Changes in Agricultural Structure in North-Eastern Thailand

Moriyama, Hideo
Seminar of Farm Management, Faculty of Agriculture, Kyusyu University

Tsuchiya, Keizo
Seminar of Econometric Analysis in Agriculture, Faculty of Agriculture, Kyusyu University

https://doi.org/10.5109/23840

出版情報：九州大学大学院農学研究院紀要. 31 (1/2), pp.145-158, 1987-02. Kyushu University
バージョン：
権利関係：

J. Fac. Agr., Kyushu Univ., 31 (1•2), 145-158 (1987)

Changes in Agricultural Structure in North-Eastern Thailand

Hideo Moriyama and Keizo Tsuchiya*

Seminar of Farm Management, Faculty of Agriculture,
Kyusyu University 46-07, Fukuoka 812

* Seminar of Econometric Analysis in Agriculture,
Faculty of Agriculture, Kyusyu University 46-07,
Fukuoka 812

(Received July 29, 1986)

Farmers in the North-EasternThailand have suffered bitterly from poverty because of the unfavorable agroecological conditions. However, the irrigation development in this region has brought some changes in agriculture. In Khon Kaen Province the acreage of cultivated land has been expanded at a remarkable rate. But in the surveyed villages, the expansion of cultivated area in recent years was little. The data from the farm survey of 75 households show that the irrigation facilities brought about the decrease of damage from drought as well as the increase of average rice yield. The youngsters in their teens which consist of a high percentage of the population in the area will increase more number of the farm households after their marriage and as a result the amount of farm land per household will eventually decrease. By introducing the irrigation system into the rain-fed area it will become possible for farmers to support their families on a smaller size of farm.

INTRODUCTION

Farmers in the North-Eastern region suffered the bitterest poverty of those living in Thailand because of the unfavorable agroecological conditions. Crops harvested were few and those varieties were limited. In the years of drought, the people of the North-Eastern had to eat insects and roots of trees in order to survive. Laughter ceased in this area (Yoshikawa, 1966)

However, the establishment of irrigation system brought changes in agriculture and life-style.

In this paper we will discuss the improvement of agricultural development. We hope to examine the changes within the farm households and villages caused by development in irrigation system.

MATERIALS AND METHODS

The Nong Wai Pioneer Agricuture Project in North-Eastern Thailand was selected for our study. It will be possible to analyze the factors that bring about the development of agriculture, comparing the farm households in rain-fed area to households in the irrigated areas.

With the assistance of the Royal Irrigation Department, Ministry of Agriculture, the Kingdom of Thiland, we selected Dong Pong, Dong Yan and Song Pleuy villages as representative type of intensive irrigated villages, Noan, Ton and Bung Kae villages

as the extensive irrigated villages and Noan and Ton villages as the rain-fed villages.

With the help of the staffs and students of Kasetsart and Khon Kaen Universities, we collected farm survey data from a total of 75 farm households, from each area (10 in August 1984 and 15 in October 1985).

The improvements of agricultural productivity brought about by development in irrigation system were discussed using the crosssection analysis (Tsuchiya and Kai, 1987). In this paper, the changes in agricultural structure by means of the time-series analysis will be the main focus.

RESULTS

Rice planted areas and yield in Khon Kaen Province

In the fomer water transpotation custom, the when and the amount of rain that fell were the decisive factors that determined the extent of arable and planted land. Under these circumstances, the construction of dams and irrigation system and facilities played the most important role in the expansion of arable and planted areas. Furthermore, the farmers depended on rain to water crops, they did not plant paddy rice except in the rainy season. Not much attention was given to plant paddy rice during the dry season, but with the development in irrigation system, farmers were not only able to plant rice during the dry season but the productivity rate also remained constant during the rainy season.

