is followed

by a relatively cool and dry northeast monsoon. The country can be subdivided into four regions--Central, Northwest, Northeast, and South (figure 1).

Central Region--Central Thailand, drained by the important Chao Phraya River, is the geographic and economic center of the country. It is the main rice-producing area. Soil condition is predominantly dark, heavy clay. The annual average rainfall is between 1,200 and 2,000 millimeters (mm).

Northwest Region--In this mountainous, forested region, crop production is limited to the fertile valleys of Chao Phraya tributaries. Teak and other valuable woods come mostly from this area. The northern alluvial soil favors the cultivation of rice, tobacco, groundnuts, soybeans and fruit trees. Double-cropping of rice is commonly practiced in this area as irrigation water is more readily available. The average annual rainfall is between 800 and 1,200 mm.

Northeast Region--Farming is difficult in the rolling terrain of the region because of soil and water problems. Soil is mostly of fine, sandy loam type with low nutrient content. The region is flooded during monsoon season and very dry during summertime. The annual rainfall is between 800 and 1,200 mm.

South Region--The area is characterized by the presence of several coastal plains and mountain ranges. There are several delta areas suitable for rice cultivation. Saline soil exists in the northern part of the region and poor sandy loam soil is evident in the southern part. Rubber and coconut are the significant crops grown in the region. This area gets the highest average annual rainfall, about 2,000 to 4,000 mm.

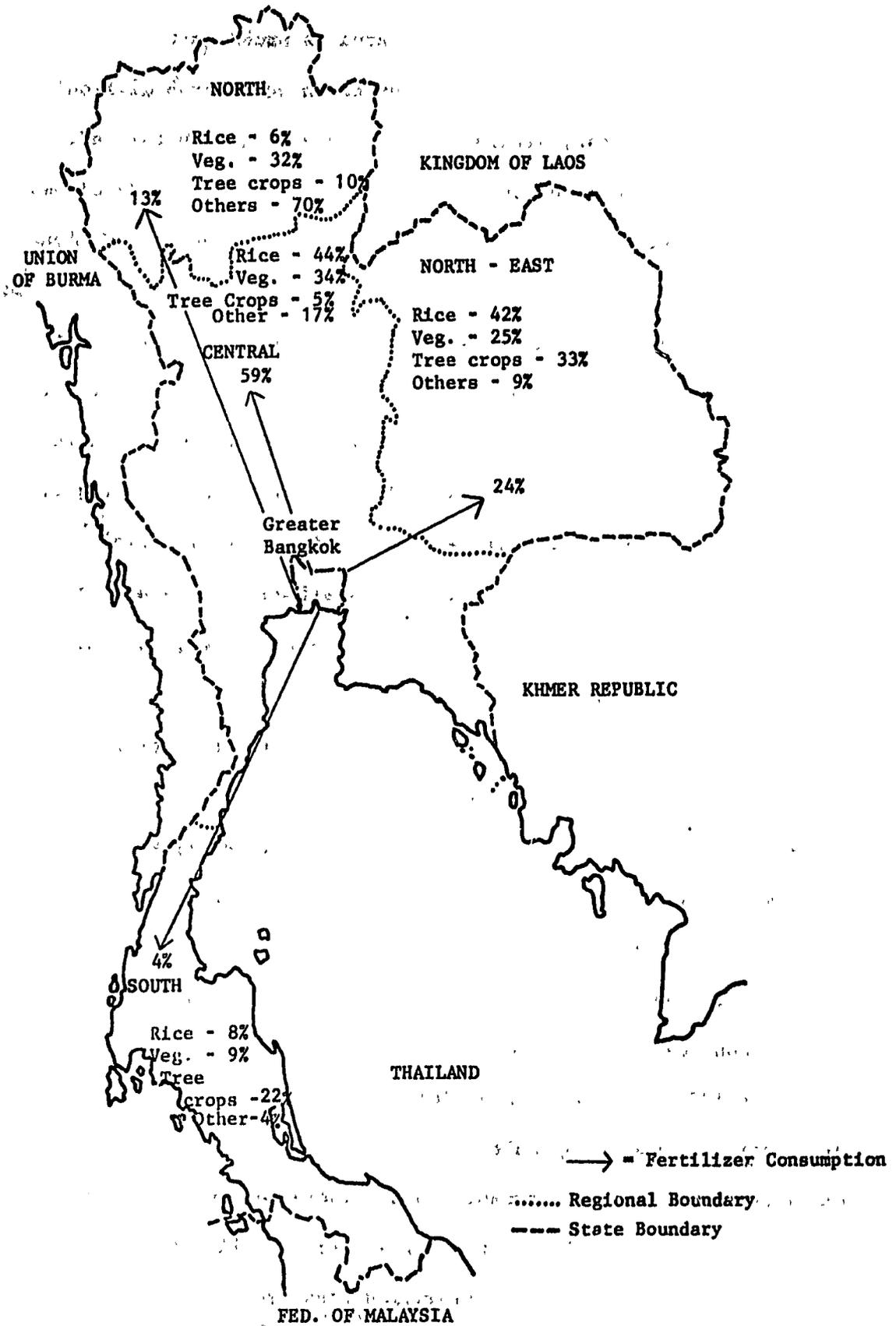


Figure 1. Regional Percentage Distribution of Crops and Fertilizer Consumption in Thailand, 1970

Crop Production

About 25% of the total land area is under cultivation. Although rice is estimated to have been grown on about 8 million hectares (ha), Thai agriculture is still relatively diversified. There is a large amount of agricultural land which can be developed for crop production. The Thai's have shown a remarkable tradition of migration and the amount of new land that has been opened up in this manner has far exceeded the area developed through the government's land development scheme. The potential for increasing productivity appears to be good and increasing emphasis is likely to be placed on this during the coming years. Table A5 gives a summary of projected crop productivity for the third agricultural plan (1972-1976). Although crop production is becoming diversified, yields are still quite low. Some improvement in yields is taking place, but they vary considerably from year to year (table A6).

Rice--Rice continues to be the most important crop and gets the most attention from the government. A number of major irrigation projects in the rice areas are being undertaken, partly with IBRD and USAID financial assistance. The spread of the new high-yielding varieties and increasing application of inputs, although in limited degree at present, is expected to continue. Productivity of the rice crop is considered low, especially when it is considered that rice yields in 1972 were lower than yields in 1907. This is due to areas of poorer land now being cultivated plus little increase in yield from excellent rice producing areas. Future increases must come from better use of land already cultivated. Current rice yields are reported to be about 1,600 kilograms (kg) of milled rice per hectare. Research

at The International Rice Research Institute (IRRI) in The Philippines has produced yields of milled rice nearly three times the 1972 Thailand average. Thailand must increase production of rice in order to maintain its position as a world rice exporter and to feed a rapidly growing population.

Maize--Maize has become a major export crop. Production has risen from a negligible amount in the mid-1950's to well over 1.5 million mt/year in 1970. It is estimated that maize production for 1971-72 is over the 2 million mt level, reflecting the expansion in the area cultivated after last year's good corn prices in the export market and low return on rice production. The increasing demand for export to Japan, and to a lesser extent Taiwan, has been the major factor behind the rapid growth in maize production. At present, however, the market in Japan is weakened due to competition from U.S. suppliers, particularly after the recent freight reduction. The Japanese government is also reported to be urging animal feed manufacturers to use surplus rice instead of maize.

