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COMPARISON OF COST-RETURN BETWEEN RICE AND OTHER CROPS IN THE AREA DEFINED AS UNSUITABLE FOR RICE PRODUCTION IN THAILAND

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Chapter I

Introduction

For decades Asia has been producing and consuming 95% of the total rice production in the world with China topping the list followed by India. Lately consumption as well as production have also been on the rise in some western countries especially U.S.A. which is now one of the major rice exporting countries. Through extensive changes in government policies, former major rice importing countries such as Vietnam and Indonesia which used to depend heavily on imported rice can now produce sufficient rice for domestic consumption. Furthermore for the past few years Vietnam has been able to export its surplus rice and become the third major rice exporting country after Thailand and U.S.A. These factors affect the situation of rice trading in the world market.

At present Thailand is the world's largest rice exporter. Sixty-five percent of the Thai population live in the rural area and the majority of these people are rice farmers. Income from rice export amounts to almost 15% of the country's total export values or 29% of the total income from export of agricultural products. On the contrary it is a well known fact in Thailand that a majority of rice farmers is poor. The most commonly given reason is that since we have to compete with other exporting countries in the world market where prices are determined by supply and demand our domestic prices are unavoidably affected by exporting prices.

By accepting the above reasoning, the future of rice farmers in Thailand looks bleak. Should they then continue to live in this uncertainty year after year? Would it be feasible for them to switch to other crops which can guarantee them a better future ?

Another factor which should not be overlooked is that Thailand has been able to expand its agricultural production because of its large surplus land. This advantage is not going to last forever. With the country becoming more and more industrialized, urbanization has been expanding into the rural areas and as a result land prices increase steadily. Now that farmers can no longer expand their agricultural frontiers crops with higher yield should be looked at.

Objectives

Rice has always been a topic for research and discussion in Thailand since

the livelihood of the Thai people revolves around rice. Various kinds of studies concerning rice in Thailand have been conducted by government agencies, research institutions, private sectors, etc. One common agreement found in these studies is that certain parts of the country are made up of land which is not suitable for rice production and that substitute crops should be cultivated. However there has been no comparison of cost-return between rice and these alternative crops in the study area.

This study looks into the current situation concerning rice production in the country particularly in the area defined as unsuitable for rice production. Assuming that there will be no drastic changes in the number of food processing facilities nor irrigation projects in the area under study, the performance of certain crops are reviewed.

Explanatory Note

Weights and Measures

Crop year	= beginning of April to March the following year
Kwien of paddy	= metric ton
1 rai	= 0.395 acre
1 tang	= 15 kg

Regions

Thailand is divided into 4 regions. The northeastern and northern regions consist of 17 provinces each, the central plain region is composed of 25 provinces and the southern region comprises 14 provinces.

Chapter II

Rice Production in Thailand

Cultivated Areas and Production

Rice is among "family Gramineae" species. It can grow in both hot and warm climates, in flooded areas of up to 4 meters depth or on highland 2,500 meters above the sea level. At present there are roughly 120,000 rice varieties different in morphology and suitability in accord with the areas they are cultivated. In Thailand approximately 3,500 varieties of rice are planted[1]. Good quality rice produced in Thailand is the "photoperiod sensitive" type requiring short period of daylight. It is therefore planted during the rainy-cold seasons when the period of sunlight is less than 12 hours a day. In 1991, rainfed rice or lst crop accounted for 93.3% of the total harvested area (Table 1) with a yield of 14.9 million tons or 86.6% of the total production.

Second crop is harvested during the rainy season resulting in high moisture

Table 1. Rice cultivated areas and production (in percentage)

		% of Harvested to Planted Area				% of Harvested Area for 1st & 2nd Crops				% of Regional Prod. to Total Production			
		1988	1989	1990	1991	1988	1989	1990	1991	1988	1989	1990	1991
North	- 1st	96.2	96.6	96.9	84.4	93.6	98.3	91.5	95.1	24.2	26.6	26.4	23.4
	- 2nd	97.8	99.3	98.0	97.3	6.4	1.7	8.5	4.9	2.8	3.1	3.9	2.6
Northeast	- 1st	97.8	95.3	96.2	93.1	98.6	98.3	98.6	98.4	30.7	31.0	36.3	45.0
	- 2nd	98.1	98.1	95.6	98.9	1.4	1.7	1.4	1.6	0.8	1.1	0.9	1.3
Center	- 1st	96.8	97.3	97.5	76.3	79.5	79.9	79.5	81.2	24.4	22.2	22.8	13.9
	- 2nd	99.3	99.4	82.7	98.5	20.5	20.1	20.5	18.8	10.8	11.1	5.2	9.0
South	- 1st	93.2	83.6	88.7	92.4	94.4	94.1	95.5	96.5	5.5	4.1	4.0	4.2
	- 2nd	99.4	97.9	75.1	99.6	5.6	5.9	4.5	3.5	0.4	0.4	0.2	0.2
Total	- 1st	96.9	95.4	96.5	88.1	92.1	91.4	92.6	93.3				
	- 2nd	98.7	99.2	87.1	98.3	7.9	8.6	7.4	6.7				

Source: MOAC, 1991.

Note: Figures obtained from the source have been converted into percentages.

content and therefore cannot be kept for a long time. These factors attribute to lower prices for 2nd crop. Furthermore it is planted during dry season and requires a lot of irrigated water which, at the same time, is also in great demand by other crops. Because of its low prices the government does not consider it worthwhile to use irrigated water for 2nd crop and has not therefore encouraged expansion of the area for its cultivation.

Land Suitability

Soil conditions can be divided into two categories : physical and chemical conditions. Physical condition refers to its composition : whether it contains soil particles, sand or clay. Chemical condition is judged according to its pH value. Acidity in soil is found when its pH value is lower than 7 (7 is the pH value for water which is considered neutral). Eighty percent of the land area in Thailand is acidic, having pH values between 4.6-6.5. However most of these areas contain soil which can absorb and retain water well, except in the northeast where the land is extremely sandy causing lower water-holding capacity.

Using the soil conditions as a basis, the Land Development Department has divided the total land area into 5 regions : north, northeast, center, east and south and subdivided them into 4 categories : very good, good, average and poor according to the degrees of suitability for rice cultivation (Tables 2 and 3).

A total of 62.6 million rai or 19.5% of the total land area in Thailand is defined as suitable for rice cultivation (average and above). This figure is close to the actual rice cultivated area. Ninety percent of rice is grown in this area while the other 10% is grown in the area defined as "poor" or unsuitable for rice production.

Table 2. Suitability of land for rice production (millon rai)

	North	N-East	Center	East	South	Total
V. Good	5.91	6.68	8.01	1.86	1.71	24.17
Good	3.13	1.57	0.36	0.76	2.75	8.57
Average	0.44	21.40	4.88	2.73	1.02	30.47
Average and above	**9.48**	**29.65**	**13.25**	**5.35**	**5.48**	**62.64**
Poor	96.55	75.86	26.22	16.73	42.70	258.06
Total	**106.03**	**105.51**	**39.47**	**22.08**	**48.18**	**321.27**

Source: TDRI, 1990.