As for the planted area of paddy rice field in Khon Kaen Province from 1963 to 1972, there are large differences between the smallest and the largest area. The smallest area was 719,613 rai (1972) and the largest area was 1,694,725 rai (1966), double the amount of the smallest area (Sanyu Consult. Inc., 197613). Consequently, the average rice planted area was 1,236,132 rai. When the planted area was smaller, in other words, during the year when planted rice was less, it can be said that the rate of damage was higher to planted area. There were also differences in the yield of paddy field rice per rai. The least one was calculated at 96 kg (1967) and the most one was 246 kg (1972). Except in 1967, during which time farm households suffered serious damage, the productivity rate was 200-240 kg per rai (Sanyu Consult. Inc., 1976b).

C. C. Zimmerman reported on the Phra Lap village in Khon Kaen Province in 1931 ; the average area of cultivated land was 7.77 rai per farm household. The yield of paddy field rice was 152.2 Tang per farm household (Zimmerman, 1931). Tang is a unit of capacity in popular. One Tang means in this case 20 litters unhulled rice (about 10 kg). From these data, the average yield per rai was 196 kg. This means the productivity rate increased only 10 to 20 per cent during these 40 years.

During the 1970's the total rice planted area in the rainy season increased from 1,500,000 rai to 2,000,000 rai in Khon Kaen Province. In 1983, it decreased to 1,650,000 rai, but in 1984, it recovered to 2,230,000 rai. However, the average rice yield per rai in North-Eastern Thailand was 70-80 percent of the national average which increased from 258 kg (1980) to 305 kg (1984). The average yield in Khon Kaen Province which is the district we have studied, was classified as a higher group in North-Eastern Thailand. It is difficult to keep up high yield every year. 185 kg in 1982 is one of the examples of low yield. However, the yield has increased slightly in rate since the 1960's (Table 1). As for the yield in the dry season, the average rice yield per rai both

Table 1. Planted Area and Average Yield by Regions and Provinces, Crop Year 1979/80 1983/84.

	Planted Area (1,000 rai)						Yield (kg/rai)					
	Whole Kingdom		North-Eastern		Khon Kaen		Whole Kingdom		North-Eastern		Khon Kaen	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1979/80	56,868	2,103	29,086	72	2,230	13	258	528	194	355	252	372
1980/81	56,882	3,227	28,224	148	1,986	39	284	608	210	432	238	471
1981/82	56,392	3,578	28,001	97	1,951	18	295	564	206	367	185	449
1982/83	56,171	3,963	26,607	219	1,649	73	284	531	206	378	249	401
1983/84	58,115	4,481	30,123	385	2,228	87	305	591	250	395	268	439

Source: The above data is taken from the "Agricultural Statistics of Thailand Crop Year 1983/84", Ministry of Agriculture and Co-operatives, 1984, pp. 30−39.

Note : 1) M. and S. denote Major Rice Crops and Second Rice Crops respectively.
2) 1 rai = 0.16 ha.

in North-EasternThailand and in Khon Kaen Province was also 70-80 percent of the national average. On the other hand, the planted area was greatly increased in North-Eastern Thailand, especially in Khon Kaen Province. One of the reasons is good weather, except in 1982. And another important reason is the dam construciton in Ubonrat (1962-1966).

We will show the average yield in which the surveyed village exists. It was 200-250 kg per rai in the 1960's, which was approximately the same as the national average, in recent years these yield was up to 400-500 kg per rai, above the national average. Reasons of increase are considered as follows : Making use of high yielding varieties of seeds, increasing the application amount of fertilizer, technical development of cultivation, etc.. Comparing irrigated paddy fields with non-irrigated (rain-fed) paddy fields, we realized the water supply in cases of necessity was the most important thing to increase agricultural development. Also, the expansion of planted areas and the growth of the yield per rai make it possible to increase the yield per farm household.

When the index numbers of rice prices in 1976/1977 was 100, it increased to 187 in 1980/1981. In recent years, the index of rice prices came down to 167 (Ministry of Agri. and Co-op., 1984) due to falling market prices and the nonadvancement of income per farm household.

