

PN-AAK-006

TRENDS IN RTG AGRICULTURAL POLICIES

by

Phiphit Suphaphiphat

A Report Prepared for USAID/Thailand

Thai University Research Association : Report No. 2

November 1979 Bangkok, Thailand.

P.O. B-9247-355

## Table of Contents

	Page
Abbreviation	
Introduction	
I. Fertilizer	3
II. Seed	10
III. Water Resources	14
IV. Labor	19
V. Mechanization	22
VI. Pesticide	25
VII. Credit	28
VIII. Output Pricing Policies	31
IX. Concluding Remarks	34
 Annex I. Statistical Tables	 35
<u>Table</u>	
1. Total Fertilizer Consumption in Thailand, 1960 - 1977	35
2. Distribution of Fertilizer Consumption by Regions	36
3. Rate of Fertilizer Utilization in Selected Countries	37
4. Prices of Fertilizer in Thailand, 1965 - 1973	38
5. Comparison of Fertilizer Prices in Thailand and in Some Asian Countries, 1971	39
6. Total Seed Requirements for Six Crops (1974) and Projected Seed Production by 6 <sup>th</sup> Year of the Seed Development Project	40

7. Wet Season Irrigation Areas by Regions	41
8. Dry Season Irrigation Areas	42
9. Wet Season Irrigation Areas as Percentage of Cultivated Areas by Regions	43
10. Imports of Pesticides, 1972 - 1976	44
11. Pesticides Consumption by Crops, 1977	45
Annex II. Footnotes	46
BIBLIOGRAPHY	53
	64

## Abbreviation

ARD Office of Accelerated Rural Development

BAAC Bank for Agriculture and Agricultural Co-operative

BOT Bank of Thailand

BOI Board of Investment

DA Department of Agriculture

DOAE Department of Agricultural Extension

DLD Department of Land Development

DOLA Department of Local Administration

EGAT Electricity Generating Authority of Thailand

NEA National Energy Authority

MOAC Ministry of Agriculture and Cooperatives

MOF Marketing Organization for Farmers

RIID Royal Irrigation Department

RIG Royal Thai Government

## Introduction

There has been a growing awareness among economists and policy makers that economic development in Thailand cannot be achieved without an effective means of raising the income and the well-being of the people in the agricultural sector. Despite the satisfactory growth of agricultural output through the expansion of land over the last twenty years, the average income of a farmer today is still far below that of a person in other occupations. The disparity of incomes within the agricultural sector on a region-wise basis has not yet been improved. The average income of a Northeastern farmer still ranks behind that of farmers in other regions of the country with over one-third of its total population living below the poverty line.<sup>1</sup>

In view of the limited availability of land and the steadily increasing population, it is inevitable that a future increase in agricultural production of the country can be achieved only by improvement in productivity and increased intensive utilization of resources employed in the production process. To achieve this objective, new and greater quantities of inputs are needed. However, the growth of agricultural output through increased use of input is greatly influenced by prices of both outputs and inputs. Furthermore, prices of outputs are key determinants of the farmers' gross income, whereas prices of inputs are directly related to the costs of production. Thus the prices of output and inputs not only play a vital role in resource allocation but also have a direct impact on the farmers' net

income. Policies regarding agricultural prices should therefore, be formulated in such a manner that they encourage increased agricultural output, and hence improve the incomes and well-being of the people in the farm sector.

This paper attempts to review existing literature and data pertaining to RTG policies on agricultural pricing as well as the provision of important inputs for farmers. This documentary research is not intended to be exhaustive. Rather, it will place greater emphasis on the input policies and their impact on small farmers. Attention will be given to each of the major inputs, that is fertilizer, seeds, water resources, labor, mechanization, pesticide and credit. A brief discussion on output pricing policies will then presented.

## I. Fertilizer

Even though both organic fertilizer and chemical fertilizer are used in Thailand, the use of organic fertilizer is negligible. The discussion of fertilizer in this paper, therefore, will concentrate on the utilization of chemical fertilizer.

Chemical fertilizer is considered one of the major inputs contributing significantly to higher yields thereby assuming an important role in the success of intensive farming. Thai farmers first began to use chemical fertilizer after World War II. However, fertilizer was not widely used, and the country's total consumption of fertilizer was insignificant. However, over the period 1960 - 1977, fertilizer utilization in Thailand increased markedly, it rose from about 52,000 tons in 1960 to approximately 625,000 tons in 1977, a dramatic twelve-fold increase in 18 years, with an average annual growth rate of 18 percent (Table 1). It is expected that the demand for fertilizer in Thailand will continue to grow steadily. Fertilizer consumption is estimated to be around 773,000 - 823,000 tons in 1981 <sup>2</sup> and 940,000 - 1,190,000 tons in 1985. <sup>3</sup>

Most of the chemical fertilizer used by farmers at present is a mixture (N.P.K.), which is available in various formulas. The use of nitrogen fertilizer is of secondary importance and potash and phosphate fertilizers are used in relatively small proportions. Rice alone accounts for over 50 percent of the country's total fertilizer consumption. The combined consumption of the other three major crops, namely, rubber, tobacco, and sugar cane, is about one-third of the total demand. As far as distribution by region is concerned,

fertilizer consumption in Thailand has been heavily concentrated in the Central Plain region. The Central region has used fertilizer more than other regions combined (Table 2).

Despite the tremendous increase in the use of fertilizer in the 1970's the present level of fertilizer utilization in Thailand still hasn't reached the recommended quantity: in its fertilizer consumption per hectare, Thailand falls below the average figure of developing countries and in fact, ranks last among ASEAN countries (Table 3).

Three factors have caused the low rate of fertilizer utilization in Thailand. The first confirmed by a survey by the British Sulphur Corporation,<sup>4</sup> is that a large number of Thai farmers have not learned of the advantages of fertilizer utilization. The second factor is the lack of complementary inputs, especially well-irrigated land and fertilizer-responsive seeds of high-yield varieties of the major farm products. It is quite obvious that the shortage of these two complementary inputs impedes a greater consumption of fertilizer. The third factor, which appears to be the most relevant and persuasive, is that the ratio of prices of fertilizer and farm outputs, high when compared to other countries, has resulted in unattractive profits when fertilizer is used. Theoretically, the demand for fertilizer varies inversely with its price but moves in the same direction as changes in the prices of farm outputs. In Thailand, it is estimated that fertilizer price elasticity is between -0.75 to -0.76, being greater (in terms of absolute value) than crop price elasticity which is about 0.58-0.65.<sup>5</sup> Thus the prices of fertilizer should exert a greater

influence than prices of farm outputs on the level of fertilizer utilization. The relatively high price of fertilizer has been one of the major factors responsible for the low rate of fertilizer utilization in Thailand.<sup>6</sup> In addition, it has been shown that the ratio of the fertilizer price to the rice price of Thailand is highest among the rice growing countries in Asia.<sup>7</sup> This shows why Thailand uses the lowest amount of fertilizer per hectare among the ASEAN countries as earlier mentioned.

Up to 1966, most fertilizer used in the country had to be imported, and the fertilizer trade was in the hands of the private sector without any government intervention. However, after the establishment of the Chemical Fertilizer Company under the support of RTG,<sup>8</sup> the fertilizer trade and utilization in the country were no longer influenced by market forces alone. There were two main justifications for setting up the country's first fertilizer plant : (1) the country would be partially self-sufficient in fertilizer; and (2) the plant could make use of the large deposits of domestic lignite. The plant uses lignite as feedstock and has a rated capacity of 100 tons of anhydrous ammonia per day, which can be converted to 60,000 tons of ammonium sulphate and 30,000 tons of urea per year. The chemical fertilizer company began operation in 1966. However, during the first three years of operation, the Company was able to produce at only 20 - 30 percent of its rated capacity, resulting in a very high unit cost of production.