Table 3. Suitality of land for rice production (% of the area in the region)

	North	N-East	Center	East	South	Total
V. Good	5.6	6.3	20.3	8.4	3.6	7.5
Good	3.0	1.5	0.1	3.4	5.7	2.6
Average	0.4	23.1	12.7	12.4	2.1	9.5
Average and above	**9.0**	**28.1**	**33.6**	**24.2**	**11.4**	**19.5**
Poor	91.0	71.9	66.4	75.8	88.6	80.5

Source: TDRI, 1990.

Irrigation

Thailand's irrigation can be considered as having one of the lowest levels in Asia. More than 80% of the agricultural land are not irrigated and the distribution of irrigated areas is quite imbalanced. For example, agricultural land in the central region which makes up 23% of all agricultural land in the whole kingdom is 37.4% irrigated. The northeast which makes up 41.1% of all the agricultural land has 6.7% of its agricultural land irrigated (Table 4).

Table 4. Percentage of agricultural land, rice fields and irrigated land

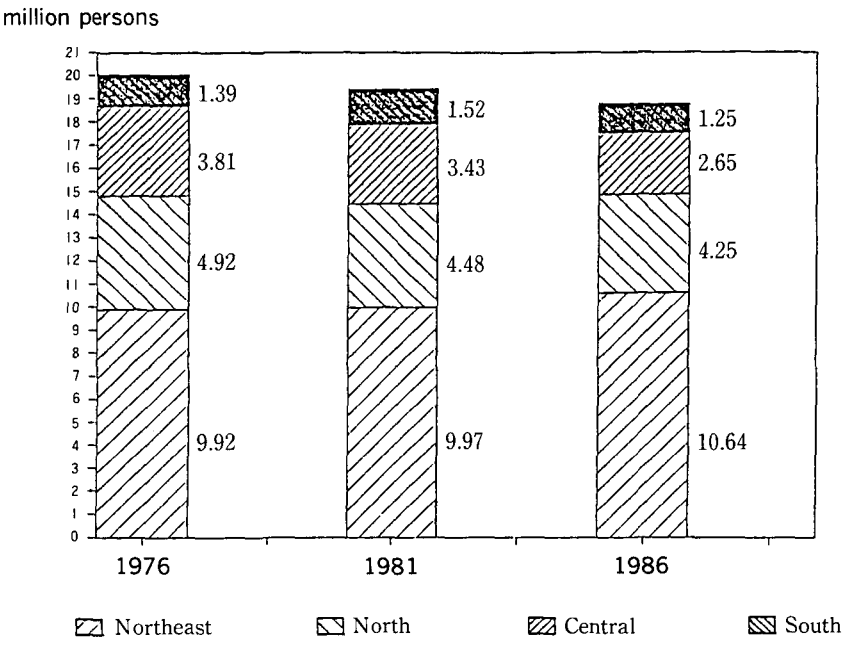
	% of Agric. Land to Total Land	% of Agric. Land to Total Agric. Land	% of Rice Fields to Reg. Agric. Land	% of Irri. Areas to Reg. Agric. Land
North	10.6	23.0	49.8	19.9
Northeast	18.9	41.1	63.4	6.7
Center	10.5	23.0	42.2	37.4
South	5.9	12.9	22.6	14.3

Source: MOAC, 1991.

Note: Figures obtained from the source have been converted into percentages.

Farmers' Population

Figure 1 shows the number of households engaged in rice production. The northeast which is considered the driest part of Thailand has the highest number of farmer population (half of the entire farmer population in the whole kingdom).



Source: TRDI, 1990.

Figure 1. Number of households engaged in rice production, 1976, 1981 and 1986

The household census conducted between 1976 and 1986 shows that the number of rice farmers increased in the northeast while the north and the central plain witnessed a decrease in the ratio of farmers to total population in the region from 25% to 23% and from 19% to 14% respectively. The number of rice farmers in the south fluctuated between 7% and 8%. The overall rice farmer population decreased from 48% of the total population in 1976 to 42% in 1981 and 36% in 1986. The decrease in the number of rice farmers indicates that rice farmers are shifting away from growing rice to other profession which can generate better income[1].

According to a survey of income and expenditures of farmers for crop year 1988/89 by the Ministry of Agriculture and Cooperatives, 85.90% of the income came from crops while the remaining 12.58% and 2.52% were incomes from livestock and others. In comparison between regions, the central part had the highest annual income per household, i. e. 65,620.69 baht followed by the south 34, 676.06 baht and the north 30,926 baht while the northeast had the lowest income of 12,696.48 baht per year. Agricultural expenditures for the central part, south, north and northeast were 53%, 29%, 47% and 49% of the income from agriculture respectively[2].

Farmers' Conditions

For years Thailand has been exporting its surplus produce into the world market without government subsidy. In other words the rise and fall in the world market prices affect farmers directly. Since the position of farmers is different from that of a business enterprise where any costs incurred are used as a basis for fixing selling prices, even when prices fall sharply farmers still have to sell their products and struggle with the decline in their living standard. As far as the current situation of rice marketing in Thailand is concerned, it is not wrong to say that even when prices in the world market rise only a small fraction of the benefit goes to rice farmers.

Rice production in Thailand especially in the northeast has been uneven because of drought, flood and pests. This caused instability of both prices and income at farm level. The farm price of rice received by farmers varies widely and frequently. Prices steadily decrease from October to December when first crop is harvested then increase until April, and decrease again in May when the second crop comes in. Prices then gradually increase until reaching the peak in September[3]. However since most farmers are poor they have to sell their rice immediately after the harvest at the time when prices are low. During the cultivation period when prices reach peak levels farmers do not benefit because they have already sold their rice.

The present local market structure for rice is disadvantageous to farmers. Even though the number of farmers is much more than that of the merchants they are not well united. Cooperatives and other farmer groups are not strong enough to have any real bargaining power with merchants. Despite an increase in Bangkok wholesale and export prices, farm prices remain low or increase very little.

Chapter III

Rice Production in the Northeast

Number of Farm Holdings

According to the report of the 1988 intercensal survey of agriculture conducted every 10 years by the National Statistical Office, Office of the Prime Minister[4], the total number of farm holdings in the northeast region was 2.2 million. The largest number found in Nakhon Ratchasima was 237,523 (10.9%) and the smallest in Mukdahan, 31,779 (1.5%).

The number of holdings was classified into 4 sizes, under 6 rai, 6-9.9 rai, 10-39.9 rai and 40 rai and over. As shown in Table 5 below the majority of holdings (68.54%) was in the size of 10-39.9 rai whereas the minority (7.20%) was in the size of under 6 rai.

Table 5. Number of farm holdings by size of holdings

Size of holding	No. of holdings			Percentage			Percentage of change	
	1978	1983	1988	1978	1983	1988	1983/78	1988/83
Total no. of holdings	1,660,172	1,899,365	2,179,562	100.00	100.00	100.00	+14.41	+14.75
Without land	12,966	661	281	0.78	0.04	0.01	−94.90	−57.49
With land	1,647,206	1,898,704	2,179,281	99.22	99.26	99.99	+15.27	+14.78
Under 6 *rai*	157,003	151,647	156,920	9.46	7.98	7.20	− 3.41	+ 3.48
6 − 9.9 rai	176,159	197.827	224,634	10.61	10.42	10.31	+12.30	+13.55
10 −39.9 rai	1,035,451	1,247,923	1,493,807	62.37	65.70	68.54	+20.52	+19.70
40 rai and over	278,593	301,307	303,920	16.78	15.86	13.94	+ 8.15	+ 0.87

Source: Office of the Prime Minister, 1988.