It had been said that a normal yield of rice was difficult to decide upon in developing countries because of differences in the yield every year. We must emphasize that the water supply did much toward promoting a stable yield.

Number of farm households

Generally speaking, economic development diminishes farm households ; but in Thailand, the farm household has been increasing yearly : about 2,119,000 households in 1950, 3,214,000 in 1963, 4,120,000 in 1975, 4,467,000 in 1980 and 4,685,000 in 1982 (Table 2). Farm households showed a marked increase especially in Northern and North-Eastern Thailand. Meanwhile the area of cultivated land has also been extending : 58,682,000 rai in 1950 and 123,580,000 rai in 1982. The average area per farm household

Table 2. Number of Farms, Farm Holding Land, Farm size, 1950-1982.

	Number of Farms (1,000 Farms)		Farm Holding land (1,000 rai)		Farm Size (rai)	
	Whole Kingdom	North-Eastern	Whole Kingdom	North-Eastern	Whole Kingdom	North Eastern
1950(a)	2,119	816	58,682	27,222	27.7	33.4
1963(a)	3,214	1,221	69,682	26,419	21.7	21.6
1975(b)	4,120	1,676	112,211	47,497	27.2	28.3
1980(b)	4,467	1,786	118,998	50,092	26.6	28.0
1982(b)	4,685	1,945	123,586	52,853	26.3	27.1

Source : The data (a) of 1950 and 1963 are obtained from Atsushi Kitahara "Kaihatsu to Nogyo (Development and Agriculture-Capitalization in North-eastern Asia) " Sekaishisosha, 1985, p.85 (taken from Economic Farm Survey, Agricultural Census). The data (b) of 1975, 1980 and 1982 are obtained from the "Agricultural Statistics of Thailand Crop Year 1983/84", Ministry of Agriculture and Co-operatives, 1984. pp. 186, 187.

decreased from 27.7 rai in 1950 to 21.7 rai in 1963 and recovered to 27.2 rai in 1975. There was a slight decrease in 1980 to 26.6 rai and 26.3 rai in 1982. North-Eastern Thailand shows similar changes in area, but it is slightly larger than the national average.

In Khon Kaen Province, the number of farm households increased by 11,103 from 1981 to 1982 (Ministry of Agri. and Co-op., 1984). The area of cultivated land decreased by 172,419 rai for another purposes. The average area per farm household decreased from 29.7 rai to 26.4 rai. The average area of paddy field rice also decreased from 20.1 rai to 18.0 rai.

Landholding Policy in Thailand

The landholding system in Thailand is similar to the 'Sak-di-Na' system established in the middle of the 15th century. It, along with the 'Tam-Lahchakhan' system which was the system of military service and forced labor, was the basic system of the bureaucratic and centralistic states of Thailand. Under the 'Sak-di-Na' system the King held all the land in the country and it was he who gave the land directly to the common people. The King ruled the land through nobility and goverment officials who were responsible for the community (Ayabe, 1971, Seesutrapan, 1974, Pramot, 1975).

There was also a system called 'Chon-Na'. Under this system, farmers who wished to cultivate land under good geographical conditions were able to ask the government officials to make a survey of the land. They later paid the officials for the land and obtained landholding documents. The farmers were given the right to hold land within 25 rai. Later they were allowed to hold land amounts of 200 rai per farm household (Ayabe, 1971).

In the age of King Rama V, the forced labor system was changed into payment in cash and slavery was abolished. The farmers freed from the old system exploited non cultivated areas. Anyone who cultivated land belonging no-one for a given period of time was able to possess the land. This system was called 'Chap-Chong'-T. Yano

expresses 'Mudan Kousaku (cap coong)' in his writing (Yano, 1975a). It was adopted in 'The Land Ticket Grant Act' of 1909. In 1936 the area of landholding was not to exceed 100 rai per farm household due to the increase in population. In 'The Cooperative Society Settlement Act' of 1940, and 'The Land Allotment for Living Act' of 1943, it was decided that the government would take direct charge of the 'Chap-Chong' system. Although the personal 'Chap-Chong' system was abolished in 'the Land Act' of 1954, it remains with the farmers as an invasion of the national protected forest (Yano, 1975b, Onchan, Chalomwong and Hongladaron, 1984).