Rubber--Rubber is grown on small holdings in the South Region. It is an important export crop; Thailand is the world's third largest exporter of rubber. However, productivity of existing trees is low and processing capacity of factories limited.

Kenaf--Kenaf's performance during the last 5 years is not very encouraging. Low production and uncertain export market contributed to the decline in the export earnings from this crop. However, the next few years should provide excellent export market for Thai kenaf as a result of the destruction and deterioration of jute and kenaf plantations and mills in Pakistan.

Cassava--Production of cassava is estimated to reach 3 million mt in 1977, up from 2.6 million mt in 1970-71. Cassava is grown primarily

as an export crop. Production is concentrated in two southern provinces-- Chon Buri and Rayong, but some is grown throughout the country. Products showed some improvement with the volume of export indicating increases. However, most producers are having trouble in meeting new export quality controls for pellets which were set by the government. The controls were established in view of efforts at quality improvement by two important competitors--Indonesia and Brazil--and the likelihood of the imposition of strict quality regulations by the European Economic Community (EEC) (3).

Sorghum--Sorghum is another crop of increasing importance. Like maize, its use is mainly as a feed ingredient and its cultivation is largely confined to newly opened land.

Coconut--Coconut is one of the very important products of Thailand. It gives not only oil for cooking and industrial uses but also meat for food as well. Most of the Thai curries and desserts require either coconut meat or milk as their major ingredients. So far, local production has not been sufficient to meet local demand. Therefore, Thailand has to import about 300-400 mt/year of coconut. Production reached its peak in 1956 and 1957, and has leveled off since then. The government does not seem to have any plan for coconut self-sufficiency in the near future.

Tobacco--Tobacco production is chiefly centered in the North and Northeast provinces. Most of the tobacco is of low nicotine content (1%) and appears to have considerable potential as an export crop. The Government Tobacco Monopoly controls the production of this crop and the manufacture of tobacco products. Under the guidance of this government agency, production increased threefold between 1950 and 1969. Indigenous demand accounts for about 90% of the annual production, and consequently only 10% is able to be exported.

Soybean--Soybean production increased only slightly between 1950 and 1965. Since 1965 production has increased rather rapidly. The 1969 and 1970 production was 61,000 and 65,000 mt, respectively. Most of its production is consumed locally; only about 5,000 mt/year is exported. As far as local consumption is concerned, soybeans are made into bean curd, soy sauce, soybean milk, oil or bean cake for animal feeds. An increasing demand for soybean, both for export and for local use, is the main factor which attracts more land into soybean cultivation. Most soybeans planted are of local varieties, and the size of the beans is relatively small compared with U.S. beans. The percentage share of soybeans in total agricultural crop production has stayed at less than 1% since 1950. For the past 20 years, its share hardly increased at all, even though its production volume increased fivefold.

Cotton--Cotton is another crop in which production is rather static. Thailand's annual demand for cotton is about 170,000 mt, out of which about 60,000 mt is met by local production and the rest by raw cotton and cotton cloth imports. Production increased 3.7 times or about 8.4%/year between 1950 and 1970.

Vegetables and Fruits--Vegetables and fruits other than cassava are primarily grown for domestic consumption. Commercial vegetable growing is rapidly increasing. Its production is concentrated in the Bangkok and Chiang Mai areas near the population centers. Due to strong demand, prices are usually firm. Generally, growers believe that most vegetable crops have a benefit/cost ratio in the range to 5:1 to 6:1.

Fertilizer Supply

Only about 15% of the total fertilizer consumption is produced domestically. This production is primarily nitrogen products--urea and ammonium sulfate--manufactured at the Mae Moh facility near Lampang in the

north. While the plant has a rated capacity of 54,000 mt of N, this capacity has never been fully achieved. In 1971, the plant produced an estimated 9,000 mt of urea and 18,000 mt of ammonium sulfate. Estimates for 1972 and 1973 indicate that the plant is producing even less material than 1971 and management is reported to be importing fertilizer. The government, acting to protect the local industry, banned nitrogen imports in 1969. However, the government in 1972 acting through CHEMFERCO (Chemical Fertilizer Company) lifted the ban and is again importing nitrogen.

A review of import statistics shows that during the period 1960-70 fertilizer imports into Thailand increased from 10,000 mt of material to approximately 250,000 mt in 1970. The rapid growth of imported tonnage was accompanied by significant changes in types of fertilizer. In 1971, the mixed fertilizers were the source of approximately 78% of all N, P₂O₅, and K₂O imported. Straight nitrogen products accounted for 19%, P₂O₅ materials 1%, and K₂O materials 2%. The most common grades of fertilizer available in Thailand are 16-20-0, ammonium sulfate (20% N), urea (46% N), potassium chloride (60% K₂O) and a host of complex fertilizers (N, P₂O₅, K₂O). Table 1 illustrates the most common fertilizers sold by crop in Thailand.

Table 1. Selected Fertilizers Commonly Marketed
by Crop in Thailand, 1971

<u>Fertilizer and analysis</u>	<u>By crop</u>
1. 16-20-0	Rice
2. Ammonium sulfate (21% N)	Rice
3. 13-13-21	Fruit tree, water rube
4. Urea (46% N)	Rice and other crops
5. 20-20-0	Rice
6. 14-14-14	Vegetable, fruit tree
7. 15-15-15	Cotton, cassava, fruit tree
8. 13-13-20	Vegetable, tobacco
9. 12-12-19	Fruit tree, coconut, tobacco
10. 12-12-17 + 2mg	Fruit tree, coconut, tobacco

The major suppliers are Japan, Europe, and the United States. Approximately 160 importers--foreign and national--are involved in bringing fertilizer into Thailand.

Consumption and Utilization

During the last 10 years, fertilizer consumption patterns have undergone significant change. Total fertilizer material consumption increased sixfold during the period 1960-70 while nutrient consumption increased over eight times. Nutrient consumption in 1971 showed a decline from 1970. Total nutrient use in 1972 was estimated at about 98,000 mt with nitrogen accounting for 40,000 mt, P_2O_5 43,000 mt, and K_2O 15,000 mt (figure 2). Even with the decade of increases, use per hectare is still very low (8 kg/ha) especially considering that there was a steady increase in land area opened for crop production. Like any country where agriculture is the most important sector of the economy, the farmers of Thailand, in general, have knowledge of the benefits derived from fertilizer application. However, it is estimated that only about 50% of the farmers familiar with fertilizers do, in fact, use fertilizer.