According to the survey, the total area of farm holdings in the northeast region was 49.4 million rai. Of these rice alone occupied 33.9 million rai (68.7%), followed by field and vegetable crops 11.2 million rai (22.6%), permanent crops 807,793 rai (1.6%). Pasture, forest and other areas totalled 3.5 million rai (7.1%).

Production of Rice

The seventeen provinces in the northeastern region make up about one third of the total area of Thailand. Farmers in this region grow both glutinous and non-glutinous rice. Non-glutinous rice is for sale while glutinous rice is mostly for home consumption. Generally the planted area for glutinous rice for the whole kingdom is around 18-21 million rai depending on rainfall and rice prices. Total production is between 5 and 6 million tons (rice grain). Eighty percent of the total cultivated area for glutinous rice is in the northeast while the remaining 20% is shared between the North (17%) and the Central plain and the South (3%). During the period 1984-87 production of glutinous rice dropped by 3.06% due to the decrease in cultivated area. The reduction in cultivated area could be attributed to i) lack of motivation due to low price resulting from over supply, and ii) the government's policy which encouraged farmers to grow more non-glutinous rice[3].

Table 6 shows the production cost of rice in each region during the period 1988/89-1990/91. The region which has the lowest production costs per rai for both 1st and 2nd crops is the northeast. However when it comes to average cost per ton the northeast and the south have the highest cost of production.

About 36% of rice produced in the Northeast is for home consumption, 3% for seed, and 10% for payment of labor and debts. The remaining 51% is sold in the market[3]. Surin, Buri Rum, Nakorn Ratchasima, Si Sa Ket, Ubon Ratchathani and Roi-Et are provinces which produce rice exceeding local demand. They then sell their surplus rice to deficit areas nearby.

Table 6. Production cost of rice by region, crop year 1988/89-1990/91

	1988/89					1990/90					1990/91				
	North	Center	N-East	South	Average	North	Center	N-East	South	Average	North	Center	N-East	South	Average
First Crop															
Variable cost (baht/rai)	858.39	852.70	658.06	737.74	751.81	831.92	821.60	668.14	865.96	743.63	882.53	823.36	682.79	875.52	766.05
Fixed cost (baht/rai)	190.43	193.52	154.29	148.28	170.81	190.77	187.65	151.47	163.44	169.21	190.77	187.65	151.47	163.44	169.21
Total cost (baht/rai)	1,048.82	1,046.22	812.35	886.02	922.62	1,022.69	1,009.25	819.61	1,029.40	912.84	1,073.30	1,011.01	834.26	1,038.96	935.26
Average cost (baht/tom)	2,615.51	2,760.47	3,594.47	3,587.13	3,065.18	2,563.13	2,662.93	3,548.09	3,914.07	3,032.69	2,802.35	3,498.30	3,634.06	4,139.28	3,376.39
Second Crop															
Variable cost (baht/rai)	1,346.06	1,415.62	1,118.92	1,194.44	1,365.58	1,368.77	1,206.58	1,063.07	1,078.61	1,232.78	1,411.40	1,459.80	1,084.66	1,214.93	1,393.82
Fixed cost (baht/rai)	158.83	172.29	136.04	141.54	165.04	158.83	172.29	136.04	141.54	165.38	158.83	174.96	136.04	141.54	165.94
Total cost (baht/rai)	1,504.89	1,587.91	1,254.96	1,335.98	1,530.62	1,527.60	1,387.87	1,199.11	1,220.15	1,398.16	1,570.23	1,634.76	1,220.70	1,356.47	1,559.76
Average cost (baht/rai)	2,355.07	2,377.11	2,561.14	2,923.37	2,402.86	2,273.21	4,419.45	2,601.11	4,485.85	3,452.25	2,299.02	2,554.31	2,647.94	3,034.61	2,523.88

Source: MOAC, 1991.

Marketing of Rice

Figure 2 illustrates the marketing channels of rice in the Thailand. Paddy on farm is sold to local middlemen, e. g. village assemblers, district assemblers and district or provincial rice mills. Farmers also sell their rice to Cooperatives or other farmers' groups and sometimes to government rice purchasing programs. More rice is sold to district assemblers and provincial rice mills than to village assemblers and village rice mills. This is because the first two have more purchasing power than the latter-mentioned and at the same time they also have trucks to transport rice from the villages to rice mills. The prices received by farmers depend on the current market situation. Lately communications and transportation between rural and urban areas have become more convenient, district and provincial assemblers can directly contact farmers in villages. The role of village assemblers has gradually reduced.

The marketing system of rice in the Northeast is similar to those in other regions. It can be classified into three levels : farm, provincial and regional or into two channels : private and governmental. The trading center, Bangkok, collects rice from producing areas, distributes to deficit regions, and exports to foreign countries. As mentioned earlier, though both glutinous and non-glutinous rice are produced in the Northeast most glutinous rice is kept for home consumption. Only non-glutinous rice is marketed and plays an important role in the region's trade.

Rice Mills

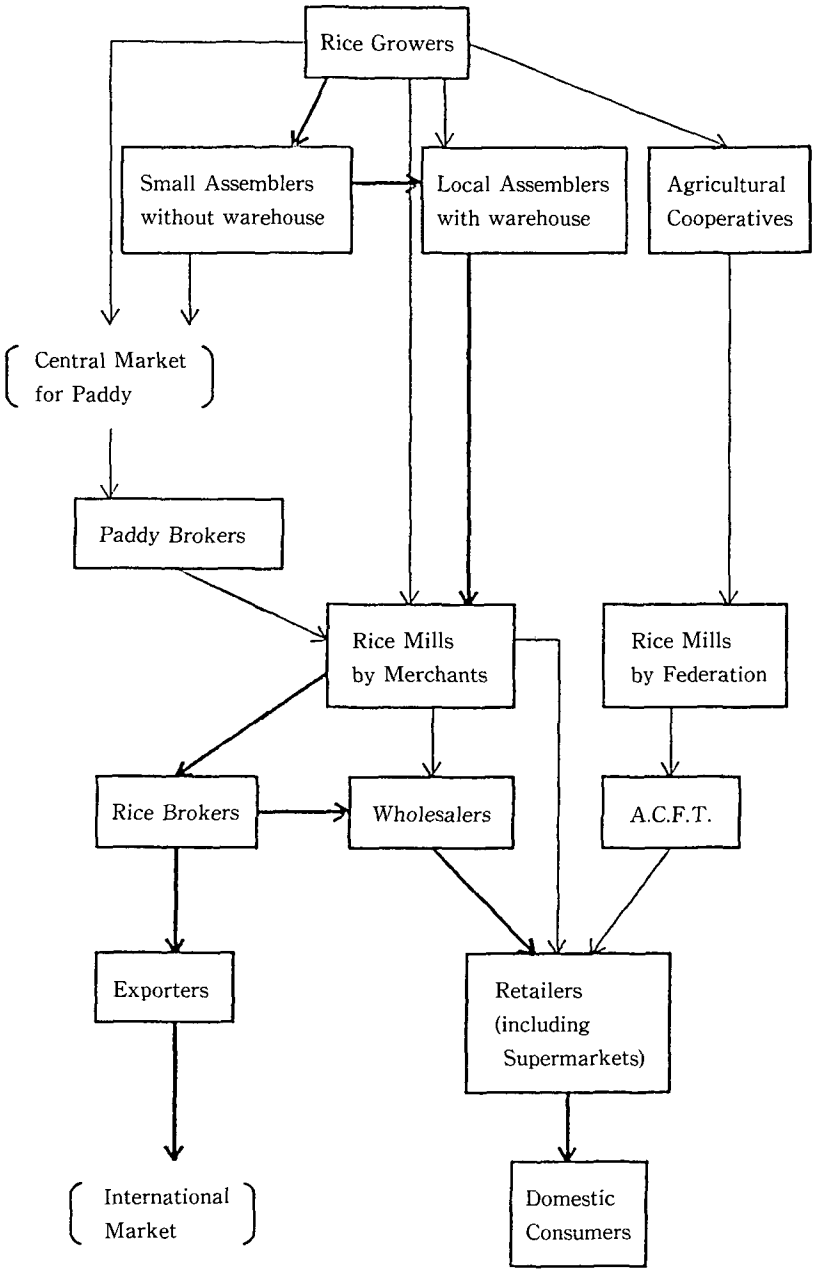
Rice millers buy paddy from farmers and assemblers. After processing, they sell the rice to wholesalers and exporters. Large commercial mills with processing capacities of 15-300 tons of paddy per day are located in town. Small mills with processing capacities of less than 3-4 tons are located in villages and small consumption areas. These small rice mills polish rice for farmers in return for bran and broken rice. Rice processed by small mills is normally for local consumption while large mills supply other areas. The number of rice mills by region and by capacity is given in Tables 7 and 8 below.