The heavy loss incurred forced the Company to shut down its plant in mid-1968. The government had to step in to protect the company from liquidation by banning all nitrogen fertilizer imports. Nevertheless, after resuming operations under government protection, the Company could not increase its output to meet the increasing domestic demand. At the same time, although the Company was the sole supplier of nitrogen fertilizer in the country, it still experienced financial losses caused mainly by the inefficiency of its operations. The substantial financial support that the government gave the Company transformed the Company into a full-fledged state enterprise. Instead of following the recommendation of experts to close down the inefficient plant,<sup>9</sup> the government decided in 1971 to assist the company further. The new measure allowed the Company to monopolize all nitrogen fertilizer imports. As a consequence, prices of nitrogen fertilizer shot up and the use of mixed fertilizer in the country became popular because of its relatively lower price during the period after 1968 (Table 4 and 5). In a response to the growing demand for mixed fertilizer in the country, Chemical Fertilizer Company initiated a project to construct a mixing plant in Thailand. The proposed project materialized in 1972, when the Thai Central Chemical Company was incorporated with a registered capital of 120 million baht. The Company became a joint venture of the RTG, a private Thai firm, and in addition to receiving promotional privileges from the BOI, this new Company was also given a special right by the government to monopolize

all fertilizer imports. Fortunately, the political upheaval in October 1973 led to the formation of a new government,<sup>10</sup> which decided to withdraw all government commitments to the Thai Central Chemical Company. All government shares in the new Company were sold to a private Thai firm. The government also adopted the policy of freeing the fertilizer trade, lifted the ban on fertilizer imports, and withdraw the rights given to the Chemical Fertilizer Company and the Thai Central Chemical Company as the sole importer of fertilizer. Nevertheless the fertilizer mixing plant project of the Thai Central Chemical Company still proceeded. The plant was completed and commenced operation in January 1975 with a designed capacity of 300 tons per day. In 1976 the capacity was expanded to 120,000 tons per year. In early 1978, the Thai Central Chemical Company asked for government protection on the grounds that the domestic market was greatly affected by dumping from foreign producers. In compliance with the company's request, the Kriangsak government imposed a 20 percent surcharge in all kinds of imported fertilizer. The decision of the government on this matter was met with widespread criticism from the public. The government later ruled that the surcharge would be confined to only six categories of fertilizer instead of to all categories as originally planned. At any rate, criticism continued and the mounting pressure from the public finally forced the government to abolish the surcharge altogether in April 1978.

A detailed analysis of the RTG policies on fertilizer during the period 1960 - 1975 was made by Sompop Manarurgsan.<sup>11</sup> The analysis concludes that fertilizer policies in Thailand prior to 1973 led to the monopoly of the fertilizer trade and resulted in relatively high prices of fertilizer in the domestic market. Expansion in agricultural production was thus greatly hindered, and the resource allocations of the country were distorted.

In order to promote the use of chemical fertilizer among Thai farmers as a means to increase agricultural production, the RTG initiated a program in 1967 to acquire fertilizer by inviting bids and sell on credit to farmers at a low price through various farmer groups and organizations. The program was reorganized in 1973 and later was administered by the MOF, which was established in 1974. The amount of fertilizer purchased by the government under this program in recent years has accounted for a large share of the total domestic demand for fertilizer.<sup>12</sup>

However, the high administrative cost of selling fertilizer directly to farmers coupled with the high percentage of bad debts has given rise to heavy financial losses in the operation of the program. Though the program enables farmers to obtain fertilizer at a price lower than that prevailing in the market, the benefit of the program is not

equally distributed to all farmers. According to the present administrators of the program, most of the benefit goes to farmers who are members of established farm organizations.

During the period of the oil crisis between 1973 and 1975, the fertilizer situation in Thailand was worsened by soaring prices and the acute shortage of fertilizer. As a consequence, low quality and sub-standard fertilizer flooded the domestic market and became used so widely that the government had to intervene to protect farmers from being exploited by irresponsible merchants. The first Fertilizer Act was enacted in 1975 with the view to getting rid of the malpractices in the fertilizer trade and to set standards of quality of fertilizer marketed in the country. However, lack of capable manpower has hindered enforcement of this law.

## II. Seed

The importance of seed as an agricultural input has been overlooked. Thai farmers traditionally siphon off a portion of their harvested agricultural output, which is used as seed for the next growing season. This practice is repeated season after season. The humid sub-tropical and tropical climates of Thailand make it difficult for some field crops such as soybeans to maintain the germination quality of the seed from harvest to planting under on farm drying and storage conditions. More importantly, if farmers do not **renew** their seed stocks after a few years, the crops genetic properties--the varietal identity and purity -- cannot be maintained. The use of seed in this manner adds to higher cost per unit of production because a greater amount of seed has to be used for planting while the yield is likely to remain the same or decline. On the other hand, if processed and certified seed of good quality is used, it results in better standards, fewer weeds, and greater yield and as a consequence, lower unit cost of production and higher income for farmers. As a matter of fact, the development and distribution of improved seed is one of the most effective and economical means of increasing agricultural output.

Through government agricultural research programs have succeeded in developing better varieties of various crops, especially rice, benefits from crop improvement research have not been maximized because the improved seed has not reached the hands of farmers on a widespread basis. The lack of a good distribution system to provide an adequate and timely supply

of improved seed to farmers has been regarded as one of the obstacles hindering the growth of the country's agricultural output.<sup>13</sup> Under the RTG's Third National and Social Development Plan, emphasis was given to improving the production and supply of improved soybean seed. The DA and DOAE have been assigned responsibility to carry out this task.<sup>14</sup>

The first attempt to encourage Thai farmers to use improved seed occurred in 1972 when the RTG initiated the Seed Multiplication and Improvement Project under the leadership of the DOAE to provide high quality seed to farmers. This project was later incorporated as a part of the Thailand Seed Development Project, which was set up in 1975. The Seed Development Project was jointly financed out of the RTG budget appropriations, and loans from the U.S. Government.

The Seed Development Project, covering a period of six years, from 1976 to 1981, has been set up to produce and distribute high quality improved seeds of six major crops, namely, soybean, corn, rice, mungbean, peanuts, and sorghum. (Compare the project targets with the national requirements in table 6). Three agencies of the RTG are directly involved in the project. Foundation seed of improved varieties is produced by the DA which, in turn, hands over the seed to the DOAE. Seed multiplication is carried out by the DOAE through contract growers. Multiplied seed, if meets the established standards, is purchased from the contract farmers and delivered to DOAE seed processing centers.<sup>15</sup> After processing

and testing, the seed is then distributed to farmers by the MOF.<sup>16</sup>

During its first two years of operation, the Seed Development Project was rocked with many problems, the second-year evaluation shows that the overall achievement of the project so far has not been up to expectations. Progress fell short of the planned implementation targets in most aspects, especially in the amount of seed produced, processed, and distribution system tends to benefit high income farmers more than those whose incomes are low, as the latter cannot afford to come to the MOF distribution center in Bangkok. Knowledge of good seed has not yet reached farmers in as large a number as planned. Few farmers appreciate the value of good seed.<sup>17</sup> At any rate, the production targets, even if fully achieved, represent only a small fraction of the country's total requirement. In order to achieve a real positive impact on agricultural productivity, there should be widespread use of good quality seed by a large percentage of farmers. In this connection, private investment on seed production should be promoted. Actually, a private seed processing plant has already been established in Lopburi.<sup>18</sup> In order to protect farmers' interests, the RTG has to exercise its power to promote competition in the seed trade. At the same time, a set of laws providing for a certification program setting standards of quality of seed, along with effective enforcement, is required.

In addition, greater attention should be paid to the development of rice varieties suitable for rainfed areas, where most of the Thai rice is planted. Rice research in the past has concentrated mainly on developing improved rice varieties for irrigated areas which cannot be applied to rainfed cultivation at all.