Cultivated land is increasing yearly, but this increase is very slow. Therefore, much of arable land still remains. In Thailand, especially in Khon Kaen Province, cultivated land is increasing at a remarkable rate. However, in Muang District, in which the surveyed villages exists, increase in recent years is slight because land has been cultivated there since ancient times.

The area of mountains and forest was 40.8 per cent of the whole area of Thailand in 1975, but decreased to 30.6 per cent in 1982. In North-EasternThailand, the area decreased rapidly from 27.3 per cent to 15.4 per cent during those years (Ministry of Agri. and Co-op., 1984). In the district we studied, the area of mountains and forest was not great. This means that almost all of the suitable land for the development is already being cultivated.

General conditions in the surveyed district

Discussing number of farm households and the area of arable land, it would be better to study and report on those at the district level rather than at the provincial level. However, it is impossible for us to get sufficient statistical data. Therefore, we will focus on our surveyed villages and discuss them in detail. Table 3 compares the Muang District, in which the surveyed villages exist, with Khon Kaen Province. The average population in each village in Muang District is high, but cultivation area per

Table 3. General figures of Khon Koen Province and Muang District, 1984.

		Khon Kaen Province	Muang District
Number of Tambon		154	15
Number of Muban		1,717	177
Average per Muban	Population	853	1,639
	Number of household		255
	Number of farms	106	139
Average per farm (rai)	Paddy field	13.2	10.9.9
	Upland field	7.7	3.1
	Orchard	0.6	0.2
	Vegetable garden	0.2	0.2
	Others	17.9	1.7
	Total area	39.6	16.4

Source: Field survey in Khon Kaen conducted by K. Tsuchiya in 1985.
Note :1) Tambon that is composed with many Muban (resemble to a village) is the administrative ward.
2) Others mean the wild and forest.

Table 4. General figures of the Villages, 1984/85.

		I	E	R
Number of Households	Farm	165	264	171
	Non-farm	6	14	5
	Total	171	278	176
Population	Male	452	800	696
	Female	430	846	577
	Total	882	1,646	1,273
Area (rai)	Paddy field	1,143	2.500	1.785
	Upland field	140	2,000	1,046
	Orchard	3		–
	Vegetable gardens	50	45	53
	Forest	3	23	–
	Total	1,336	4,571	2,884
Planted area of rice (rai)	Wet Season	1,143	2,500	1,785
	Dry Season	1,143	1,602	916
Average yield of rice (kg./rai)	Wet Season	500	450	400
	Dry Season	500	400	450

Source : Refer to Table 3.

Note: 1) I.E.R. denote Intensive irrigated village, Extensive irrigated village and Rain-fed village, respectively. These symbols are used with the same meaning for the following tables.

2) The figure of the planted area and average yield in rain-fed village seem to be over-estimation (Tsuchiya and Kai, 1987).

household is only 40 per cent of the average in Province. This means there are differences in the area of forest and fields in the two districts.

Farm households increased in every village. They increased considerably in irrigated villages especially in the intensive irrigated villages, but they increased only slightly in rain-fed villages. Table 4 shows the general demographic view of the surveyed villages in 1985. The percentage of farm households is over 95 per cent. The average number of members in one household was 7.2 in the rain-fed villages and, 5.9 and 5.3 in irrigated villages.