The number of rice mills in each region decreased annually (Table 7). In the

Table 7. Number of rice mills by region, 1986-1990

	Northeast	North	Central	South	Total
1986	25,907	10,970	5,530	4,538	46,945
1987	25,774	10,834	5,516	4,513	46,637
1988	25,689	10,704	5,508	4,497	46,398
1989	25,584	10,618	5,475	4,448	46,125
1990	25,516	10,543	5,467	4,430	45,956

Source: MOAC, 1991.



Source: Hokkaido University, 1993.

* Agricultural Cooperatives Federation of Thailand

Figure 2. Marketing channels of rice in Thailand

northeast the number decreased from 25,907 in 1986 to 25,516 in 1990. However, it still had the largest number of rice mills (55%) followed by the north (23%), central part (12%) and south (10%).

In 1984 out of 816 rice mills with milling capacity of 25 *kwien*/day or more 349 or 43% were located in the central part. Although the largest number of rice mills was found in the northeast, 99% of them were those with milling capacity of less than 25 *kwien*/day (Table 8).

Table 8. Number of rice mills by capacity, 1984

	Milling Capacity Less than 25 kwien/day	Milling Capacity More than 25 kwien/day	Total
North	10,504	199	10,703
Northeast	25,793	265	26,058
Center	5,475	349	5,824
South	4,803	3	34,806

Source: Siamwalla et al, 1990.

Large rice mills in the northeast mill paddy all year round but more during the periods when rice prices are high. Paddy can be stored by local assemblers or rice mills for 4-5 months. Polished rice can be stored only 2-3 months after which the grain turns yellow and quality declines.

In 1980, 83.4% of the storage space available belonged to middlemen and rice mills (Table 9). Of the total storage space in the northeast 1.16 million tons or 79% belonged to middlemen or rice mills.

Table 9. Warehouse capacity in 1980 (Unit: 1,000 tons)

	Center	North	N-East	South	Total	%
Middleman and Rice Mills	1,007	531	1,161	24	2,724	83.4
Agricultural Cooperatives	95	46	96	–	237	7.2
Famers' Groups	–	–	17	–	17	0.5
Government Organizations	97	0.2	168	–	290	8.9
Total	1,200	577	1,466	24	3,267	100.0

Source: Bank of Thailand.

Selling Prices of Rice

Rice which is being traded domestically or internationally is not of a single kind nor is being traded at a single place. Rice prices therefore differ according to its type, quality and trading location. Prices also fluctuate according to supply and demand.

Three main factors can be said to contribute to wholesales prices in Bangkok. They are (i) the current situation of the international rice trading, (ii) the demand for domestic consumption, and (iii) the conditions of rice production within the country. These three factors set up an initial price at Bangkok

market since Bangkok serves as a center where demands both locally and internationally are matched with existing supply. Exporter serves as coordinator between demand from abroad and suppliers, i. e. farmers and rice mills.

Generally domestic prices are also fixed in Bangkok since Bangkok is the largest rice trading place catering to the different needs of different wholesalers. There are those who deal with rice for consumption in Bangkok, those dealing with exports, and those who channel rice to various parts of the country. Prices of polished rice offered by exporters have great impact on rice mills. Consequently rice mills pass such impact onto merchants who naturally pass it onto rice farmers.

At the beginning of the harvest season, i. e. from November to March, there is an oversupply of rice in the market since most farmers are in need of money and have to sell their rice immediately. This phenomenon causes prices to be lower than at the end of the season.

Table 10. Rice prices, 1986-1990 (baht/ton)

	1986	1987	1988	1989	1990
Farm price (rice grain 5%)	2,420	2,862	4,170	4,207	3,831
(polished rice 5%)	3,667	4,321	6,318	6,374	5,805
Bangkok wholesales price (rice 5%)	4,694	5,420	6,437	7,156	6,413
FOB price (rice 5%)	5,495	5,903	7,595	8,203	7,336

Source: MOAC, 1992.

Table 10 gives farm gate prices, wholesales prices in Bangkok and export prices during the period 1986-90. It should be noted that farm gate prices are for paddy while the wholesales and export prices are for polished rice. After milling 1 *kwien* of rice produces a total of 650-670 kg of polished and broken rice[1]. In order to compare these prices in Table 10 above farm gate prices are given in two forms : (a) what farmers get for 1 ton of paddy, and (b) what merchants have to pay for 1 ton of polished rice.

Chapter IV

Alternate Crops

As the number of rice exporting countries continues to grow and the world prices of rice continue to be low and unstable, many farmers would certainly wish to switch to other crops with better potentials. In this and the following chapters we will look into the current situation of a number of crops which are less likely to suffer from the general overcapacity in the market. We will concentrate our study on crops which grow well under the climate and soil condition of the northeast. In fact besides rice, which in 1988/89 accounted for 23.43% of the total income per household, a variety of produce has already been a source of income

for people in the northeast.

We learned from Chapter III that around 50% of rice produced in the northeast is sold in the market and the rest is kept for home consumption. That is to say even if farmers in the northeast were to switch to other crops they would continue to grow glutinous rice for their own consumption.

Factors affecting productivity can be categorized as internal and external. The internal factor is the attitude and desire of the farmers themselves. The external factor, which is not under the farmers' control and is vital to support the production, includes marketing, financial source and agricultural technology. The importance of these factors should not be overlooked if we are to transform the current farming into a more commercialized one.

In trying to compare the cost-return between growing rice and other crops in the northeast the performances of various commercial crops cultivated in Thailand during the past 3-5 years are reviewed. Crops which are not suitable for land condition of the northeast and do not have any marketability potentials are not presented in this report.

Rice and its current situation has already been discussed in the previous chapters. We shall now take a look at crops, which in 1988/89, contributed substantially to farmers' income per household in the northeast.