### III. Water Resources

The expansion of irrigation areas has been regarded as one of the government's most important policy measures to boost the agricultural output of the country. Public investment in irrigation has been emphasized over the past two decades. During the fiscal year 1970 - 1977, the average annual capital outlays on irrigation amounted to 1,451 million baht, accounting for 16.39 percent of the total capital expenditures.<sup>19</sup> At present, irrigation systems provide water control in the wet season for about 2.22 million hectares and dry-season irrigation for approximately 0.53 million hectares, the total cultivated area being about 20 million hectares. However, both wet and dry season irrigation networks have concentrated in the central region of the country (Table 7 and 8). Wet season irrigation now constitutes a major portion of the total crop area in the Central, Western and Eastern regions but a much smaller portion in the Northeast (Table 9). Unfortunately the present irrigation systems have not been well distributed among different regions and the irrigated cultivation in the country is far below its potential indeed. Ironically farmers in Northeast Thailand, who have long suffered from acute water shortages than their counterparts in other regions, have reaped the least benefit from public expenditure on irrigation.

By and large, in the past water resource development in Thailand concentrated heavily on the construction of dams, reservoirs, and distribution systems. The dams and reservoirs usually are multi-purpose : to provide flood control and hydroelectric power, as well as water for

agriculture. These various-purposes can by no means be achieved without conflict. Under some circumstances, meeting the requirements of generating electricity have to be fulfilled at the expense of water for irrigation. Since all the multi-purpose dams of the country are under the supervision of EGAT, it is hypothesized that the water supply from the dams will be utilized primarily for the generation of hydroelectric power, and the provision of water for irrigated cultivation will be of secondary importance.<sup>20</sup>

In addition, during the 1980's the construction of dams and reservoirs was not accompanied by completed distribution systems. Without the necessary ditches and dikes, or village-level irrigation and drainage systems, the optimal utilization of the water supply made available by the dams and reservoirs is impossible. The government believed that all the tertiary ditches would be provided by farmers themselves. The government mistakenly assumed that the farmer had the technical, financial, and organizational capabilities to carry out the formidable task of constructing irrigation distribution facilities by themselves. The government later realized its lack of farsightedness and a new approach was adopted for irrigation development. During the period under the third National Economic and Social Development Plan, the major policy aimed at slowing down the construction of big dams and concentrating on the improvement and expansion of delivery systems.<sup>21</sup> The World Bank also recommended that the irrigation program of Thailand to be carried out in the period

1977-1990 should focus on the widespread introduction of higher standards of tertiary or on-farm development, which involves the construction of ditches and drains to insure a timely and reliable supply of water to the farmers' fields. The tertiary development should be the responsibility of the RTG, rather than of the farmers or farmer institutions.<sup>22</sup>

As far as water resource development is concerned, little attention has been given to greater utilization of existing natural water resources such as rivers and tributaries in general and underground water in particular. Furthermore, a surprising number of government agencies are involved in water resource development.<sup>23</sup> These agencies have different policy objectives and operate under different legal frameworks. The lack of coordination among these agencies has given rise to conflicts in the allocation of efforts resulting in the inefficient utilization of water resources of the country.<sup>24</sup> The Water Resources Planning Subcommittee appointed by NESDB will be in charge of outlining a comprehensive scheme and coordinating all activities regarding water resource development in order to improve the efficiency of water resource utilization. However, the success of the committee has yet to be seen.

Another major problem that besets various irrigation projects is the lack of co-operation on the part of farmers in the operation and maintenance of irrigation facilities. Farmers are expected to be responsible for not only the construction of distribution systems but the operation

and maintenance of the systems as well. Unfortunately, the performance of farmers in this respect has not been up to expectations. Farmers in the project areas have no enthusiasm; neither do they have any sense of responsibility regarding the maintenance of the distribution systems already constructed by the project. Without proper operation and maintenance the working life of all irrigation structures is at most only one-third to one-half their expected life. Therefore, farmer organizations, educational and training programs, and group action to make full use of and to maintain the irrigation systems have become the determining factor for the establishment of a successful water development project.<sup>25</sup> To overcome the operational and maintenance problems, it has been suggested that a strong sense of ownership of the irrigation facilities on the part of the farmers should be developed through their own labor and monetary contributions as well as through their participation in the initiation, selection, and planning of the projects.<sup>26</sup>

In order to meet the water requirements of farmer more effectively, there is a need to strengthen the capabilities of Changwats in planning and supervising the implementation of a large number of small-scale water projects at the village level. Water projects in every village should be initiated and implemented by using government subsidies, and farmers are required to share a portion of the burden to insure that projects are economically feasible and efficiently carried out.<sup>27</sup>

Since farmers do not have to pay for the use of irrigated water provided by the government,<sup>28</sup> it has been suggested that the free use of water may lead to the non-optimal utilization of water. Advocates of the imposition of a levy on the water users have two main arguments. The first one is that the water charge can help get rid of wasteful use of water and encourage more efficient utilization of the limited water supply. The second argument is from the stand point of equity: users who benefit from the irrigation facilities should pay for the services they receive. In addition, the proceeds can be used to expand irrigation systems further to serve more farmers.<sup>29</sup> The RTG has already decided in principle that for all new irrigation projects, all operation and maintenance costs and as much as possible investment cost will be paid directly by the beneficiaries. For example, in the Chao Phya Irrigation Improvement Project, the RTG has planned to impose a charge which would recover 90% of the cost of on-farm development excluding land-levelling, over nine years without interest.<sup>30</sup> This proposal is supported by the World Bank. The RTG has to institute a new law in regard to the collection of irrigation charges, since the existing law is inadequate for efficient enforcement. New legislation which will enable the RTG to assess, impose, and collect appropriate charges from beneficiaries of all irrigation project is now being drafted. However, it is worth noting that the collection of water charges may be a desirable measure, but is rather improbable because of practical difficulties.

#### IV. Labor

Based on the 1976 Labor Force Survey, 3.6 million or 62 per cent of the country's total labor force of 13.8 million was engaged in agricultural occupations.<sup>31</sup> Whether the employment in the agricultural sector poses a serious problem is a controversial issue in Thailand, at least insofar as the degree of its impact is concerned. On the one hand, there is the belief that a large percentage of the labor force in the agricultural sector is unemployed, especially during the dry season.<sup>32</sup> On the other hand, there is the belief that large-scale unemployment in the agricultural sector does not exist, according to many studies.<sup>33</sup> This view is also shared by the World Bank.<sup>34</sup> The problem of underemployment is not serious because of the seasonal nature of agricultural production particularly in subsistence agriculture.<sup>35</sup> A substantial percentage of farmers in Thailand, with the exception of the central region, are owner-operators. The number of hired agricultural laborers is relatively small, and they tend to concentrate mostly in the Central region of the country.<sup>36</sup>

It is agreed unanimously that the real problem of agricultural labor is its low productivity. There are many factors in the low productivity of Thai farmers. The most important ones include the lack of complementary inputs, such as water, fertilizer, credit, etc., obsolete techniques of production, knowledge on the part of farmers themselves in regard to new agricultural technology. The RTG implements its main policy of helping improve farmers' productivity through its agricultural

extension service, which is used to impart knowledge to farmers. Until very recently, the agricultural extension service was inadequate, with a ratio of extension staff to farmer of about 1 : 3,000. There also existed a substantial backlog of known technology and improved practices to be transferred to farmers. To provide extension services to farmers more efficiently and on a broader basis, the RTG has established an intensified and expanded extension service in about half of the country's provinces. The expanded program includes the appointment of additional staff and the introduction of proven extension methods, with emphasis on regular farm visits and regular training of extension workers. Coverage of the expanded program is anticipated to include all provinces in the country by about 1985.<sup>37</sup> However the success of the programs is doubtful unless the coordination among various departments within the MOAC is improved.