Crop Consumption

Recent studies have estimated fertilizer use according to the various Thai cropping patterns (4, 5). While these studies differ in their estimates of percentage distribution of nutrients used on crops in the various regions, they do follow the same general use pattern. Of the total fertilizer consumption in 1970-71, about 33%-50% was used on rice, 33% on tree crops, 25% on vegetables, and the rest on field crops (maize, cassava, cotton, tobacco, soybeans, etc.). It is believed

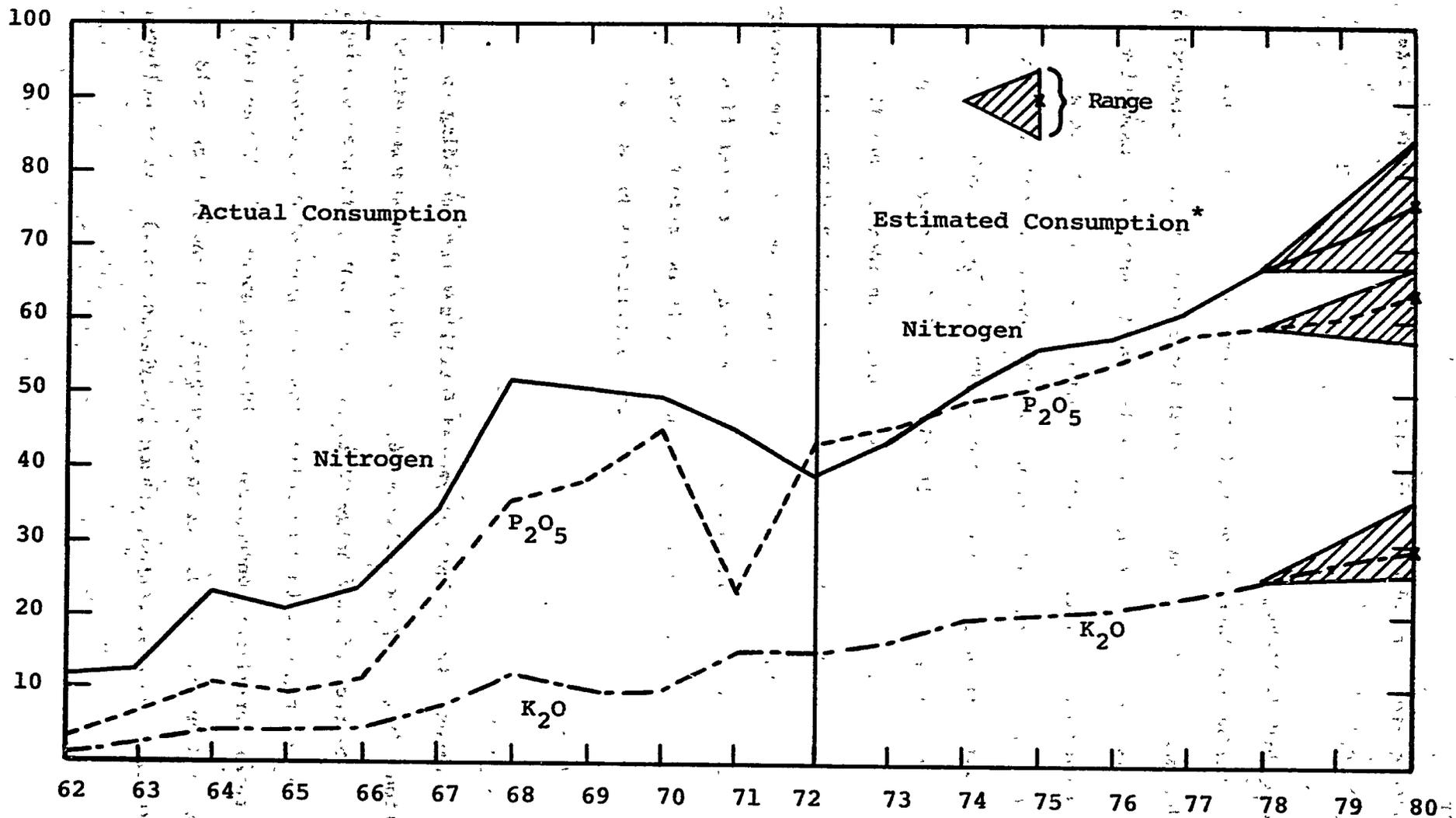


Figure 2. Fertilizer Consumption in Thailand 1962-72 With Estimates to 1980

*TVA estimates

that a high percentage of the vegetable crops are fertilized (80%-90%). Only about 20%-30% of the rice crop is fertilized while less than 10% of the maize hectareage receives fertilizers.

Data in table 2 indicate the nutrient consumption per hectare for 1968-70. These data clearly indicate the concentration of fertilizer application on high-value crops such as vegetables. The volatile rice market of the past few years has had its effect on fertilizer use on rice. This decline in fertilizer use on rice was responsible for the decline in total nutrient consumption in 1970-71. Although maize has become a major foreign exchange earner, only a small percentage of the maize is being fertilized. This can partially be explained by the fact that most maize is grown on newly opened land; thus, soil fertility can still support two crops of maize on a legume crop per year. However, continuous cropping with maize without manuring will quickly deplete soil fertility since maize is known to be a "high feeder" crop. Other factors contributing to the low fertilizer use on maize is that Thailand is in a surplus maize situation and the price of maize is about 0.8 baht/kg (20.8 baht = \$1) while nitrogen costs about 10 baht/kg (pre-1973-74 prices). Thus, there is little economic incentive for farmers to fertilize maize.

Table 2. Consumption of N, P₂O₅, K₂O in Thailand
by Major Crop Groups, 1968-1970 (4)

<u>Crop</u>	<u>Hectares</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
		. . . kg/ha . . .		
Rice	7,637,000	7.1	6.4	4.0
Vegetables	351,000	49.5	60.0	84.8
Tree crops	2,854,000	7.0	10.1	15.1
Others	588,000	19.4	20.5	14.5
Total	11,400,000	9.1	9.8	10.0

Regional Consumption

Geographically, nearly 36% of all fertilizer is sold in the Central Region (some studies estimate as high as 46%), 30% in the Northeast, 22% in the Northwest, and 11% in the South (table 3). The Central Region accounts for about 44% of the rice, 34% of vegetables, 35% of tree crops, and 17% of all other crops (table 4). The Northeast is an important agricultural region with 42% of the rice, 33% of the tree crops, and 25% of all vegetables. The North is an important vegetable and field crop growing area especially sugarcane and tobacco.

Table 3. Regional Fertilizer Consumption
in Thailand (%) 1968-71 (4)

<u>Region</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971^a</u>
Northwest	20.4	20.8	20.8	22.2
Northeast	32.9	32.2	31.2	31.1
Central	36.9	36.3	35.6	35.9
South	9.8	10.7	12.4	10.8

^aBased on private information.

Table 4. Regional Distribution of Main Crops
in Thailand 1968 (%) (4)

<u>Crop</u>	<u>Northwest</u>	<u>Northeast</u>	<u>Central</u>	<u>South</u>
Rice	6	42	44	8
Vegetable	32	25	34	9
Tree crops ^a	10	33	35	22
Others ^b	70	9	17	4

^aFruit trees, rubber (coconut negligible in fertilizer consumption).

^bCotton, cassava, sugarcane, tobacco.

Fertilizer Marketing and Distribution

Nearly 70% of all fertilizer in Thailand is distributed through private regional or village dealers and about 10% through private factories such as sugar and rice mills. The public sector, which is composed of

government agencies and cooperative associations controlled or supervised by the government, serves as the distribution channel for about 20% of the total fertilizer sold.

Nearly all fertilizer sold in Thailand has its origin in Bangkok. Small amounts come through ports of Kantang and Phu Ket with still smaller quantities brought over the southern border by train. This is primarily "rubber fertilizer" imported from Malaysia.

The imported fertilizer moves almost exclusively by truck while the production from the Mae Moh plant moves by rail. Some rail transportation is also used in the upper Central Region where there is not yet good direct highway connections. It is estimated that nearly 70% of all fertilizer movement is by truck, 24% by rail, and 7% by water.