Maize

The overall planted area for maize during the past five years decreased at the rate of 2% annually because of low prices. However yield per rai rose 3.74% due to favorable climatic conditions and greater use of hybrid seeds which produce higher output.

With the rapid expansion of the animal feed industry domestic demand for maize increased to 18.62% in 1991/92 or around 3 million ton. Exports were on a decline because exporters had to compete with animal feed industry in purchasing maize resulting in higher prices. This made it difficult to compete with other exporting countries, e. g. China. In 1991 Thailand's maize exports totalled 1.23 million ton, worth 3.9 million baht, decreased 1% in volume and 5% in value. However average farm price was 2.67 baht per kilogram, a 5% increase from the preceding year[5]. Japan was the main market for maize exports, accounting for 80% of overseas sales.

In 1992 the government fixed the domestic low and high prices of maize per kg at 3.10 baht and 3.80 baht accordingly. Import duty was fixed at 6% but could be reduced if domestic prices exceeded the high price of 3.80 baht. Likewise if domestic prices fall below the low price of 3.10 baht a surcharge will be added to import prices.

From Table 11 below an average yield per rai in the northeast was highest in 1988/89 at 419 kg/rai. With high yield and good farm price, return per rai for maize farmers during that year was 1.7 times of the previous year.

Table 11. Production cost and return of maize in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	689	326	2,63	857	168
1988/89	752	419	2.90	1215	463
1989/90	742	385	2.54	977	236
1990/91	*756	372	2.67	993	237

Source: MOAC, 1990, 1991, 1992.

*estimated figure from whole country average

Based on the current situations both at home and abroad a total production of 4.3 million tons is considered adequate for the continued increase in the domestic consumption and also sufficient for exporting. The government hopes to accelerate the production in the 10 provinces to 450 kg/rai so that the overall production from the existing planted area of 10.5 million rai would reach the ideal figure of 4.3 million tons.

Cassava

Cultivated area for cassava increased steadily until 1986 when there was an oversupply in the market and prices went down. The cultivated area for cassava shrinked to 7.7 million rai with a total production of 15.25 million tons. This in turn caused the prices to go up and consequently the cultivated area to increase. However the cultivated area started to decline after reaching 10.13 million rai with a total production of 24.26 million tons in 1989. In 1991 the total cultivated area for cassava was 9.32 million rai and the total production 19.70 million tons. Out of this 12.12 million tons (61.5%) came from the northeast.

In 1991 Nakhon Ratchasima was the largest producing province in order of planted area (1.98 million rai) followed by Chaiyaphum (0.53 million rai). The smallest producing province was Yasothon with the planted area of 48,901 rai. In terms of quantity Nakhon Ratchasima produced the largest (over 4.3 million tons or 32% of the total production). The other provinces whose production exceeded 1 million tons were Chaiyaphum and Udon Thani.

Demand of sugar cane caused by an expansion in sugar manufacturing capacity tempted cassava farmers in the northeast and the central region to switch to planting sugar cane instead. At the same time some provinces in the central-southern region switched to planting fruits, para rubber, potatos or maize. These were major causes for the decrease in the cassava cultivated area.

Although shredded cassava and cassava pellets remained important agricultural products exported to the EC and non-EC markets, export of cassava starch accelerated. This was because of the high price of potato flour and an increase in the number of manufacturing industries such as food processing, paper, textiles, etc. which require starch for their production. The market for cassava starch from Thailand increased considerably because of its good quality and

lower prices. In 1991 Thailand exported 750,000 tons of starch, an increase of 109,713 tons from the previous year[5].

Trading of cassava with the EC is bound by an agreement which Thailand signed with the EC on 27 April 1990 covering a period of 4 years (1991-94). The important content of the agreement is given below :

1. Total export for 4 years (1991-94) shall be 21 million tons (unchanged from the earlier agreement (1987-90)). However annual export quota increased from 5.5 to 5.75 million tons.
2. Advanced quota allowed during the final year of the agreement is increased from 500,000 to 600,000 tons and may start from July instead of October.
3. 6% import tax remained unchanged from earlier agreements.

The ratio of non-EC to EC exports was 1 : 1.3 in the early part of 1989, and later reduced to 1 : 1.1. Non-EC countries imported more cassava to substitute for other cereals such as maize and sorghum whose prices had increased.

In 1991 exports of cassava products amounted to 7.05 million tons, worth 24, 388 million baht, a decrease of 13% in volume but an increase of 5% in value compared to the previous year[5]. Since then cassava trade became more active because the Ministry of Commerce adjusted its policies for allocating export quotas. At the same time cassava flour industry also expanded. Greater competition between two industries : sun-dried cassava and cassava flour pushed the prices to go up. Farmers could sell their fresh cassava roots for an average price of 0.83 baht per kg, an increase of 33% over the previous year. However a decline in cassava demand in the world market is evident. The maximum import by the EC is 5.7 million tons which may increase to 6.4 million tons during the last agreement year. Countries outside the EC-Eastern Europe and Russia have reduced their purchase due to lack of foreign currency, while Israel, Japan, South Korea and U.S.A. needed less animal feed and therefore reduced their import of cassava pellets. Prices of cassava roots depends on the world market situation and the total amount produced. Cassava is used as one of the ingredients in the animal feed and can be substituted by other produce such as maize, sorghum and soybean. Correlation of prices among these products is therefore inevitable.

Table 12 below gives an average production cost, yield per rai, selling prices

Table 12. Production cost and return of cassava in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	884	2208	0.89	1965	1081
1988/89	899	2210	0.61	1348	449
1989/90	1022	2369	0.56	1326	304
1990/91	1057	2169	0.62	1345	288

Source: MOAC, 1990, 1991, 1992.

and returns of cassava in the northeastern part of Thailand. In 1989 production cost increased 13% from the previous year while farm price went down 8%.

Mungbean

Mungbean has been one of the popular economic crops among farmers in the lower north, central part and the northeast. Mungbean can be cultivated during any season throughout the year. During crop year 1991/92 the cultivated area for mungbean was 2.65 million rai with a total production of 301,000 tons.

Sixty percent of mungbean is consumed within the country, for making starch, noodle, bean sprout, etc. Nonetheless export prices do affect domestic prices. Table 13 which covers crop years 1987/88-1990/91 gives a pessimistic outlook on the future of mungbean. However since 1991 demand for mungbean has been on a rise locally sending the farm price to soar as high as 11.64 baht/kg in 1992[6]. With an increase in domestic demand for processed food as mentioned above it is expected that prices will remain at this level or even be higher.

Table 13. Production cost and return of mungbean in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	468	94	7.94	746	278
1988/89	532	109	8.59	936	404
1989/90	565	112	6.36	712	147
1990/91	665	103	6.20	639	−26

Source: MOAC, 1990, 1991, 1992.

Soybean

During the past years cultivated area and production of soybean increased at the rate of 12% and 16% respectively. However yield per rai increased by a mere 3.7%. This might be because farmers expanded their cultivated land into area where soybean had never been planted before.

Domestic demand of soybean for use in the cooking oil and animal feed industries increased annually from 656,550 tons in 1987/88 to 1.14 million tons in 1990/91. Eighty percent of the soybean produced in the country is used in the making of cooking oil. Soybean cake is subsequently used to produce animal feed. Import of soybean, soybean cake and cooking oil made from soybean required prior government approval. In 1989/90 the government relaxed its rule and allowed for the free import of soybean cake. However a surcharge is collected from the difference between the import and domestic prices. In 1990/91 Thailand imported a total of 455,606 tons of soybean cake mostly from China. In order to reduce the amount imported, the government had implemented a 5-year plan (1989/90-1993/94) to increase the production of soybean within the country.