Most Thai farmers have had four years of formal schooling because primary education is compulsory in Thailand. Education is generally considered to be an important factor as it contributes to the higher quality of the labor force. However, the primary school curriculum in Thailand is oriented towards preparing students for higher education while only small percentage of the farmers' children will further their studies beyond the primary level. Primary school education has come under the criticism that it contributes insignificantly to the improvement of the productivity of human resources in the agricultural sector.<sup>38</sup> Primary

school education, as well as non formal education for adults, should be redirected more towards the knowledge and development of skills associated with agriculture.

Agricultural production in Thailand relies mostly on family labor. During periods in which a great number of laborers are required, such as planting and harvesting, exchange of laborers among households used to be a normal practice to cope with the problem of shortage of family laborers. The system of exchanging laborers among farm households has gradually been replaced by the use of hired laborers. The wages of hired laborers are determined by supply and demand forces in the market. Since hired farm laborers are not organized, it is difficult for them to demand a legal minimum wage as industrial workers have. At present, the minimum wage of industrial workers is 45 baht/day which is slightly over the wage normally paid to farmer laborers.

## V. Mechanization

Mechanization of agriculture in Thailand has increased rapidly as a result of changes in production patterns as well as shortages of laborers and draft animals during the growing and harvest seasons. Three types of machinery are widely used among Thai farmers : farm tractors, power driven water pumps, and diesel engine.

There are three main categories of farm tractors. The first one is the large-sized, 4-wheel farm tractor of greater than 40 H.P., which has to be imported or locally assembled using imported C.K.D.'s. The second category is the small-sized 4-wheel farm tractor of 12-15 H.P. This category is both imported and domestically manufactured. The third category is the 2-wheel walking type which is mostly manufactured locally, and uses an engine of about 5-7 H.P.

Large-sized, 4-wheel farm tractors are used in preparing land for crops grown in the upland areas. The use of this type of farm tractor is also necessary in the clearing of virgin land. The other two categories of farm tractor are mostly used in land preparation for rice transplanting cultivation in the low land areas. In some cases, after tractor ploughing, the seedbed is prepared by ploughs drawn by draft animals.

The use of tractors enables farmers to prepare their land for cultivation quickly and without having to wait for rain to soften the ground. In areas where double cropping can be practised, tractors make it possible to clear the field for the second crop. Moreover, in medium

and heavy soils, tractors perform better in terms of deep ploughing, chisel ploughing, and sub-soiling discing. The use of the 2-wheel walking type farm tractor has proved to be more economical than water buffalo.<sup>39</sup> The economical use of this type of farm tractor coupled with its relatively low price has led to its popularity among rice farmers, especially those in the Central Plain region.

Throughout the country water pumps driven by small engines have now almost replaced wind mills in pumping water from the irrigated waterways into planting areas. The popularity of power driven water pumps among Thai farmers is due mainly to its convenience and efficient operation. Most of the large sized 4-wheel farm tractor are usually owned by custom service operators, a great majority of whom are also farmers, but are engaged in providing tractor ploughing services to others as well. Poor farmers, who cannot afford to purchase a farm tractor, can still rely on the use of farm tractors by merely paying the custom service fee. The use of farm mechanization helps increase farm productivity and lowers both unit and overall farm production cost.<sup>40</sup> In addition, it can contribute to higher employment as a result of increasing intensity of land use.<sup>41</sup> However, the excessive use of farm mechanization without corresponding increases in other inputs will not help increase production. This was shown in a case study of rice production in a province in the lower Central region in Thailand.<sup>42</sup>

The government does not have any policies directed towards farm mechanization in particular. However, the government policy in keeping diesel price low in the past stimulated the adoption of farm mechanization to some extent. The market structure of farm machinery in Thailand is rather competitive. Farmers are able to select farm machinery from a large number of suppliers selling different brands of products. As far as farm mechanization is concerned, the role of the government should concentrate on the provision of technical knowhow to local manufacturers of farm machinery, especially producers of 2-wheel walking type farm tractor which is widely used at present. Standards in quality of this type of farm tractor should be established. Apart from the use of tractors and water pumps, farm mechanization should also be developed in other areas of farming, such as planting, harvesting, threshing, drying, etc. At the same time, farmers must be trained in the proper use and maintenance of farm machinery in order to insure maximum efficiency and durability of the machines.

## VI. Pesticides

The use of pesticides in Thailand has increased steadily. In view of the fact that almost all of the pesticides used in the country are imported, the statistics of pesticides imports can roughly represent the total consumption of pesticides in Thailand. In 1972, the value of the imports of pesticides was 224.85 million baht and rose to 515.11 million baht in 1976 (See table 10).

Estimates in terms of the end-user value have revealed that the consumption would top 1,120 million baht in 1979, the consumption of insecticide, herbicide, and fungicide accounting for about 59%, 31% and 10% respectively of the total.<sup>43</sup> In Thailand pesticides are very necessary for growing vegetables and many field crops, especially cotton and tobacco. If pesticides were not used, the yields of these crops would severely be affected. Based on the national average, pesticides alone accounted for about 22 percent of the total cost of cotton production.<sup>44</sup> In the case of tobacco, the share of pesticide in the total production cost was about 7 percent.<sup>45</sup>

However, on the basis of total consumption of pesticides by crops, estimates have shown that in 1977 rice alone used about 38 percent of the country's total pesticides consumption, accounting for 35 percent, 76 percent, and 28 percent of total consumption of insecticides, fungicides, and herbicides respectively. Upland crops took up 32 percent of total pesticides consumption, 35 percent of total insecticides used, 20 percent of fungicides and 27 percent of herbicides. The use of pesticides for

upland crops concentrated on maize, sugarcane, pineapple, tobacco and cotton. The remaining balance was applied to vegetables, orchard, and trees (See table 11).

The pesticides market in Thailand is competitive at all levels from import to retail sale at farm. Owing to the expanding market of pesticides, firms engaging themselves in pesticides business have been competing with one another in order to gain a larger share of the market by introducing various kinds of pesticides into the country. The pesticides trade in Thailand had never been regulated until the First Poisonous Act was enacted in 1967. This Act was revised again in 1973. However, due to the poor enforcement of the law, many problems pertaining to the use of pesticides still remain. Major problems deserved to be mentioned are the following.<sup>46</sup>

- (1) Highly toxic chemicals are easily available without restrictions;
- (2) Labels do not include necessary information on active ingredients, antidotes or first aid instructions;
- (3) Backyard or home-made formulas are common and these home-made products and concoctions are plentiful in the market;
- (4) Applicators tend to use higher doses than usually recommended by the manufactures or agricultural extension agents;

(5) Pest resistance and recurrence have widely been manifested; while deterioration and contamination of the environment has become evident.

Government policies regarding the use of pesticides should be geared towards strict enforcement of the present legislation in order to get rid of the malpractices in the pesticides trade. In addition, farmers have to be trained and educated regarding the proper and effective use of pesticides. They should also be informed of the potential hazards of pesticides.

## VII. Credit

Credit is a key element in the agricultural development because it helps accelerate the adoption of new technologies as well as enables farmers to obtain various essential inputs and services to achieve higher output targets. In Thailand, the demand for credit by farmers is believed to be substantial. The minimum cash credit need for agricultural production was estimated to be about U.S. \$0.67 billion in 1969 and U.S. \$ 1.5 billion in 1977.<sup>47</sup> Based on these two estimates, the credit needs by Thai farmers rose by U.S. \$0.58 billion between the period 1969 - 1977 representing an increase of 10.3 percent per year on the average. Many studies pertaining to agricultural credit have revealed that 42 - 72 percent of the credit extended to farmer was used for production purposes.<sup>48</sup> Prior to 1975, a relatively larger percentage of the agricultural credit was supplied from non-institutional sources.<sup>49</sup>

The RTG has long realized the need to extend the institutional credit to farmer since farmers are exploited, because of their ignorance or having no alternative credit sources, the rate charged being exorbitant when compared to that prevailing in the institutional market. The most effective way of reducing interest rate and exploitation in the non-institutional credit market is to increase both the alternative sources and the volume of credit in the farm sector. This can be achieved by establishing government credit agencies and/or by pursuing policies with a view to encouraging private institutions to lend to agriculture. The

RTG policies concerning agricultural credit have been formulated along this line of suggestion.