The composition of land was as follows : In the intensive villages, 85.6 per cent was paddy field, 61.9 per cent in the rain-fed villages and 54.7 per cent in the extensive irrigated villages. Upland field made up 43.8 per cent in the extensive irrigated villages, 36.2 per cent in the rain-fed villages, and 10.5 per cent in the intensive irrigated villages. The average cultivation area per household was 17.3 rai in the extensive irrigated villages, 16.9 rai in the rain-fed villages, and 8.1 rai in the intensive irrigated villages. In the case of extensive irrigated villages, the amount of cultivated area per farm household was double of that in the intensive irrigated villages. The average area of the paddy field per household was largest in the rain-fed villages with 10.4 rai, and 9.5 rai in the extensive irrigated village and 6.9 rai in intensive irrigated

village.

Although irrigation system are in the extensive villages, this does not benefit all of the cultivated land. Under these conditions, large areas of land must be used as upland field.

When and how much rain falls differs every year. It is possible to plant rice in the dry season even in the rain-fed villages. However, it is not always possible to plant rice in all of the paddy fields in irrigated villages. From 1984 to 1985, rice was planted in all of the paddy fields during rainy season (Table 4). In the dry season, the rate of planted area to paddy field was 100 per cent in the intensive irrigated village, 51.3 per cent in rain-fed village, and 64.1 per cent in extensive irrigated village. Consequently, the total rice planted area in rainy and dry season was 15.8 rai per household in rain -fed village, 15.5 rai in extensive irrigated village, and 13.9 rai in intensive irrigated village. Considering the average rice yield per rai and the number of members in a household, we can conclude there is not much difference in rice yield per household or per capita between each village.

Farm households were separated into three groups, full-time and part-time I (engaged mainly in farming) and part-time II (engaged mainly in other jobs) farm hoseholds based on the number of days of farming. Table 5 shows the ratio of each group in farm households. In the rain-fed villages, the ratio of the part-time I farm households is high. In the extensive irrigated villages, the ratio between full-time farm households and part-time I farm households is high. In intensive irrigated villages, the ratio between full-time and part-time II farm households is high.

We will consider what effects were produced on the maintenance of the population in the villages by the increase and the stability of the productivity rate of rice.

The extensive irrigated village held 135 farm households and a population of 600 in 1967. The number of farm households increased to 153 and the population increased

Table 5. Types of Farms and Size of Farms 1984/85

		Types of Farms				Size of Farms					
		Full time	Part-time I	Part-time II	Total	0 − 9 (rai)	10−19 (rai)	20−29 (rai)	30−39 (rai)	40−49 (rai)	50 rai and above
Number of Farm Households	I	11	5	9	25	6	13	4	1	0	1
	E	13	10	2	25	5	10	4	3	1	2
	R	7	15	3	25	2	7	7	6	3	0
	Total	31	30	14	75	13	30	15	10	4	3
Percentage of Farm Households	I	44.0	20.0	36.0	100.0	24.0	52.0	16.0	4.0	−	4.0
	E	52.0	40.0	8.0	100.0	20.0	40.0	16.0	12.0	4.0	8.0
	R	28.0	60.0	12.0	100.0	8.0	28.0	28.0	24.0	12.0	−
	Total	41.3	40.0	18.7	100.0	17.3	40.0	20.0	13.3	5.3	4.0

Source : Field survey in Khon Kaen conducted by K. Tsuchiya in 1984 and 1985

Note : 1) Part-time I means farm households mainly engaged in farming

2) Part-time II means farm households mainly engaged in other jobs.

3) I.E.R. symbols have the same meaning as in Table.4.

to 721 in 1975. In 1985 the number of households was 206 and the population was 1,200. But these numbers are different from those shown on Table 4. On the Table 4, the total number of households is 278, farm households are 264 and the population is 1,646. These numbers are calculated by the administrative ward. Possibly a village chief understood a village to be smaller than what the administrative ward believed it to be. From the data shown, the average number of members in one household increased from 4.44 in 1960 to 5.83 in 1985. In 1985 the average area under cultivation per capita was 2.77 rai in extensive irrigated village, 2.27 rai in rain-fed village and 1.51 rai in intensive irrigated village. The average area of the paddy field per capita was 1.52 rai, 1.40 rai and 1.30 rai respectively. It is interesting to note that in Phra Lap village where Zimmerman surveyed from 1930 to 1931, the average paddy field area per capita was 1.42 rai (Zimmerman, 1931).