Table 14. Production cost and return of soybean in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	944	183	8.63	1579	635
1988/89	1039	197	8.29	1633	594
1989/90	1123	211	7.26	1531	408
1990/91	1220	202	7.49	1513	293

Source: MOAC, 1990, 1991, 1992.

Table 14 above gives an average production cost, yield per rai, selling prices and returns of soybean in the northeastern part of Thailand. In 1990/91 although farm price increased by 3% increase in production cost of 8.6% from the previous year and decrease in yield per rai at 4% caused a 28% decrease in net return per rai.

Groundnut

Groundnut is cultivated in various parts of the country particularly in the north and northeast. Farmers usually plant groundnut alternately with rice and other crops. Although the returns were high compared with other crops as can be seen in Table 15 below they fluctuated more frequently and greatly. This

Table 15. Production cost and return of groundnut in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	1024	214	7.53	1611	587
1988/89	1078	226	7.95	1769	718
1989/90	1105	211	8.66	1827	722
1990/91	1146	218	7.92	1726	580

Source: MOAC, 1990, 1991, 1992.

made farmers reluctant to expand their cultivated area.

Ninety percent of the groundnut is consumed within the country ; the remaining 10% is exported. Expansion of export market is unlikely because the quality of groundnut cultivated in Thailand is rather poor. At the current rate of consumption within the country additional products can still be absorbed into the market.

Cotton

From 1987 to 1991, both cultivated area and production of cotton increased at an average of 11% and 14% respectively. Important cotton producing provinces in the northeast are Udon Thani, Loei and Nakorn Ratchasima. Farmers in these provinces expanded their cotton cultivated area since cotton prices during the past years were rather good compared with maize and soybean. Similar to

other crops, an increase in the total production of cotton was mainly because of an increase in the cultivated area not yield per rai.

Demand for cotton by textile industry in Thailand jumped threefold during the past five years. At present we can only supply 10% of the needed quantity the remaining 90% comes from import. High prices prompted several major cotton producing countries, e. g. China, India and U.S.A. to increase their production causing an oversupply. As a consequence a number of cotton exporting countries therefore sought to subsidize their cotton farmers in order to be able to compete in the world market.

Cotton prices in Thailand are heavily dependent on the world market prices

Table 16. Production cost and return of cotton in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	1922	187	12.32	2303	382
1988/89	1939	240	12.31	2954	1015
1989/90	2073	218	13.88	3025	953
1990/91	*2293	218	12.97	2827	534

Source: MOAC, 1990, 1991, 1992.

*estimated figure based on whole country average

since, as mentioned earlier, 90% of the cotton used comes from import.

Kenaf

Cultivated area and overall production of kenaf declined at an annual rate of 9.76% and 5.77% respectively. This was mainly because of unsteady prices causing farmers to switch to other crops which could earn them steady and better income. However, yield per rai increased due to the government effort in promoting better quality kenaf among farmers.

Most of the kenaf produced was supplied to local sack weaving industry. There are altogether 11 such factories in Thailand.

Synthetic fibers are another cause for the decline in demand for kenaf since these substitute fibers can be obtained at a lower price. Although Table 17 below gives a rather negative outlook for the production of kenaf in the north-

Table 17. Production cost and return of kenaf in the northeast

	Prod.Cost/rai (baht)	Avg.Yield/rai (kg)	Farm Price/kg (baht)	Return (baht) per rai	Return (baht) Net/rai
1987/88	794	170	4.14	704	−90
1988/89	877	192	4.46	856	−21
1989/90	890	195	6.03	1176	286
1990/91	*1026	203	4.53	919	−107

Source: MOAC, 1990, 1991, 1992.

*estimated figure based on whole country average

eastern region as a whole, the cost-return analysis in the following chapter which looks at kenaf production in each province shows some positive picture.

Chapter V

Comparison of Cost-Return between Rice and Other Crops

Under the climate, irrigation and soil conditions of the northeast only certain kinds of crops can be cultivated and produce satisfactory yields. In the previous chapter the performance of seven kinds of crops, namely maize, cassava, mungbean, soybean, groundnut, cotton and kenaf were reviewed. These crops have been chosen for this study because (i) they do not require special preparation of land before cultivation, (ii) they can withstand the severe conditions of the northeast during cultivation (since they have actually been grown there), (iii) they are non-perishables, (iv) there is still room for these crops in either domestic or international market, and most importantly (v) previous data is available.

Production cost and yield of each crop varied from province to province. To use average figures for the region would not represent an accurate picture. In this chapter we will look at the production cost and yield of these crops in each of the 17 provinces in the northeast.

Since only 6.7% of the agricultural land in the northeast is irrigated cultivation mainly depends on rain water. Climate condition therefore plays an important role in the productivity of crops in each year. To use data for a particular year, e.g. when the climate was favorable or unfavorable, would again be inaccurate. Therefore in comparing the cost-return of each crop average figures based on the past 3 years (1988/89-1990/91) are used.

The figures used for rice are from 1st crop since the cultivated area for 2nd crop in the northeast accounts for less than 2% of the total cultivated area.

Productivity

As mentioned above yield of each crop varied from province to province. Table 18 below provides a 3-year average for crops under study. Figures given in the books, Agricultural Statistics of Thailand, Crop Year 1990/91[7] and 1989/90[8] and Target for Important Agricultural Products, 1992[9] which are on a yearly basis were recalculated to provide for a 3-year average.

During the study period farmers in all the 17 provinces in the northeast grew rice. Among them Loei had the highest yield per rai (389 kg) followed by Kalasin (294 kg) while Nakhon Phanom had the lowest (220). It is worth noting that Loei is the only province in the northeast where its agricultural land is not classified as unsuitable for rice production.

Maize was grown in 9 provinces. Provinces with the highest yield per rai were Khon Kaen (463 kg) and Ubon Ratchathani (462 kg). The lowest maize producing province was Buri Ram (326 kg).

Table 18. Yield per rai (in kg) for crops under study by province 3-year average (1988/89-1990/91)

	1st Rice	Maize	Cassava	Mungbean	Soybean	Groundnut	Cotton	Kenaf
1. Nakhon Phanom	220		2078		*166	190	131	206
2. Sakon Nakhon	270		2144		168	203		193
3. Nong Khai	242		2138		207	177		177
4. Udon Thani	245	395	2203	101	199	221	199	185
5. Loei	389	393	2264	121	206	252	183	254
6. Mukdahan	248		2153		177	178	125	203
7. Yasothon	230		2183			203		198
8. Ubon Ratchathani	224	462	2219	108	*156	229	254	166
9. Kalasin	294	431	2144		167	213		238
10. Khon Kaen	279	463	2167	103	205	199		191
11. Maha Sarakham	237		2172		162	216		252
12. Roi Et	241		1969		146	193		199
13. Buri Ram	245	326	2193		162	206		180
14. Si Sa Ket	284	461	2237	93	162	230		228
15. Surin	258		2127		138	216		182
16. Chaiyaphum	259	335	2228	107	196	222	192	201
17. Nakhon Ratchasima	224	392	2348	102	203	227	304	204

Source: MOAC, 1990, 1991, 1992.