Apart from establishing the BAAC as a main source of institutional credit to Thai farmers in 1966, the government through the BOT adopted a quota system in 1975 to channelize commercial bank loans to agriculture. According to the quota system, commercial banks are required each year to lend to agriculture at a certain percentage of the banks' total lending.<sup>50</sup> The regulated quota could be met either through direct lending to farmers or farmers' organizations or through deposits with the BAAC. Moreover, provincial branches of the existing commercial banks are allowed to be established on condition that at least 60 percent of the branch's local deposits has to be set aside for loans in the branch's service area, and at least one-third of these loans has to be granted to the farm sector. The aforementioned policies of the BOT has resulted in the rapid expansion of the institutional credit since 1975.

Despite rapid expansion of the above-mentioned institutional credit, less than 10 percent of the Thai farmers have access to institutional credit. Most of the institutional credit to farmers is for short-term loans for one season or at the most up to two years. The institutional credit appears to have relatively little impact on the poor non-credit worthy farmers. Based on a study of rural financial markets in Thailand by Meyer et.al,<sup>51</sup> many problems with regard to institutional farm credit have

been disclosed. For one thing, credit to Thai farmers has been concentrated heavily on short-term loans in spite of the direct need for the long-term loans in the acceleration of agricultural development. Secondly, the regional allocation of credit has been in favor of the Central region which is the most developed region of the country. Thirdly, the administrative cost of lending is high due to the high bad debts and delays repayment of loans. Finally, large farmers and full owner operators have received a greater proportion of loans than small farmers and tenants. The inequitable distribution of institutional credit among farmers may help perpetuate income disparities in the farm sector. The future policies regarding institutional farm credit should, therefore, be directed towards solving the above-mentioned problems.

## VIII Output Pricing Policies<sup>52</sup>

The RTG's pricing policies with regard to agricultural products have confined to some major commodities. The distinguished case is rice whose production, consumption and export are affected by various government policy instruments, such as rice premium, export quota, and rice reserve requirement. As far as sugar is concerned, the government generally imposes a tax on sugar exports especially at the time when prices in the world market are high but provides subsidy to sugar exporters at the time of low sugar prices in the international market. Regarding rubber, a cess is levied on the rubber exports to finance the rubber replanting scheme. In order to protect domestic consumers, price ceilings have been set for various staple food items such as rice, sugar, and meat. Price guarantee and price support programs, though are desirable as a major policy instrument to help raise farm incomes directly, are implemented on an ad-hoc basis and their operations are very limited in nature. So far, there has never been any complete and lasting scheme regarding price guarantee and price support of agricultural commodities in the country.

Different agricultural output price policies aim at achieving different sets of objectives and these objectives are sometimes in conflict with each other. The most obvious examples are the export quota, rice premium, and rice reserve which have been the heated controversial issues in Thailand for years. Rice premium and export quota have supposedly been used to stabilize domestic prices but the stabilization has been

achieved at price levels well below world prices; but farmers seemed to have been adversely affected by such policy. The elimination of the export quota, rice premium and rice reserve requirement has been suggested by many economists on grounds that these policies depress the domestic rice price and hence farmers' incomes and they are major disincentives to rice production, resulting in a slow expansion rate.<sup>53</sup> However, the government has still retained the rice premium and the rice reserve program because the government believes that the abolition of these policies will bring about greater benefits to rice marchants than to farmers while consumers particularly the poor in the non-farm sectors will have to pay higher prices for rice. At any rate, the criticism of the rice premium as being a policy instrument to subsidize rice consumers at the expense of the rice farmers had led the government to use the proceeds from collection of rice premium in activities which are useful to farmers directly. The proceeds have, therefore, been set aside as a part of the Farmer Compensation Fund which was established in 1974. The Fund has been used to finance projects oriented towards helping farmers, for example selling cheap fertilizer to farmers, land reform and price support programs.

By and large, the price guarantee and price support programs carried out by government in the past have achieved little success.<sup>54</sup>

Failures of programs were due to the lack of fund to purchase large quantities of rice to support prices during the harvest season, the floor prices being too high, the shortage of facilities, such as transportation and warehouses, and the inexperience on the part of the government officials. Since the programs were ad-hoc in nature, they were not timely carried out. Those who benefited from the programs were merchants, and middlemen rather than farmers, because the programs were usually carried out at the time when farmers had already sold most of their product to the merchant middlemen.

## IX. Concluding Remarks

Based on the above findings, it appears that the input and output pricing policies of the government have contributed little to the increase in agricultural production of the country. The obvious case is the fertilizer policy and rice price policy which have resulted in higher price of fertilizer and lower price of rice than those which would have prevailed under condition of no government interventions. As a consequence, farmers lack incentive to increase rice production.

As regards the provision of important inputs, such as water, improved seed, and institutional credit, the supply of these inputs has been unable to keep pace with the farmers' increasing demand. Nor have farmers been trained and educated to use such input as fertilizer, farm machinery, and pesticides more efficiently on a widespread basis. More importantly, the input policies of the government deliberately or in-deliberately, have been discriminating against poor farmers.

All government policies with regard to agricultural inputs and outputs should be redirected towards the objective to raising farm income, and providing incentives to farmers and at the same time emphasizing the improvement in income disparity within the farm sector. In view of the fact that inputs have to be used complementarily, all important inputs have to be made available adequately, timely, and at the prices which the farmers can afford to buy. Farmers should also be able to sell their outputs at prices that can assure them of a fair return on their investments.

Annex II

Statistical Tables

Table 1

Total Fertilizer Consumption in Thailand, 1960 - 1977

<u>Year</u>	<u>Total Consumption (Ton)</u>	<u>Percentage Change (%)</u>
1960	52,163	-
1961	58,253	11.67
1962	68,213	17.10
1963	104,618	53.37
1964	120,780	15.45
1965	98,782	-18.21
1966	160,196	62.17
1967	237,967	48.55
1968	271,922	14.27
1969	260,257	-4.29
1970	282,259	8.45
1971	264,895	-6.15
1972	412,231	55.62
1973	414,707	0.60
1974	364,207	-12.18
1975	480,846	32.03
1976	601,351	25.17
1977	624,724 <sup>a</sup>	3.80

Note : <sup>a</sup>Preliminary figure

Source : Division of Agricultural Economics, MOAC

Table 2  
Distribution of Fertilizer Consumption by Regions

(%)

<u>Year</u>	<u>North</u>	<u>Northeast</u>	<u>Central</u>	<u>South</u>	<u>Total</u>
1969	3.35	27.67	59.07	9.91	100
1971	5.45	33.99	47.27	13.29	100
1973	6.28	19.49	59.60	14.63	100
1974	8.61	18.06	58.61	14.72	100
1975	7.64	22.17	55.92	14.27	100
1976	6.20	21.30	61.40	11.10	100

Source : Division of Agricultural Economics, MOAC

Table 3

Rate of Fertilizer Utilization in Selected Countries

<u>Country</u>	kg./hectare					
	<u>1964</u>	<u>1966</u>	<u>1968</u>	<u>1970</u>	<u>1972</u>	<u>1974</u>
Developed Countries	71.0	82.4	88.1	94.6	100.4	94.6
Developing Countries	6.2	8.0	10.0	13.3	16.9	18.8
Japan	310.3	357.1	398.5	372.6	362.8	374.9
South Korea	166.1	184.6	206.3	241.6	272.1	350.4
Singapore	171.4	192.3	250.0	250.0	272.7	333.3
West Malaysia	20.3	30.3	31.2	53.9	66.9	103.2
Philippines	10.9	12.8	16.8	22.4	19.0	27.7
Indonesia	5.7	8.2	15.1	13.1	24.5	29.5
Thailand	2.4	5.0	7.4	6.0	11.6	13.4