Generally, rail transportation is cheaper than truck. Two types of truck transportation are available--the government monopoly, express transport organizations (ETO) and private companies. Only government consigned fertilizer shipments are moved by ETO due to the excessive freight rate charged by the firm.

All fertilizer is sold in bags (jute, plastic), usually 45 kg and 50 kg bags. However, smaller quantities are sold at numerous locations throughout Thailand. Some distributors sell exclusively in amounts of 10 kg, 3-kg, and even 0.5 kg. Usually, the smaller bags command a higher price per kilogram. In some instances, the smaller bags of fertilizer may cost a third to one-half more per kilogram than the larger bags. This will vary by analysis.

Brand names play an important part in fertilizer distribution. Distributors can be recognized by such brand names as "flying tiger," "flying dragon," "lion," "helicopter," and many others. These brands are widely distributed throughout the country and obviously are an

important part of advertising and promotion for the dealers. For a more detailed description and analysis of fertilizer marketing in Thailand, please refer to "Fertilizer Marketing Systems in Thailand," FAO, 1972 (6).

Fertilizer-Crop Yield Relationships

As already alluded to earlier, fertilizer use per hectare in Thailand is extremely low. When compared with other Southeast Asian countries, Thailand has one of the lowest rates of fertilizer use per hectare in the area (table 5). In 1971-72, Thailand used about 8 kg of nutrients per hectare, or 2.5 kg of N, P₂O₅, K₂O per capita.

Table 5. Fertilizer Consumption Per Hectare and Per Capita for Selected Asian Countries, 1971-72 (7)

<u>Country</u>	<u>N</u>	<u>P₂O₅</u>	<u>K₂O</u>	<u>Total</u>	<u>Kg/capita</u>
	kg/ha ^a				
Japan	161	122	107	390	20
China	30	8	1	39	6
Korea	150	69	40	259	18
Vietnam	32	12	5	47	7
Ceylon	22	5	15	43	7
West Malaysia	25	9	25	59	18
Philippines	11	5	3	19	0.2
Indonesia	11	1	0.3	12.3	1.8
Thailand	3	4	1	8	2.5
Burma	2	1	1	4	2

^aArable land.

Carrying the regional comparisons a little further, figure 3 illustrates fertilizer use-yield relationships in selected neighboring countries to Thailand. The effect of fertilizer use on rice yields is obvious although the yield relationships in Ceylon and Malaysia tend to fall out of the yield pattern. This suggests that response of rice to fertilizer does not become significant until application exceeds 100 kg/ha. Of course, this assertion is only an opinion and would need to be further substantiated with research evidence.

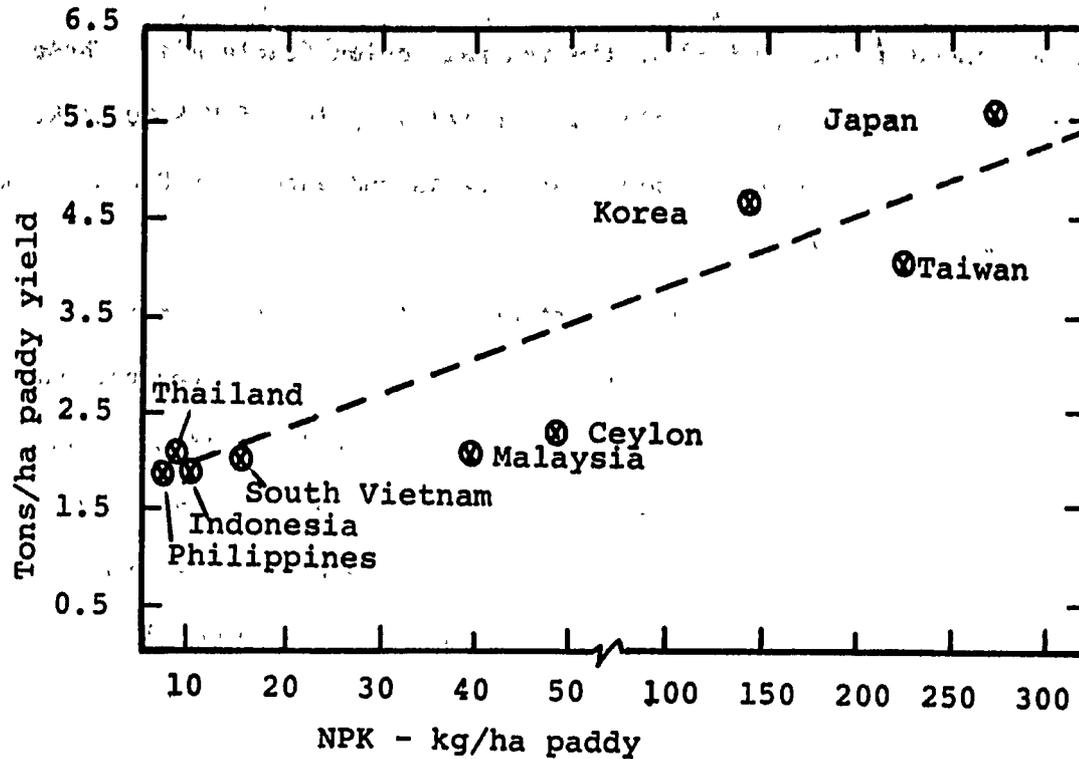


Figure 3. Fertilizer-Paddy Rice Yield Relationships in Selected Asian Countries, 1969/70

From the results of hundreds of fertilizer trials, it is known that judicious application of fertilizers will lead to increased crop yields on Thailand farms (5). Unfortunately, only limited information is available on the relationship between actual fertilizer use and yield level on crops other than rice. Nearly all information published thus far refers to application rates for all crops and not for specific crops. This may lead to misinterpretations, particularly when evaluating fertilizer-yield relationship on fertilized crops.

Extensive agronomic-economic research on fertilizer rice yields has been conducted in Thailand since 1958 (8, 9). The experimental results have clearly indicated that traditional and new varieties are quite responsive to nitrogen. Economic studies of fertilizer use on large pilot demonstrations in different rice-growing regions indicated a

maximum return per hectare to fertilizer was in the range of U.S.\$24.35 in the Northeast to U.S.\$48.10 in the Central Region (table A8). These net return values are based on the semisubsidized price of U.S.\$0.10/kg of 16-20-0 when the prevailing price of rice is guaranteed at U.S.\$0.05/kg (1972 price levels) of rough rice.

Between 1964-1970, the Department of Agricultural Extension conducted numerous field trials comparing rice yields using conventional farm practices (CFP) with yields obtained on large pilot demonstrations (LPD). The yield increase on the LPD over the CFP ranged from 990 kg/ha in 1964 to 1,074 kg/ha in 1966 (table A9). The highest net return to fertilizer during the period was U.S.\$48 in 1967. Since 1967 the net return declined each year and was U.S.\$30/ha in 1970. At the same time, the CFP yields increased from 1,889 kg/ha to 2,262 kg/ha in 1970. This is a reflection of the unfavorable fertilizer-rice price ratio which existed during this period.

Fertilizer Price-Crop Price Relationships

The high cost of fertilizer relative to prices farmers receive for their products is frequently mentioned as the most important obstacle to improving crop yields and incomes of Thai farmers. Of course, a favorable product-fertilizer price relationship is a necessary incentive regardless of how accomplished. If market imperfections are such that the product-fertilizer price ratio is not favorable to the farmer, then government action will probably be necessary.