In comparison with other districts, there are only a few cases of leased land. Trade in land was hardly done. Considering these conditions, it is possible to say the area of cultivated land is one of the decisive factors determining the number of the members in a household.

Form of family and the men engaged in farming

The forms of family in the surveyed villages are as follows : All of 75 surveyed households were grouped by the age of the eldest person in one household (Table 6). The households whose heads were in their twenties or thirties were nuclear families composed of a couple and their unmarried children. The percentage of nuclear families was 75 per cent in the households whose heads were in their forties and fifties and decreased to 33 per cent in their sixties. On the contrary, the percentage of extended family which included their children's family increased with advancing age.

It was common in Thailand for a husband to live with his wife's parents for at least two or three years after their marriage. It was the custom for the bride's family to arrange a new house to welcome the bridegroom. For a bridegroom meant the net increase in labor for the farm which had enough land and a thin population. Such a custom as 'Het nam kan, kin nam kan' (working and living together) with 'the members living on the premises' has been upheld for a long time. While these old customs are lost in some districts, it still exists in North-Eastern Thailand (Mizuno, 1982).

There are 29 extended family households composed of more than two families.

Table 6. Number of Farm Households classified by the Ages of the Head of the Household, 1985.

Ages of Head of Household	20-29	30-39	40-49	50-59	60-69	70-79	80 and above	Total
1 Family	1	12	17	12	4	0	0	46
2 Families	0	0	5	4	5	8	0	22
3 or 4 Families	0	0	0	0	4	1	2	7
Total	1	12	22	16	13	9	2	75

Source : Refer to Table 5.

There are two peculiar households. One is where the head of the household lives with his grandchild's family, in other words, the family of the manager lives with his grandfather. The other is the case where the head of the farm household lives with his niece. Besides these two households, the 27 households are living with their daughters' family. Only seven cases of five households are living with the bride of the son, however, one of these households did so after living with his daughter's family. No further information has been obtained on these two households. In four cases two households had no daughter instead there were only sons.

Table 7. Number of Farm Households classified by Number of Families, 1984/85.

Number of Families		1	2	3	4	Total
Number of Farm Households	I	17	5	2	1	25
	E	17	7	1	0	25
	R	12	10	3	0	25
	Total	46	22	6	1	75
Percentage of Farm Households	I	68.0	20.0	8.0	4.0	100.0
	E	68.0	28.0	4.0	–	100.0
	R	48.0	40.0	12.0		100.0
	Total	61.3	29.3	8.0	1.3	100.0

Source: Refer to Table 5.
Note : I.E.R. symbols have the same meaning as in Table 4.

Table 8. Number of Persons Engaged in Agriculture, 1984/85.

Ages		11-14	15-19	20-29	30−39	40−49	50-59	60 and above	Total
I	Male	1	4	8	2	4	6	2	27
	Female	1	11	4	7	7	2	0	32
	Total	2	15	12	9	11	8	2	59
E	Male	1	6	2	6	4	2	2	23
	Female	4	8	5	6	5	2	0	30
	Total	5	14	7	12	9	4	2	53
R	Male	1	5	7	6	5	2	4	30
	Female	3	6	10	4	5	4	0	32
	Total	4	11	17	10	10	6	4	62
Total	Male	3	15	17	14	13	10	8	80
	Female	8	25	19	17	17	8	0	94
	Total	11	40	36	31	30	18	8	174

Source : Refer to Table 5.
Note : I.E.R. symbols have the same meaning as in Table 4.