Source : FAO, Annual Fertilizer Review, 1975

Table 4

Prices of Fertilizer in Thailand, 1965 - 1973

<u>Year</u>	Ammonium Sulphate <sup>a</sup>			Urea <sup>a</sup>			Ammonium Phosphate		
	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>
1965	1.42	1.27	11.81	2.48	2.24	10.71	2.74	1.66	65.06
1966	1.42	1.27	11.81	2.47	2.21	11.76	2.76	1.78	55.06
1967	1.32	1.13	16.81	2.32	1.95	18.97	2.56	1.66	54.22
1968	1.85	1.14	62.28	3.05	1.87	63.10	2.43	1.69	43.78
1969	2.06	0.86	139.53	2.41	1.56	54.49	2.30	1.52	51.32
1970	1.99	0.73	172.60	2.61	1.90	37.37	2.38	1.53	55.56
1971	1.67	0.68	145.59	2.80	1.30	115.38	2.25	1.56	44.23
1972	1.74	0.72	141.67	3.25	1.42	128.87	2.42	1.76	37.50
1973	1.97	1.05	85.71	3.03	1.76	72.16	2.55	1.82	40.11

Note : (1) refers to retail price paid by farmers (Baht/kg.)  
 (2) refers to (IF Price (Baht/lg.)  
 (3) refers to margin (1) - (2) (%)

<sup>a</sup>Subject to import restriction

Sources : (1) From Division of Agricultural Economics, MOAC  
 (2) from Japan Tariff Association Ministry of  
 Finance, Japan

Quoted from Sompop Manarungsan, The History of Fertilizer  
 Policies in Thailand : An Economic Study, 1960 - 1975.  
 M. Econ. Thesis, Faculty of Economics, Thammasat  
 University, 1978.

Table 5  
Comparison of Fertilizer Prices in Thailand and in Some  
Asian Countries, 1971

Types of Fertilizer	Baht/ton				
	Central Thailand	West Malaysia	Philippines	Taiwan	India
1. Ammonium Sulphate <sup>a</sup>	1,500-1,700	1,400	1,230	1,230	1,250
2. Urea 45-46% <sup>a</sup>	3,000-3,300	1,600	2,000	1,900	2,560-2,610
3. Ammonium phosphate					
16-20-0	1,700-2,000	-	2,200	1,600	2,540
4. Ammonium phosphate					
20-20-0	2,100	-	-	-	2,550
5. N-P-K					
14-14-14	2,200-2,300	1,807	-	-	2,260

Note : <sup>a</sup> Subject to import restriction

Source : British Sulphur Corporation, Thailand National Fertilizer Study, Prepared for International Bank for Reconstruction and Development, London, 1972.

Table 6

Total Seed Requirements for Six Crops (1974) and Projected Seed Production by 6<sup>th</sup> Year of the Seed Development Project

<u>Crops</u>	<u>Total</u> <u>National Acreage</u> <sup>a</sup> <u>(1,000 rai)</u>	<u>Planting</u> <u>Rate</u> <sup>b</sup> <u>(kg./rai)</u>	<u>Total</u>		
			<u>Seed</u> <u>Required</u> <u>(ton/year)</u>	<u>Projected</u> <u>Seed</u> <u>Production</u> <u>ton</u>	<u>%of total</u> <u>requirement</u>
Rice	47,570	6	785,420	3,000	1.05
Corn	7,550	3.6	27,180	1,600	5.89
Soyabean	1,170	6	7,020	2,200	31.33
Peanut	814	24	19,536	1,200	6.14
Mungbean	1,450	6	8,700	4,0	5.17
Sorghum	750	3.6	2,700	200	7.41

Note : <sup>a</sup>Source : DONE Crop Promotion Division estimates  
for 1974

<sup>b</sup>Approximately 20% above DA recommendation to allow  
for some replanting. Actual farm level planting rates  
are presently another 20 - 25% higher to compensate  
for poor quality of seed.

Source : USAID, Thailand-Seed Development loan : Project Paper.  
July 1975. Annex B-3.

Table 7  
Wet Season Irrigation Areas by Regions

<u>Regions</u>	(1,000 of ha)			
	<u>1961</u>	<u>1966</u>	<u>1971</u>	<u>1976</u>
Central	342.8 (33.06)	726.2 (46.35)	726.2 (41.81)	744.0 (33.56)
Western	178.7 (17.23)	223.3 (14.25)	223.3 (12.85)	414.7 (18.71)
Northern	85.0 (8.20)	129.6 (8.27)	277.9 (16.00)	363.4 (16.39)
Eastern	256.2 (24.71)	275.4 (17.58)	275.4 (15.85)	350.9 (15.83)
Northeastern	144.2 (13.91)	160.6 (10.25)	176.2 (10.14)	213.3 (9.62)
Southern	30.0 (2.89)	51.6 (3.30)	58.1 (3.35)	130.3 (5.89)
Whole Kingdom	1036.9 (100)	1.566.7 (100)	1.737.1 (100)	2.216.6 (100)

Note : Figures in parentheses are percentages

Source : Royal Irrigation Department, MOAC.

Table 8  
Dry Season Irrigation Areas

<u>Year</u>	<u>Great Chao Phya Project</u>		<u>Other Projects</u>		<u>Whole Kingdom</u>	
1967	35.1	(81.63)	7.9	(18.37)	43.0	(100)
1968	45.2	(72.67)	17.0	(27.33)	62.2	(100)
1969	45.3	(66.62)	22.7	(33.38)	68.0	(100)
1970	53.8	(70.79)	22.2	(29.21)	76.0	(100)
1971	71.7	(71.77)	28.2	(28.23)	99.9	(100)
1972	94.6	(73.79)	33.6	(26.21)	128.2	(100)
1973	143.1	(69.13)	63.9	(30.87)	207.0	(100)
1974	221.8	(70.37)	93.4	(29.63)	315.2	(100)
1975	276.9	(74.76)	93.5	(25.24)	370.4	(100)
1976	294.4	(65.26)	156.7	(37.74)	451.1	(100)
1977	384.3	(72.85)	143.2	(27.15)	527.5	(100)

Note : Figures in parentheses are percentages

Source : Royal Irrigation Department, MOAC

Table 9  
Wet Season Irrigation Areas As Percentage of  
Cultivated Areas by Regions

<u>Region</u>	<u>1961</u>	<u>1966</u>	<u>1971</u>	<u>1976</u>
Central	38.0	75.7	77.2	83.5
Western	32.1	33.6	34.5	66.3
Eastern	42.1	42.7	41.5	49.2
Southern	6.6	9.5	9.7	84.7
Northern	7.7	8.1	13.1	18.8
Northeastern	5.3	4.7	4.6	5.1
Whole Kingdom	16.6	20.6	20.7	26.0

Source : Royal Irrigation Department, MOAC

Table 11

Imports of Pesticides<sup>a</sup>, 1972 - 1976

Year	Quantity (ton)	Value (million baht)
1972	12,003	224.85
1973	14,617	312.01
1974	13,288	395.07
1975	8,213	316.73
1976	11,531	515.11

Source : Division of Agricultural Economics, MOAC,  
Agricultural Statistics of Thailand Crop  
Year 1976/1977

Note : <sup>a</sup>Including insecticides, fungicides,  
disinfectants, weed-killers, anti-sprouting  
products, rat poisons, animal dressings,  
naphthalene balls, and moth balls

Table 11

Pesticides Consumption by Crops, 1977  
(metric tons)

<u>Crops</u>	<u>Insecticides</u>	<u>Fungicides</u>	<u>Herbicides</u>	<u>Total</u>
Rice	4,970.978 (35.15)	1,527.441 (76.37)	1,253.355 (28.17)	7,751.774 (37.65)
Upland Crops	4,974.732 35.18)	403.775 (20.19)	1,210.995 (27.22)	6,589.502 (32.00)
Vegetables	2,318.413 (16.39)	4.955 (0.25)	830.586 (18.67)	3,153.954 (15.32)
Orchard & Tree	1,877.257 (13.28)	63.829 (3.19)	1,153.684 (25.94)	3,094.770 (15.03)
Total	14,141.380 (100)	2,000.000 (100)	4,448.620 (100)	20,590.000 (100)

Source : Bureau of Agricultural Economics, MOA

Quoted from EJCAP, Agro-Chemicals News in Brief vol.11. No.3 July,  
1979.