Product-fertilizer price relationships for selected crops can be estimated from table A10. In 1972 nitrogen was priced at about 10 baht/kg (urea), P_2O_5 at about 8 baht/kg (superphosphate), and K_2O about 4 baht/kg (muriate of potash). Therefore, rice and maize growers

in 1972 had to pay the equivalent of 12 kg of product for 1 kg of nitrogen; in 1968 the ratio was approximately 6:1 or about one-half. The fertilizer-crop price relationship for vegetables, tobacco, and rubber is considerably more favorable.

Further discussion of rice prices indicate that domestic price trends after June 1973 are not reliable as indicators of the "real" price developments in Thailand. As a result of higher world rice prices, Thailand's rice producers' prices will average substantially above 1972 (table A12). However, relative to world prices, the Thai prices are low. By comparison, U.S. rice producers in 1973 received a return for their paddy in excess of three times the returns to Thai producers.

Price variations in Thailand can be influential in evaluating fertilizer-crop price relationships, especially among regions. Figures 4, 5, and 6 illustrate the average 1971 monthly price movement for maize, sorghum, and soybeans in Thailand. The price range reflects regional prices for the respective months. Table A11 presents data which also show the effect of fertilizer prices on profit-cost ratios for rice, maize, and cassava in different regions and soil fertility levels.

Credit

Since 1966 the Bank for Agriculture and Agricultural Cooperatives (BAAC) has administered the farm credit program in Thailand. The rural credit system is composed of private, commercial and institutional structures. The private and commercial lenders operate within the "free capital market" and extend credit on an arbitrary noninstitutional basis. This category usually includes private moneylenders, shopkeepers, millowners, neighbors and friends or family members. The institutional

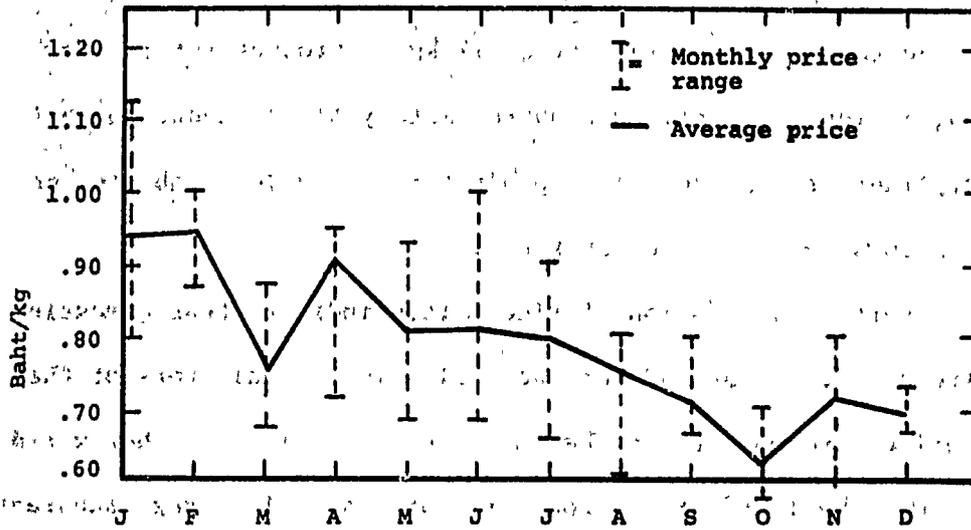


Figure 4. Average Monthly Movement of Prices Paid to Farmers for Maize, Thailand, 1971

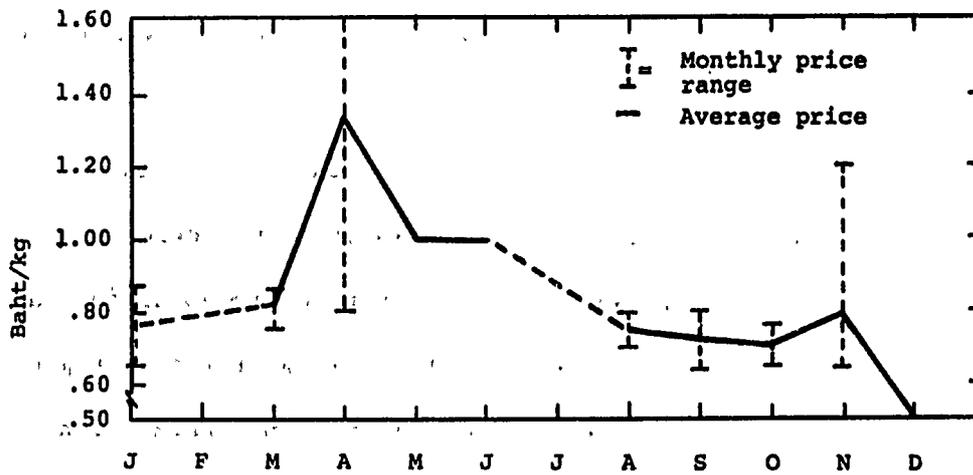


Figure 5. Average Monthly Movement of Prices Paid to Farmers for Sorghum, Thailand, 1971

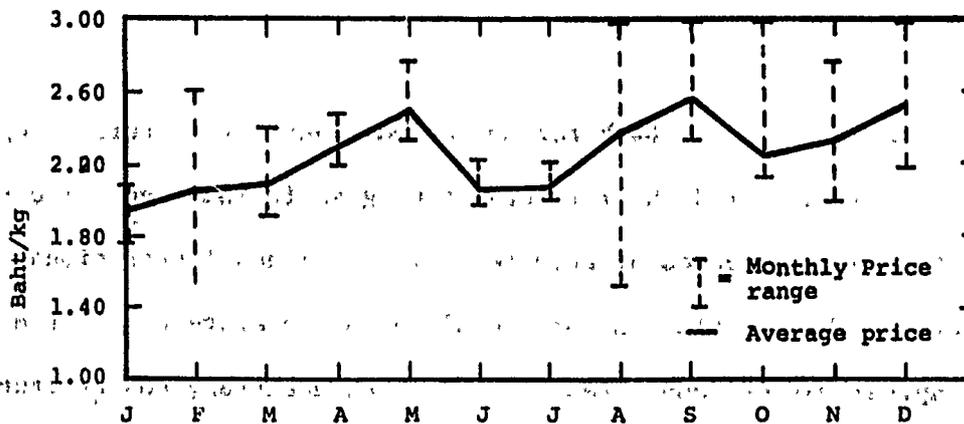


Figure 6. Average Monthly Movement of Prices Paid to Farmers for Soybeans, Thailand, 1971

credit system includes lenders who are legally organized in the form of a bank, corporation, association, or cooperative.

Various studies on use of credit in Thailand have shown that 40%-60% of all rural credit is used for farm production purposes (12, 13, 14). However, these same studies indicate that nearly 50% of Thailand subsistence farmers have never borrowed money and feel that credit is unnecessary.

Approximately 50% of all rural credit in Thailand originates with relatives and neighbors (table A13). Another 40% is provided through the commercial system primarily via local store owners and crop buyers. Institutional lending accounts for the remaining 5%-10%. In 1970 institutional credit affected only 7% of Thailand's 4.3 million farm families (15). Of the institutional credit available by the BAAC, short-term loans (less than 18 months) for farm production expenses are the most important. Loans to rice producers account for nearly 50% of all production loans (table A14). However, loans for other commodities (maize, sugarcane, tobacco, etc.) are increasing in importance.