The percentage of nuclear family is 60 per cent of all families. In the households with the heads who are in their thirties or forties, the nuclear family have possibilities of changing into extended family in the near future as their children reach marriageable age. Cases of two or three families living together are found in the rain-fed villages (Table 7). This is interesting and could be a topic of investigation from the standpoint of landholding and the form of employment. Those who are engaged in farming have been classified by their age (Table 8). The farmers in their twenties are most frequently found in the rain-fed villages. In the irrigated villages, teen-agers are the most numerous. The youngsters in their teens are particularly worthy of notice, because they have the possibilities of changing the nuclear family into extended family or establishing new nuclear family. Usually it is said that the youngest daughter inherits the property, but it seemed that the equality inheritance system among daughters as well as sons superior in our surveyed villages. If one considers inheritance system, this would mean the increase of farm households in number and, at the same time, suggests a shrinkage of farming units.

Under the existing law in Thailand, children under 14 years of age are forbidden to work except for housework and supplementary jobs. Actually 6.3 per cent of all persons in agriculture are children. It is interesting that they comprise 9.4 per cent of the extensive irrigated villages and play an important role in farm labor.

The effects of **irrigation system**

In past times of self-sufficient economy, the farmer's precarious living in North-Eastern Thailand was so severe as to be known as 'the most underdeveloped'. The people stocked rice during the rainy season to support themselves and sold the surplus in the dry season to purchase their necessities. In lean years they had to wait until the next harvest putting up with many inconveniences (Phumitawon, 1973). This conventional primitive life-style of the villagers, however, has been changed by the recent waves of modernization. Tractors, mobiles and other farm machinery are

Table 9. Number of Farm Machineries and Livestock, 1985.

		Total Number			Number per farm		
		I	E	R	I	E	R
Number of Farm Machineries	2 Wheel Tractor	20	37	15	0.12	0.14	0.09
	4 Wheel Tractor	0	0	0		–	–
	Irrigation Pump	0	27	0	–	0.10	–
	Motor Car	0	4	0		0.02	–
Number of Livestock	Buffalo	53	429	314	0.3	1.6	1.8
	Cattle	31	127	170	0.2	0.5	1.0
	Horse	0	0	0	–		
	cow	0	0	0		–	–
	Hen	785	2,940	120	4.8	11.1	0.7
	Duck	300	1,459	1.259	1.8	5.5	7.4
	Pig	35	54	40	0.2	0.2	0.2

Source : Refer to Table 3.
Note : I.E.R. symbols have the same meaning as in Table 4

becoming more widely used as shown in Table 9. Livestock such as buffalo and hen, which farmers tend to raise as a valuable means of getting money rather than as a traditional working force or for self-consumption.

In North-Eastern Thailand, the percentages of land-owing farmers are comparatively higher than in the plains region of Middle Thailand. Many of the farmers have a strong desire to expand their farm land in order to make their livelihood only by agricultural cultivation. Unfortunately obtaining new land through buying and selling is nearly impossible for them except in a part of the extensive irrigated villages.

Under such an agricultural background, irrigation system have been introduced into the rain-fed areas in North-Eastern Thailand. They have brought about the decrease of damage from drought and drainage which periodically occur in this regions (i. e. two times in five years), the increase of average rice production, and the materialization of cultivation of horticultural crops such as cucumber, cabbage, long-bean, lettuce, peanuts, etc. (Sanyu Consult. Inc., 1976c, Tsuchiya and Kai, 1987). Among the irrigation farmers, there is a view that the primary cause of such advantages of intensive farm management is not exactly the adoption of irrigation system but the reduction of farm land per farm household with the increase of the number of farm households.

The significance, however, should be observed in the fact that in the situation of a decrease of arable land due to the inheritance system the more advanced intensive farming could be motivated and sustained definitely in the irrigated villages not in the traditional rain-fed villages. Another meaning of irrigation system can also be derived from the number of farm households distributed in the three groups. Farm households are located in every 20-50 rai, 10-15 rai, and 5-10 rai in the rain-fed, the extensive irrigated, and the intensive irrigated villages, respectively (Table 5). This form of distribution shows that the minimum cultivating area needed for maintaining a family should be approximately 20 rai in the rain-fed paddy cultivation which has characterized the agriculture in North-EasternThailand. By introducing the irrigation facilities into this rain-fed area it has become possible for farmers to support their families on a smaller size of farm. When further comparing the intensive irrigated farm with its extensive irrigated counterpart in respect to the effects of irrigation, the figures imply that the intensive irrigated farm yields a higher stability in rice production, enough to maintain a family in a smaller area because almost the entire area of irrigated farm can be devoted for rice planting owing to a satisfactory supply of water.