## Annex I

### Footnotes

<sup>1</sup> Poverty line is defined to be  $\text{฿ } 150/\text{month/person}$  in rural areas and  $\text{฿}/\text{month/person}$  in urban areas.

<sup>2</sup> ARSAP, Marketing, Distribution and Use of Fertilizer in Thailand, Revised ed., ESCAP Agriculture Division, Bangkok, July 1978, Table 31.

<sup>3</sup> Engineering Consulting Firms Association, Pre-feasibility Study on a Chemical Fertilizer Complex in Thailand, Japan, July 1979.

<sup>4</sup> British Sulphur Corporation, Thailand National Fertilizer Study, Prepared for International Bank for Reconstruction and Development, London, 1972, p. 64.

<sup>5</sup> ESCAP/ARSAP, Aspects of Fertilizer Demand and Marketing in Selected Asian Countries, ESCAP, Bangkok, October 1978.

<sup>6</sup> Chirmsak Pinthong and Ammar Siamwalla, A Preliminary Background Notes on Food and Nutrition Policy in Thailand, Faculty of Economics, Thammasat University, Bangkok, October 1978, pp. 36 - 41.

<sup>7</sup> F.DINAP, A Comparative Review of Fertilizer Marketing and Pricing Policies in Selected Asian Countries, ESCAP, Bangkok, June 1979.

<sup>8</sup>The government holds 49.9 percent of the Company's stock and controls the selection of the company's key personnel. The plant is located at Mae Moh, Lampang, some 600 kilometers north of Bangkok.

<sup>9</sup>H.P.A. Groll, Report on the Investigation of Mae Moh Plant of the Chemical Fertilizer Company. Bangkok, 1971.

<sup>10</sup>The new government was under the premiership of Professor Sanya Thammasakdi.

<sup>11</sup>Sompop Manarungsan, The History of Fertilizer Policies in Thailand : An Economic Study, 1960-1975. M. Econ. Thesis, Faculty of Economics, Thammasat University, 1978.

<sup>12</sup>In 1975, the government purchase accounted for about 35 percent of the country's total trading volume.

<sup>13</sup>FAO/IBRD, Seed Project Reconnaissance Mission to Thailand, Report No. THA 5 3/73, FAO/IBRD Cooperative Program. Jan. 1973, and Mississippi State University, Seed Program/Industry Development in Thailand, Report to USAID/Thailand and AID/W, Report No. TA-73-10, August 1973.

<sup>14</sup>NESDB, The Third National Economic and Social Development Plan (1972 - 1976), Bangkok, p. 126.

<sup>15</sup>There are four Seed Processing Centers Under the Project. They are located at four provinces : Phitsanulok, Korat, Chainat, and Lampang.

<sup>16</sup> See details of the Thailand Seed Development Project from USAID, Thailand-Seed Development loan : Project Paper, July 1975.

<sup>17</sup> See details in Joint Thai-US Evaluation Team, Thailand Seed Development Project : Second Year Evaluation, USAID, Bangkok, October 1978.

<sup>18</sup> The firm is an affiliate of the powerful Chareon Pokphan Group, the country's leading producer of animal feed and poultry. The group also encompasses a number of activities related to agro-industries.

<sup>19</sup> IBRD, Thailand : Toward a Development Strategy of Full Participation. A Basic Economic Report, September, 1978, Table 5.4 and Table 5.5, pp. 182 - 183.

<sup>20</sup> Ammar Siamwalla, Rice and the Thai Economy, (Bangkok : Thanmasat University Press, 1979) pp. 44 - 45. (in Thai)

<sup>21</sup> NESDB, The Third National Economic and Social Development Plan (1972 - 1976), Bangkok, pp. 136 - 137.

<sup>22</sup> IBRD, Thailand Irrigation Program Review (Washington D.C., The World Bank, 1976) pp. ii - iii.

<sup>23</sup> Main agencies include RID, NEA, DLD, DOLA, ARD, and DOAE.

<sup>24</sup> NESDB, op.cit., p. 137.

<sup>25</sup> James C.W. Wang, Experimental and Demonstration Farm for Irrigation Agriculture in Kalasin Thailand, (Bangkok : Royal Thai Government and UNDP/FAO, July 1973), p. 43.

<sup>26</sup> AIT, Water for the Northeast : A Strategy for the Development of Small-Scale Water Resources. The Water Resources Planning Subcommittee, NESDB, September, 1978, p. 6.

<sup>27</sup> Ibid., p. 5.

<sup>28</sup> Farmers, however, have to bear the cost of getting water from the public irrigation facilities to their fields.

<sup>29</sup> Peeratthep Rungchiwin, "Dry Season Agriculture", Rural Thailand 1978, NESDB, 1978, p. 87. (in Thai).

<sup>30</sup> IBRD, Thailand Northeast Irrigation Project II. Staff Appraisal Report, October, 1978, pp. 32 - 33.

<sup>31</sup> Quoted from Labor Department, A Report on Rural Labor Survey 1977, p. 2.

<sup>32</sup> See the ~~strong~~ advocate for this view from F.W. Fuh and Jan Vingerhoets, Rural Manpower, Rural Institutions and Rural Employment in Thailand, Bangkok, 1972.

<sup>33</sup> For example, See Chulalongkorn University Social Science Research Institute, Social and Economic Conditions of a Rural Population in Various Parts of Thailand, Bangkok, 1975; and Labor Department, op.cit.

<sup>34</sup> See IBRD, Thailand Special Report on Employment, 1977.

<sup>35</sup> Kosit Panpiamrat, "An Analysis of Rural Economy", Rural Thailand 1978, NESDB, 1978, p. 19. (in Thai)

<sup>36</sup> IBRD, Towards a Development Strategy of Full Participation : A Basic Report, p. 34.

<sup>37</sup> Ibid. p. 12.

<sup>38</sup> Apichai Panthasen, Economies of Education : Reform and Revolution (Bangkok : DK Publishing Co. Ltd., 1975). (in Thai)

<sup>39</sup> Songsak Sriboonchita, The Private Cost of Using Tractors Versus Buffaloes : A Case Study of Farmers in Chachoengsao Province, M. Econ. Thesis, Faculty of Economics, Thammasat University, 1975.

<sup>40</sup> RTG, Thailand Farm Mechanization and Farm Machinery Market, IFCT/USOM, Bangkok 1969, p. 115.

<sup>41</sup> I. Inuki, "Farm Mechanization, Output, and Labor Input A Case Study in Thailand," in Walter Galenson (ed.) Essays on Employment, (Geneva : International Labor Office, 1971) pp. 71 - 79.

<sup>42</sup> Sawakon Peerapun and Phiphit Suphaphiphat, "The Productivity of Farm Mechanization in Rice Production : A Case Study of Amphoe Thanya Buri, Changwat Pathum Thani, "Thai Journal of Development Administration, Jan. 1979, pp. 56 - 65. (in Thai)

<sup>43</sup> Estimates made by the Shell Chemicals Company, one of the leading importers of pesticides in the country.

<sup>44</sup>Division of Agricultural Economics, MOAC, Cost of Cotton Production Crop Year 1977/1978, August 1978. (in Thai)

<sup>45</sup>Prapat Wiratananant, et. al. "Tobacco Industry in Thailand", in Industrial Planning of Thailand, NESDB, January 1977, p. 47. (in Thai)

<sup>46</sup>Banpot Napompeth "Pesticide Legislation and Its Problems in Thailand", Agro-Chemicals News in Brief, ESCAP, Special Issue 1979, pp. 59.