A USAID study of small farmer credit (16) has concluded that the major problem of small farmers in Thailand is the limited opportunity for maintaining and/or improving their personal and material well being. It has also been concluded that production credit is the key to triggering and sustaining small farmer development through an improved institutional credit program more responsive to the needs of small farmers.

Factors Affecting Fertilizer Use in Thailand

In Thailand as in most developing countries, there are numerous factors which can inhibit or enhance fertilizer consumption, hence, affect crop production opportunities. These factors may be physical, technical,

sociocultural, economic, as well as political. The following is a brief discussion of some of these factors. Much of the following discussion is abstracted from various printed materials relative to fertilizer use in Thailand (8, 9, 10).

Soil Fertility--Soils with poor natural fertility usually produce low crop yields. In Thailand, the Northeast Region soils are the lowest in fertility. Lowland rice and upland crops grown in the Northeast have lower yields than crops grown in the North, Central, and South Regions. The soils in the Northeast Region are generally sandy loams derived from sedimentary formations. However, it is of interest to note that these soils require a mere minimum amount of fertilizer in order to double or triple crop yields. Soils in the North and South Regions are also generally sandy; but because of a good water supply, crop yields are usually higher than in the Northeast Region. The soils in the Central Region are mostly clays.

Climate--Climate is not much different within the North, Northeast, and Central Regions. The annual rainfall is about 1,800 to 2,200 mm. However, the Northeast Region suffers an unequal rainfall distribution and frequency more than the Central and North Regions. The South Region has a rainfall of 3,000 to 4,000 mm per annum. Temperature is about the same in all four regions except during the winter months when the North Region has a lower average.

Technical Problems--Increases in crop production are due to a combination of factors--more and better use of fertilizers; improved varieties capable of higher yield; weed, pests and disease control; and improved water management practices. Fertilizer use per hectare in Thailand is very low when compared to the other Asian developing countries.

The small fertilizer application is not sufficient for optimum crop yields. Such practices as topdressing of nitrogen and deep placement of fertilizers are not widely used due to poor water management and to some extent to mechanical equipment problems.

Little attention is given to the care and maintenance of rice fields or upland crops especially for broadcast rice and, in some cases, transplanted rice. Poor weed control after fertilization results in low yields. Research on chemical weed control in Thailand has shown encouraging results; however, hand weeding is the primary control method used by farmers. Some herbicides are recommended as economically beneficial for weed control but the Thai farmer lacks adequate supplies and sufficient knowledge to use them properly.

Disease and pest are two major problems in crop production in Thailand. Several diseases have caused serious damage to rice as well as other crops. Control measures are available for farmers. The measures are somewhat successful; however, serious crop damage has been observed along with reduction in yields due to improper use.

Water management practices are extremely important to crop production in Thailand. Thai farmers are still in the elementary stage of successful rainfed farming.

Economic Problems--Most of the fertilizer supply is imported. The Mae Moh fertilizer factory supplies ammonium sulfate and urea. However, in Bangkok there are distributors which sell fertilizers recommended by the government. Fertilizers are difficult to transport to farmers because of the lack of fertilizer distribution centers. Most of the fertilizers available are ammophos (16-20-0), ammonium sulfate (20% N), superphosphate (20% P_2O_5), potassium chloride (60% K_2O).

and urea (46% N). Mixed fertilizers (N, P₂O₅, K₂O) are also available at various grades. These are generally either in granulated, crystal, or ground forms. Practically all mixed fertilizers are granular.

Lack of credit is one of the most important factors limiting the amount of fertilizer use. From a UNDP study, it was found that 42% of farmers who buy fertilizer on credit received their loan from fertilizer dealers who charge 40%-60% annual interest even though the government has provided credit for fertilizer since 1966. The credit is financed through Farmers Clubs, People Irrigation Association, and the Land Co-operative Society amounting to 41,367,390 baht in 1970. However, this amount is still below the credit needs for farmers.

Sociocultural Problems--As a whole, there seems to be no special sociocultural problems for the farmers in using fertilizers. However, there is a general attitude of nonacceptance if farmers are not able to see or observe the actual effect of fertilizers. "Seeing is believing" seems to be the maxim for educated as well as uneducated farmers. Some farmers use fertilizer in very small amounts, that is, if he has not seen and/or executed the use of fertilizer. After all, a farmer's crop is the mainstay of his life and family.

Within the last decade, government agencies in charge of improving crop yields conducted various types of fertilizer demonstrations for the sole purpose of allowing farmers to perform the work along with agricultural extension officers in order to let them see and believe.

Government Fertilizer Policy--A national fertilizer policy has been undertaken by the Ministry of Agriculture in cooperation with the International Bank for Reconstruction and Development. Several fertilizer studies have been conducted over the past few years (TVA, IBRD, etc.).

The overall objective of these studies were to provide well supported information, data, and recommendation which will assist the government in defining the role of fertilizers in agriculture and the most efficient and economical means of implementing the program recommended. These recommendations dealt with consumption, current fertilizer application, distribution, marketing, current price and cost, factors affecting fertilizer consumption trends and projection of consumption, etc. To this date, there has been no visible action taken as a result of past studies.

As mentioned previously, all fertilizer prices in Thailand depend upon an open market price for imported as well as locally produced fertilizers. There is yet no government regulation controlling the marketing, sales price, and distribution of fertilizers to farmers. However, it seems that the large pilot demonstration on rice formerly sponsored by the Rice Department and at present by the Department of Agricultural Extension has given some guidelines in fertilizer pricing, subsidies, and distribution.

At present, the quality control and inspection of fertilizer is undertaken by the special committee appointed by the government for the imported fertilizers used in large demonstration project. This committee is also responsible for regulation on bidding, kind, plant nutrients analysis according to grades required as well as inspection and distribution. There is no official fertilizer law on quality control and inspection.

However, under the present increasing use of chemical fertilizer, there is an urgent need to help farmers in using the right quality and quantity of fertilizer. Hence, a technical committee has been appointed

by the government since 1971 to consider regulation of industrial production and fertilizer quality in formulation of a fertilizer law in Thailand.

Fertilizer Promotion

Esxtension--The use of fertilizer, pest and disease control, as well as cultivation practices is being promoted on major crops such as rice, corn, soybean, cotton and kenaf throughout the kingdom by demonstration administered by the Department of Agricultural Extension. The agricultural extension has been done by group contact in different fields such as seminar, lecture, demonstration, display, yield competitions, slide, group discussion, study tour, and field days which are occasionally arranged by extension officials. The relevant matters in agriculture are transmitted to Farmers Club, Agricultural Club, People Irrigation Associations, and Land Cooperatives. Amphoe or district extension officials usually visit the farmer as the individual contact. However, the mass contacts are also given to the farmer by publications, newsletters, and broadcasting as well as mobile unit training.

Training--Technology of fertilizer use, as well as pest and disease control and other relevant matters in agriculture is provided for provincial or district extension officials as in-service training. The preservice training in agricultural extension and technology is also given to newly admitted officials. In addition, members of 4-H clubs as well as farmers are included in training programs.