Note: Figures presented in the Table are recalculated ones

*two-year average

Cassava was cultivated in all the 17 provinces. Yield per rai was highest in Nakhon Ratchasima (2,348 kg) and lowest in Roi Et (1,969 kg).

Seven provinces in the northeast cultivated mungbean. Five had an average yield per rai of slightly above 100 kg while two, Loei and Si Sa Ket, had the highest and lowest yield per rai of 121 kg and 93 kg respectively.

All provinces except Yasothon grew soybean. Soybean productivity varied significantly from province to province. Nong Khai had the highest yield per rai (207 kg) while Surin the lowest (138 kg).

Groundnuts were cultivated in all the provinces. Provinces with the highest and lowest yield per rai were Loei (252 kg) and Nong Khai (177 kg) respectively.

Among the 7 cotton producing provinces in the northeast, Nakhon Ratchasima had the highest yield per rai (304 kg) followed by Ubon Ratchathani (254 kg) while Mukdahan had the lowest (125 kg).

Kenaf was grown in 14 provinces in the northeast. Provinces with the highest yield per rai were Loei (254 kg) and Maha Sarakham (252 kg). Ubon Ratchathani had the lowest yield per rai of 166 kg.

Productivity-wise Loei had the highest yield per rai for rice and also for 3 out of the 7 crops under study, namely mungbean, groundnut and kenaf. Nong Khai had the highest yield for soybean but at the same time produced the poorest yield for groundnut.

Table 19. Production cost (baht/kg) for crops under study by province 3-year average (1988/89-1990/91)

	1st Rice	Maize	Cassava	Mungbean	Soybean	Groundnut	Cotton	Kenaf
1. Nakhon Phanom	3.73		0.46		6.79	5.74	15.31	4.29
2. Sakon Nakhon	3.04		0.44		6.71	5.37		4.57
3. Nong Khai	3.39		0.44		5.44	6.17		4.99
4. Udon Thani	3.35	1.89	0.43	5.81	5.66	4.94	10.08	4.77
5. Loei	2.11	1.90		5.47	4.33	10.96	3.47	
6. Mukdahan	3.31				6.37	6.13	16.05	4.35
7. Yasothon	3.57		0.44			5.46		4.46
8. Ubon Ratchathani	3.66	1.61	0.43	5.43	7.22	4.63	7.89	5.32
9. Kalasin	2.79	1.73	0.44	6.75	5.12		3.71	
10. Khon Kaen	2.94	1.61	0.44	5.70	5.50	5.48		4.62
11. Maha Sarakham	3.46		0.44		6.96	5.05		3.50
12. Roi Et	3.41		0.48		7.72	5.65		4.44
13. Buri Ram	3.35	2.29	0.43		6.69	5.30		4.91
14. Si Sa Ket	2.89	1.62	0.42	6.69	4.74		3.87	
15. Surin	3.18		0.45		5.44	5.05		4.85
16. Chaiyaphum	3.17	2.23	0.43	5.40	5.75	4.91	10.45	4.39
17. Nakhon Ratchasima	3.66	1.90	0.41	5.75	5.55	4.81	6.59	4.33

Source: MOAC, 1990, 1991, 1992.

Note: Figures given the Table are recalculated ones.

Production Cost

Figures given in Table 19 above are the results of a calculation using yearly figures provided in the books, Agricultural Statistics of Thailand, Crop Year 1990/91[7] and 1989/90[8] and Target for Important Agricultural Products, 1992[9]. Drought and plant diseases were major causes in low yield and high production cost in some provinces.

Provinces which had the highest production cost of rice are Nakorn Phanom (3.73 baht/kg), Ubon Ratchathani and Nakhon Ratchasima (3.66 baht/kg). Loei has the lowest production cost of rice among the 17 provinces (2.11 baht/kg).

Nine provinces in the northeast grew maize. Production cost for Buri Ram was the highest (2.29 baht/kg) while Ubon Ratchathani and Khon Kaen the lowest (1.61 baht/kg).

Except Loei and Mukdahan the remaining provinces in the northeast planted cassava. There was no significant differences in the production cost which was between 0.41 baht (Roi et) and 0.48 baht (Nakhon Ratchasima) per kg.

Among the 8 provinces cultivating mungbean Kalasin had the highest production cost (6.75 baht/kg) while Chaiyaphum the lowest (5.40 baht/kg).

Production cost for soybean varied greatly. The highest was 7.72 baht/kg (Roi Et) and the lowest baht 4.33/kg (Loei). Another province whose production cost was above 7 baht/kg was Ubon Ratchathani (7.22 baht/kg).

Loei had the highest production cost for groundnut (10.96 baht/kg) while

Ubon Ratchathani had the lowest (4.63 baht/kg). All other provinces produced groundnut at the cost of between 5 and 6 baht/kg.

Production costs for cotton for some provinces namely Loei, Kalasin and Si Sa Ket were as low as 3.47 baht, 3.71 baht and 3.87 baht per kg respectively. At the same time cotton production cost as high as 16.05 baht/kg in Mukdahan and 15.31 baht/kg in Nakhon Phanom.

Most provinces produced Kenaf at a cost of a little below 5 baht/kg except Ubon Ratchatani (5.32 baht/kg) and Maha Sarakham (3.50 baht/kg).

Returns

Two categories of returns are presented here. First, return per kg which is simply the result of a subtraction of production cost from farm price (Table 20). Second, return per rai which takes into account yield per rai (Table 21). Figures given in both Tables 20 and 21 have been calculated using yearly figures provided in the books, Agricultural Statistics of Thailand, Crop Year 1990/91[7] and 1989/90[8] and Target for Important Agricultural Products, 1992[9].

From Table 21 we will look at crops which generated return higher than rice in each province.

Nakhon Phanom - because of poor yield and high production cost return from rice was the lowest in the northeast (17.60 baht/rai). Cassava seemed to be

Table 20. Farmers' returns (baht/kg) for crops under study by province 3-year average (1988/89-1990/91)

	1st Rice	Maize	Cassava	Mungbean	Soybean	Groundnut	Cotton	Kenaf
Nationwide Farm Prices	3.81	2.70	0.69	6.95	7.68	6.83	13.05	5.28
1. Nakhon Phanom	0.08		0.23		0.89	1.09	−2.26	0.99
2. Sakon Nakhon	0.77		0.25		0.97	1.46		0.71
3. Nong Khai	0.42		0.25		2.24	0.66		0.29
4. Udon Thani	0.46	0.81	0.26	1.14	2.02	1.89	2.97	0.51
5. Loei	1.70	0.80		2.10	2.21	2.50	2.09	1.81
6. Mukdahan	0.50				1.31	0.70	−3.00	0.93
7. Yasothon	0.47		0.25			1.36		0.82
8. Ubon Ratchathani	0.15	1.09	0.26	1.52	0.46	2.20	5.16	−0.04
9. Kalasin	1.02	0.97	0.25		0.93	1.71		1.57
10. Khon Kaen	0.87	1.09	0.25	1.46	2.18	1.35		0.66
11. Maha Sarakham	0.35		0.25		0.72	1.78		1.78
12. Roi Et	0.40		0.22		−0.04	1.18		0.84
13. Buri Ram	0.46	0.41	0.26		0.99	1.53		0.37
14. Si Sa Ket	0.92	1.08	0.27	0.64	0.99	2.09		1.41
15. Surin	0.63		0.24		−0.49	1.78		0.43
16. Chaiyaphum	0.64	0.47	0.26	1.55	1.93	1.92	2.60	0.89
17. Nakhon Ratchasima	0.15	0.80	0.28	1.20	2.13	2.02	6.46	0.95

Source: MOAC, 1990, 1991, 1992.