<sup>47</sup>BOT, Estimates of Credit Needs of Farmers, 1977 - 1981, November 1976 and BOT, Agricultural Credit in Thailand, (Mimeo), 1977. (in Thai)

<sup>48</sup>Tongroj Onchan, "Credit Needs of Thai Farmers", Paper presented at the Conference on Agricultural Credit Policy and Programs in Thailand, December 22 - 23, 1977, pp. 7 - 10.

<sup>49</sup>Ibid., p. 15.

<sup>50</sup>The requirement was 5 percent of the bank's total lending in 1975 and was gradually raised to 13 percent in 1979.

<sup>51</sup>Richard L. Meyer, et. al. Rural Financial Markets in Thailand: Assessment and Recommendations. Report to USAID/Thailand, May, 1978. pp. 61 - 82.

<sup>52</sup>The output pricing policies will be discussed briefly in this paper. See details regarding this topic in Brian Kelly, RTG Crop Pricing Policy, US.AID/Thailand, August 1979, (Mimeo)

<sup>53</sup>For example, see Sura Sanittanont, Thailand's Rice Export Tax : Its Effects on the Rice Economy Ph.D. Dissertation, Department of Economics, University of Wisconsin 1966. (Bangkok : National Institute of Development Administration, 1967) and Ammar Siamwalla, "A History of Rice Price Policies in Thailand," in Prateep Sondysuan (ed.), Finance, Trade and Development in Thailand : Essays in Honour of Khunying Suparb Yossundara, (Bangkok : Sompong Press, 1975) pp. 141 - 165.

<sup>54</sup>Praiphol Kumsup, "Price Guarantee and Price Support Policies of Agricultural Products : Evaluation and Recommendations," Paper presented at the Conference on Farmer Year, Thammasat University, Feb. 10 - 12, 1979. (in Thai)

## BIBLIOGRAPHY

- AIT, Water for the Northeast : A Strategy for the Development of Small-Scale Water Resources The Water Resource Planning Sub-Committee, NESDB, September 1978.
- ARSAP, Marketing, Distribution and Use of Fertilizer in Thailand, Revised ed., ESCAP, Agricultural Division, Bangkok, July 1978.
- BOT, Agricultural Credit in Thailand (Mimeo) 1977, (in Thai)  
Estimates of Credit Needs of Farmers 1977 - 1981, November 1976 (in Thai)
- British Sulphur Corporation, Thailand National Fertilizer Study, Prepared for International Bank for Reconstruction and Development, London, 1972.
- Chulalongkorn University Social Science Research Institute, Social and Economic Conditions of a Rural Population in Various Parts of Thailand, Bangkok, 1975.
- Division of Agricultural Economics, MOAC, Cost of Cotton Production Crop Year 1977/1978 August 1978. (in Thai)
- Engineering Consulting Firms Association, Pre-feasibility Study on a Chemical Fertilizer Complex in Thailand, Japan, July, 1979.
- ESCAP/ARSAP, Aspects of Fertilizer Demand and Marketing in Selected Asian Countries, ESCAP, Bangkok, October 1978.

- FADINAP, A Comparative Review of Fertilizer Marketing and Pricing Policies in Selected Asian Countries, ESCAP, Bangkok, June, 1979.
- FAO/IBRD, Seed Project Reconnaissance Mission to Thailand Report No. THA 5 3/73, FAO/IBRD cooperative Program, Jan. 1973.
- Fuh, F.W. and Vingerhouts, Jan. Rural Manpower, Rural Institutions, and Rural Employment in Thailand, Bangkok, 1972.
- Grall, H.P.A. Report on Investigation of Mae Moh Plant of the Chemical Fertilizer Company. Bangkok, 1971.
- IBRD, Thailand Irrigation Program Review Washington D.C. : The World Bank, 1976.
- Thailand Northeast Irrigation Project II. Staff Appraisal Report, October, 1978.
- Thailand Special Report on Employment, 1977.
- Thailand : Toward a Development Strategy of Full Participation, A Basic Economic Report, September, 1978.
- Inuki, I. "Farm Mechanization, Output, and Labor Input : A Case Study in Thailand," in Galenson, Walter (ed.) Essays on Employment Geneva : International Labor Office, 1971.
- Joint Thai-US Evaluation Team, Thailand Seed Development Project : Second Year Evaluation, USAID, Bangkok, October 1978.
- Kelly, Brian. RTG Crop Pricing Policy, USAID/Thailand. August 1979 (Mimeo).

Kumsup, Praiphol, "Price Guarantee and Price Support Policies of Agricultural Products : Evaluation and Recommendations," Paper presented at the Conference on Farmer Year, Thammasat University Feb. 10 - 12, 1979.  
(in Thai)

Labor Department, A Report on Rural Labor Survey, 1977. (in Thai)

Manarungson, Sompop. The History of Fertilizer Policies in Thailand : An Economic Study, 1960 - 1975. M. Econ. Thesis, Faculty of Economics, Thammasat University, 1978.

Meyer, Richard L. et.al. Rural Financial Markets in Thailand : Assessment and Recommendations, Report to USAID/Thailand.

Mississippi State University, Seed Program/Industry Development in Thailand, Report to USAID/Thailand and AID/W, Report No. TH -73-10, August 1973.

Mapompeth, Banpot, "Pesticide Legislation and Its Problem in Thailand," Agro-Chemicals News in Brief. ESCAP Special Issue, 1979.

NESDB, The Third National Economic and Social Development Plan (1972 - 1976) Bangkok, p. 126.

Onchan, Tongroj. "Credit Needs of Thai Farmers," Paper presented at the Conference on Agricultural Credit Policy and Programs in Thailand, Dec. 22 - 23, 1977.

Panpiamrat, Kosit. "An analysis of Rural Economy," Rural Thailand 1978, NESDB, 1978. (in Thai)

- Panthasen, Apichai. Economics of Education : Reform and Revolution, Bangkok : D.K. Publishing Co., 1975. (in Thai)
- Peerapun, Sawacon and Suphaphiphat, Phiphit. "The Productivity of Farm Mechanization in Rice Production : A Case Study of Amphoe Thanya Utri, Changwat Pathum Thani," Thai Journal of Development Administration, Jan. 1979 (in Thai)
- Pinthong, Chirmsak and Siamwala, Ammar, A Preliminary Background Notes on Food and Nutrition Policy in Thailand, Faculty of Economics, Thammasat University, Bangkok, October 1978.
- RTG, Thailand Farm Mechanization and Farm Machinery Market, ICT/USOM, Bangkok, 1969.
- Bungchiwin, Peerathep. "Dry Season Agriculture," Rural Thailand 1978, NESDB, 1978. (in Thai)
- Sanittanont, Sura. Thailand's Rice Export Tax : Its Effects on the Rice Economy, Ph.D. Dissertation, Department of Economics, University of Wisconsin 1966, Bangkok : National Institute of Development Administration, 1967.
- Siamwala, Ammar. "A History of Rice Price Policies in Thailand," in Sondysuan, Prateep. (ed.) Finance, Trade, and Development in Thailand : Essays in Honour of Khunying Suparb Yossundara. Bangkok : Sompeng Press, 1975.

Rice and the Thai Economy Bangkok : Thammasat University Press, 1979. (in Thai)

Sriboonchit, Songsak, The Private Cost of Using Tractors Versus Buffaloes : A Case Study of Farmers in Chachoengsao Province, M. Econ. Thesis, Faculty of Economics, Thammasat University, 1975.

USAID, Thailand-Seed Development loan : Project Paper, July 1975.

Wang, James. C.W. Experimental and Demonstration Farm for Irrigation Agriculture in Kalasin Thailand, Bangkok : RTG and UNDP/FAO, July 1973.

Wiratananant, Prapat et.al. "Tobacco Industry in Thailand," in Industrial Planning of Thailand, NESDB, Jan. 1977. (in Thai)