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Table A1. Population, Rural and Urban Classification, 1960 and 1970^a

Region	1960		1970	
	Urban	Rural	Urban	Rural
Central ^b	9	91	26	74
Northeast ^c	4	96	12	88
North ^d	5	95	15	85
South ^e	11	89	20	80
Kingdom	7	93	17	83

^a Urban based on municipal areas and sanitary districts. Balance considered rural estimates based on change for changwats reported for the 1970 Census.

^b Based on 14 of 26 changwats.

^c Based on 9 of 15 changwats.

^d Based on 8 of 16 changwats.

^e Based on 12 of 14 changwats.

Source: Census of Agriculture, 1963.

Table A2. Thailand Farms by Size, Census Data for 1963

<u>Size grouping</u>	<u>Number of farms 1,000</u>	<u>Percent distribution</u>	<u>Area in farms 1,000 rai</u>	<u>Average size of farms Rai</u>
<u>Whole Kingdom</u>				
Under 15 rai	1,539.7	47.9	10,840.4	7.0
15 - 29.9 rai	1,196.8	37.2	28,962.8	24.2
30 - 59.9 rai	303.5	9.5	14,391.8	47.4
60 and over	174.4	5.4	15,487.5	28.8
Total	3,214.4	100.0	69,682.5	21.7
<u>Central Plain</u>				
Under 15 rai	273.2	37.9	1,818.2	6.7
15 - 29.9 rai	201.9	27.9	4,309.7	21.3
30 - 59.9 rai	183.2	29.3	7,471.6	40.8
60 and over	64.6	8.9	5,781.3	89.5
Total	722.9	100.0	19,380.8	26.8

Source: Census of Agriculture, 1963.

Table A3. Foreign Trade (Baht million)

	<u>1969</u>	<u>1970</u>	<u>% change</u>
Exports	14,722	14,492	- 2
Rice	2,940	2,525	- 14
Rubber	2,663	2,235	- 16
Corn	1,660	1,908	+ 14
Tin	1,631	1,618	- 1
Imports	25,824	26,161	+ 1
Deficit	11,102	11,669	+ 5

Table A4. Exports of Farm Products, Averages 1959-61 and 1969-71

<u>Commodity & group</u>	<u>Average 1959-61</u>	<u>Average 1969-71</u>	
		<u>Total</u>	<u>Percentage change from 1959-61</u>
	. .1,000 tons . .		
<u>Food crops</u>			
Rice	1,290	1,221	-5
Maize	440	1,551	252
Cassava	330	1,141	246
Sugar	65	218	235
Other upland	32	399	1,147
Dillseed crops	82	114	39
Garden vegetables & fruits	12	17	42
Miscellaneous	18	19	6
Total food crops	2,269	4,680	106
<u>Nonfood crops</u>			
Kenaf & jute	81	262	223
Kapok & other	12	21	75
Tobacco	16	11	-31
Rubber	176	287	63
Total nonfood	205	581	104
Total exports	2,554	5,261	106

Table A5. Projection of Major Farm Products for the Third Agricultural Plan (1972-1976) (2)

<u>Crops</u>	<u>1971</u>	<u>1976 (Projected)</u>
 1,000 mt	
Rice	13,369	15,570
Rubber	309	397
Coconuts ¹	443	710
Sugarcane	5,212	6,047
Maize	2,200	3,500
Sorghum	128	171
Groundnut	210	400
Mung bean	280	280
Castor beans	44	55
Soybean	100	300
Tapioca	4,593	6,260
Tobacco	102	148
Cotton	90	200
Kenaf, Jute and Ramie	390	540
Kapok	410	500
Sesame	26	48
Vegetable and others	4,701	5,503

¹1,000,000 nut

Source: Accelerated Agricultural Development Project Ministry of Agriculture. Bangkok, Thailand, December 1971 (mimeo copy in Thailand).

Table A6. Area Production and Yield for Major Crops in Thailand (11)

	<u>1948-1952</u>	<u>1961-1965</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Maize</u>							
Area	34	422	674	692	614	749	750F
Production	31	816	1,242	1,331	1,700	1,950	1,900F
Yield	9.1	19.3	18.4	19.2	27.7	26.0	25.3F
<u>Paddy Rice</u>							
Area	5,211	6,394F	6,100F	6,500F	6,935	6,727	6,730F
Production	6,846	11,267	11,198	12,410	13,410	13,270	13,270
Yield	13.1	17.6F	18.4F	19.1F	19.3	19.7	19.7F
<u>All Cereals</u>							
Area	5,245	6,825	6,794	7,221	7,584	7,526	7,530
Production	6,877	12,102	12,481	13,798	15,180	15,340	15,270
<u>Sugarcane</u>							
Area	57	135	123	124	146F	157F	171F
Production	990	4,282	3,829	4,526	5,846	6,741	7,700F
Yield	175	318	310	365	400F	429F	450F
<u>Cassava</u>							
Area	14	113	129	124	130F	130F	130F
Production	269	1,783	1,892	1,774	1,896	1,932	1,969
Yield	188	158	147	143	146F	149F	152F

Area = 1000 hectares
 Production = 1000 metric tons
 Yield = 1000 kg/hectare

No table A7.

Table A8. Average Yield Cost of Fertilizer Input and Net Return from Results of the Large Pilot Demonstrations (LPD) in Thailand, 1966

Region	Highest yield average fertilizer	Average of fertilizer plot ¹	Average of non-fertilizer plot	Increase (kg)	Value ²	Fertilizer cost ³	Net return
 yield kg/ha ⁴ US\$/ha		
North	5,337.50	3,956.25	2,931.25	1,025	51.25	9.40	41.85
Northeast	3,581.25	1,918.75	1,243.75	675	32.75	9.40	24.35
Central	4,118.75	2,906.25	1,612.50	1,350	67.50	9.40	48.10

¹16-2-0 applied at 94 kg/ha.

²Government guarantee prices at \$0.05/kg of rough rice.

³Based upon the semi-subsidized price of \$0.10/kg of 16-20-0.

⁴Photo-sensitive-indica rice varieties.

Source: Soil Fertility Research on Rice Fertilization in Thailand, pp. 14-15, Rice Department, Bangkok, Thailand, 1971.

Table A9. Average Rice Yield, Yield Increase, and Profit Obtained from Large Pilot Demonstration (LPD) and Conventional Farm Practices (CFP) in Thailand, 1964-1970

<u>Year</u>	<u>No. of province</u>	<u>No. of plot</u>	<u>No. of family</u>	<u>Area (ha)</u>	<u>Grain yield (kg/ha)</u>		<u>Increased yield kg/ha</u>	<u>%</u>	<u>Net profit US\$</u>
					<u>LPD</u>	<u>CFP</u>			
1964	3	4	91	185	3,844	2,854	990	34	19
1965	15	53	1,607	2,534	2,250	1,250	1,000	80	37
1966	45	102	3,465	6,640	2,934	1,861	1,074	57	40
1967	63	160	5,464	10,719	3,006	1,889	1,117	59	48
1968	66	168	5,442	10,388	3,087	1,979	1,108	66	37
1969	68	197	5,914	11,078	3,130	2,019	1,021	48	42
1970	68	205	6,176	11,323	3,184	2,262	922	40	30

Source: Summary results of large pilot demonstration, 1971. Crop Promotion Division, Department of Agricultural Extension.