Note: Figures given in the Table are recalculated ones.

Table 21. Farmers' returns (baht/rai) for crops under study by province 3-year average (1988/89-1990/91)

	1st Rice	Maize	Cassava	Mungbean	Soybean	Groundnut	Cotton	Kenaf
1. Nakhon Phanom	17.60		477.94		147.74	207.10	−296.06	203.94
2. Sakon Nakhon	207.90		536.00		162.96	296.38		137.03
3. Nong Khai	101.64		534.50		463.68	116.82		51.33
4. Udon Thani	112.70	319.95	572.78	115.14	401.98	417.69	591.03	94.35
5. Loei	661.30	314.40		254.10	455.26	630.00	382.47	459.74
6. Mukdahan	124.00				231.87	124.60	−375.00	188.79
7. Yasothon	108.10		545.75			276.82		0.82
8. Ubon Ratchathani	336.00	503.58	576.94		71.76	503.80	1310.64	−6.64
9. Kalasin	299.88	418.07	536.00		155.31	364.23		373.66
10. Khon Kaen	242.73	504.67	541.75	156.22	446.90	268.65		126.06
11. Maha Sarakham	82.95		543.00		116.64	384.48		448.56
12. Roi Et	96.40		433.18		−5.84	227.74		167.16
13. Buri Ram	112.70	133.66	570.18		160.38	315.18		66.60
14. Si Sa Ket	261.28	497.88	603.99	59.52	160.38	480.70		321.48
15. Surin	162.54		510.48		−67.62	384.48		78.26
16. Chaiyaphum	165.76	157.45	579.28	165.85	378.28	426.24	499.20	178.89
17. Nakhon Ratchasima	33.60	313.60	657.44	122.40	432.39	458.54	1963.84	193.80

Source: MOAC, 1990, 1991, 1992.
Note: Figures given the Table are recalculated ones.

the only crop which could generate reasonable return (477.94 baht/rai) for farmers in this province.

Sakon Nakhon - return from rice was 207.90 baht/rai. Cassava and groundnut generated higher returns of 536 baht/rai and 296.38 baht/rai respectively.

Nong Khai - return for rice was 101.64 baht/rai. Except Kenaf all other crops under study and currently grown in Nong Khai generated higher returns for farmers than rice. These crops were Cassava (534.50 baht/rai), soybean (463.68 baht/rai) and groundnut (116.82 baht/rai).

Udon Thani - the situation in Udon Thani was similar to that in Nong Khai, that is, except Kenaf all other crops grown there generated higher income than rice did. Return for rice was 112.70 baht/rai while returns per rai for other crops are as follows : maize (319.95 baht), cassava (572.78 baht), mungbean (115.14 baht), soybean (401.69 baht), groundnut (417.69 baht), and cotton (591.03 baht).

Loei - as mentioned earlier Loei is the only province in the northeast where agricultural land is not classified as unsuitable for rice production. Loei's return from rice was the highest in the northeast (661.30 baht/rai). In fact most of the crops grown in the province generated good returns, e. g. groundnut (630 baht/rai) and kenaf (459.74 baht), the highest among other provinces.

Mukdahan - besides rice four other crops were cultivated in Mukdahan, namely soybean, groundnut, cotton and kenaf. Except cotton the three crops generated better returns than rice (124 baht/rai). The returns per rai for these

crops were as follows : soybean (231.87 baht), groundnut (124.60 baht) and kenaf (188.79 baht).

Yasothon - return from rice was 108.10 baht/rai while those from cassava and groundnut were 545.75 baht and 276.82 baht respectively.

Ubon Ratchathani - the province received high returns for most of the crops it cultivated, especially from cotton (1,310.64 baht/rai). While return from rice was 336 baht/rai, those from maize, cassava and groundnut were 503.58 baht, 576. 94 baht and 503.80 baht respectively.

Kalasin - return from rice was 299.88 baht/rai. Except for soybean whose return was lower than that of rice, the other crops generated higher returns than rice. Returns per rai for these crops were as follows : maize (418.07 baht), cassava (536 baht), groundnut (364.23 baht) and kenaf (373.66 baht).

Khon Kaen - return from maize for Khon Kaen was the highest in the northeast (504.67 baht/rai). Crops which generated return per rai higher than rice (242.73 baht) were cassava (541.75 baht), soybean (446.90 baht) and groundnut (268.65 baht).

Maha Sarakram - return from rice for the province was among the lowest in the northeast (82.95 baht/rai). Other crops provided for the following return per rai : cassava (543 baht), soybean (116.64 baht), groundnut (384.48 baht) and kenaf (448.56 baht).

Roi Et - another province whose return from rice was among the lowest (96. 40 baht). Except soybean the other three crops generated return per rai higher than rice. They were cassava (443.18 baht), groundnut (227.74 baht) and kenaf (167.16 baht).

Buri Ram - although return from maize for the province was the lowest among other provinces (133.66 baht/rai), it was still higher than that from rice (112.70 baht/rai). Other better income generating crops were cassava (570.18 baht), soybean (160.38 baht) and groundnut (315.18 baht).

Si Sa Ket - return from rice was 261.28 baht/rai. Higher returns per rai generated by maize, cassava, groundnut and kenaf were 497.88 baht, 603.99 baht, 480.70 baht and 321.48 baht respectively.

Surin - return from rice was 162.54 baht/rai. Much higher return per rai were generated by cassava (510.48 baht) and groundnut (384.48 baht).

Chaiyaphum - except maize all crops cultivated in the province generated higher return than rice. While return from rice was 165.76 baht/rai return per rai for other crops were as follows : cassava (579.28 baht), soybean (378.28 baht), groundnut (426.24 baht), cotton (499.20 baht) and kenaf (178.89 baht).

Nakhon Ratchasima - return from rice was among the lowest in the northeast (33.60 baht/rai). At the same time returns from cassava (657.44 baht) and from cotton (1,963.84 baht) were the highest. Other crops also performed well in the province with the following returns per rai : maize (313.60 baht), mungbean (122.40 baht), soybean (432.39 baht), groundnut (458.54 baht) and kenaf (193.80

baht).

Chapter VI

Conclusion

By comparing production costs, yields and returns of different crops in different provinces we are able to identify crops which proved to generate high returns for each province.

It is evident that rice performed poorly in all the provinces in the northeast except in Loei where the agricultural land is not defined as unsuitable for rice production. Returns from rice were lower than those of cassava and groundnut in all provinces except Loei.

It was also found that yields and production costs for maize, soybean, groundnut, cotton and kenaf varied greatly among provinces while those of cassava and mungbean did not. These differences were mainly due to soil conditions, aridity and plant disease.

Cotton produced the highest return among crops under study. At the same time it also generated losses in some provinces where yield was poor.

Like rice farm prices of crops under study were mainly based on world market prices regardless the amount being exported or imported. Farmers were as usual put in the disadvantage position.

The market outlook showed that except kenaf whose demand is limited additional supply of crops under study can still be absorbed into the current market.

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