Table A10. Prices Paid to Farmers for Selected Crops in Thailand, 1967-1970

<u>Product</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
 baht/kg			
Rice	1.20	1.10	0.95	0.80
Maize	0.80	0.72	0.80	0.81
Cassava	0.47	0.33	0.68	0.47
Sorghum	0.89	0.86	0.86	0.83
Soybean	2.44	2.67	2.42	2.24
Tobacco	13.28	13.47	11.58	15.42
Rubber	5.06	5.45	6.94	5.67
Onions	6.05	4.64	6.38	5.16
Garlic	12.66	7.42	6.67	5.90

Note: 1 kg nitrogen = 10 baht
 1 kg P₂O₅ = 8 baht
 1 kg K₂O = 4 baht
 U.S.\$1.00 = 20.4 baht

Table A11. Effect of Lower Fertilizer Prices on Profit/Cost Ratios for Rice, Maize and Cassava, Thailand, 1971

Fertilizer price	Region			
	North	Central	Northeast	South
	<u>Rice¹</u>			
฿ 1.8/kg	0.9:1	0.9:1	0.8:1	2.4:1
฿ 1.5/kg	1.2:1	1.2:1	1.2:1	3.0:1
	<u>Maize²</u>			
	<u>Rainfed Upland Soils</u>			
	<u>High Fertility</u>	<u>Moderate Fertility</u>	<u>Low Fertility</u>	<u>Irrigated Upland Soils</u>
฿ 2.0/kg	0.6:1	0.6:1	0.6:1	1.3:1
฿ 1.5/kg	1.1:1	1.1:1	1.1:1	2.1:1
	<u>Cassava³</u>			
	<u>Rainfed Upland Soils</u>			
		<u>Moderate Fertility</u>	<u>Low Fertility</u>	
฿ 2.1/kg		0.2:1	1.3:1	
฿ 1.5/kg		0.5:1	1.9:1	

¹ Price received by farmers for rice ฿ 0.8/kg.

² Price received by farmers for maize ฿ 1.0/kg.

³ Price received by farmers for cassava ฿ 292/ton of root.

Source: Agricultural Sector Survey, Thailand volume 1. The General Report May 1, 1972.

Table A12. Domestic Rice Price Trends: Paddy price and Paddy-to-wholesale price spreads, nonglutinous white rice, 5% broken and Paddy No. 1, by months, 1971 to 1973

Month	Paddy wholesale, Bangkok 1/				Price margin, Paddy-to-wholesale 3/		
	1971	1972	1973	Percentage change 1972 to 1973:	1971	1972	1973
	฿/ton	฿/ton	฿/ton	Percent	฿/ton	฿/ton	฿/ton
January	976	971	1,420	46.2	583	544	940
February	882	914	1,535	67.9	460	562	1,068
March	834	955	1,539	61.1	511	553	1,160
April	825	960	1,568	63.3	525	521	1,193
May	893	1,005	1,754	74.5	687	549	1,234
June	978	1,081	1,925	78.1	667	532	1,299
July	982	1,098	1,807		688	539	1,340
August	995	1,309	1,400 2/		705	746	1,100
September	1,051	1,325	1,400 2/		733	710	1,100
October	1,043	1,393	1,400 2/		696	783	1,100
November	999	1,517	1,900		669	823	1,138
December	940	1,563			614	908	
Average	950	1,170			628	648	

1/ Bank of Thailand and Ministry of Commerce.

2/ Support level.

3/ Margin between wholesale price milled rice and price of Paddy.

TABLE A13. Origin of General Credit to Farmers (in per cent of total)

Type of Lender ^{1/}	Thisyamondol Study 1962/63	Bangkok Bank Study 1965	Ubon Study 1965/66	Peters Study 1966
Relatives	39.9	} 35-40	} 39.0	} 57.0
Neighbours, friends	15.7			
<u>Commercial lenders</u>	36.5		11.0	
- Local store	16.5	10.0		23.0
- Other store	7			9.0
- Crop buyer	8.6			
- Landlord	2.1			
- Moneylender	5.4			
- Others	3.9	0.5	3.0	
<u>Institutional lenders</u>	7.9			11.0
- Cooperative	7.5	50.0	45.0	
- Other government agency	0.4			
- Banks	-		2.0	
Total	100.0	100.0	100.0	100.0

Source: UNDP Agricultural Credit Study (9).

^{1/} "Farmer credit" has been of great interest to scholars and experts and there are a number of studies but only a few of them are based on original data. Results were compared, but it has turned out that substantial differences in the findings have arisen through rather obvious reasons: 1. Conditions have changed during the course of time, i.e. results of the 1930s cannot be compared with those of the early or late 1960s. 2. The area (sample) chosen for a survey is of great importance; the Northeast is different from the Central Plain and a rice-growing area is different from a maize-growing area. 3. The time of the year in which a survey is conducted is also very important; during springtime, when the harvest has been sold and debts paid back, results will be absolutely different from those obtained in late autumn when many farmers are still in debt. Thus, many of the results just cannot be compared. See, if not otherwise quoted, the following studies: C.C. Zimmerman, Siam, Rural Economic Survey 1930-1931. Bangkok Times 1931. - J.M. Andrews, Siam, 2nd Rural Economic Survey 1934-1935. Bangkok Times 1935. - Bangkok Bank, Monthly Review, February 1966, p. 39. - All quoted by Charles W. Peters, Agricultural Credit and Marketing in Northeast Thailand. Bangkok, AID/USOM 1966.

Table A14. BAAC Short-Term Loans By Product Classification

	1967		1968		1969		1970		1971		TOTAL	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
1. Rice	1,589,624	55.16	5,393,391	57.80	10,879,047	59.47	12,100,374	60.21	8,345,785	47.76	38,308,423	56.27
2. Maize	412,023	14.30	1,131,832	12.13	1,628,929	8.90	1,935,009	9.63	2,291,314	13.11	7,399,110	10.67
3. Cotton	145,826	5.06	492,639	5.28	555,513	3.04	231,218	1.15	183,599	1.05	1,608,797	2.36
4. Tapioca	149,186	5.18	280,278	3.00	378,181	2.07	483,514	2.41	610,794	3.50	1,902,868	2.79
5. Other upland crops (e.g., kenaf, sugar-cane, pea, tobacco, etc.)	325,283	11.29	775,224	8.31	2,034,769	11.12	1,980,040	9.85	2,229,157	13.16	7,418,033	10.69
6. Market Live-stock (swine, cow and buffalo)	166,067	5.76	633,126	6.78	1,894,916	10.36	2,443,389	12.16	2,463,969	14.10	7,601,469	11.17
7. Tree crops (e.g., durian, rambutan, etc.)	49,427	1.71	410,975	4.40	533,828	2.92	390,172	1.94	554,857	3.17	1,939,260	2.85
8. Poultry and egg production	40,152	1.39	170,561	1.83	274,045	1.50	370,405	1.84	624,527	3.57	1,479,691	2.17
9. Cow-milk production	-	-	20,153	0.22	40,523	0.22	43,042	0.21	19,126	0.11	122,845	0.18
10. Other types of production (fish rearing, sea-fishing, and sericulture)	4,280	0.15	23,147	0.25	74,052	0.40	120,084	0.61	81,660	0.47	303,225	0.45
Total	2,882,071	100.00	9,331,329	100.00	18,293,808	100.00	20,097,251	100.00	17,474,791	100.00	68,079,252	100.00

Source: BAAC Yearly Reports