Conclusion

The agriculture and farm policy consistently adopted by the Thai Government is aimed to maintain and expand the small farming system, whereas equal land inheritance in the traditional family system divides the arable land expanded by exploitation of forests and wild fields to maintain a self-sufficient life-style for the coming generation. The improvements and stabilization in farm production caused by the introduction of irrigation system have only facilitated the increase of farm households without bringing about any fundamental change in the conventional structure in Thai agriculture.

As far as the rice production in North-Eastern Thailand is concerned, recent years exhibit the stabilization and improvement in itself ; for example as shown in our study

area, rice production has been raised from 200 kg per rai to 500 kg per rai in the last twenty years. This rise in rice production, however, has not necessarily led to the immediate increase of the farmer's profits in rice production nor has it contributed foward the motivation, promotion and activation of the entire productive activity to the worldwide stagnancy in the rice market and the low prices of other substitutional horticultural crops. Moreover, the more advanced irrigation facilities in the intensive irrigated villages as compared with its extensive irrigated counterpart is not always handled by the most effective farm management program which would yield the highest level of agricultural production. A forecast states is that farmers would devote their surplus time working with machines not for making intensive and efficient use of irrigated land in an attempt to yield non-rice crops, but for engaging in other jobs. We can see an example of this in the actual case of a part-time II farm household in an intensive irrigated village of North-Eastern Thailand where the ratio of off-farm employment is high (Table 5). One of the reasons for this phenomena is the expansion of the labour market toward the city construction of Khon Kaen. The biggest metropolis of Khon Kaen Province in North-Eastern Thailand is being rapidly developed. After the 1960's it has utilized workers from nearby villages.

In Middle Thailand, there can be seen a rapid increase of leaving-off-farm, degrading into tenancy and off-home-temporary work. Whereas the percentages fo the region's holding of irrigated paddy fields is 48 per cent of the entire arable land, this is exceedingly higher than the nation-wide average of 20 per cent of irrigated paddy land. The spare time produced by improvements in working efficiency due to mechanization in farming is apt to be used for earning money (cash income) to meet the cost of expansion for farming and living commodities such as fuels, fertilizer, chemicals, and television sets, etc., rather than to be consumed for farm activities in order to increase the total crop production.

Learning from the farmer's situation in Middle Thailand, the farmers in North-Eastern Thailand must establish a decisive policy to maintain their recently improved situation. This would prevent them from lapsing into the new type of poverty (Itou, 1984) found in Middle Thailand. The poverty that is associated with increasing debts from agricultural and social modernization.

Supplementary reference to fertilizer

Utilization of chemical fertilizer is another consequence of enlarging rice production by irrigation system. This has been used for non-glutinous rice planting as an expensive goods with the purpose of increasing the rice yield for sale.

The data of the fertilizer trial demonstration shows the effects of fertilizer on local varieties and improved I. R. leneage varieties of rice (Sanyu Consult. Inc., 1976b). A remarkable effect on both types of rice can be seen. Farmers themselves have already acknowledged the effectiveness of fertilizer use from experience and have adopted it as a means of farm management improvement. They are, however, facing a problem of the high cost of fertilizers.

As for the relative price of fertilizer to paddy, the 1976's data shows that the former was higher in every Asian nation except Japan and Taiwan. In Thailand the price was four times as high as the price of a paddy. This is the third highest figure following those of China and India (Palacpac, 1977). The price of fertilizer in Thailand

during the period of 1979-82 was continuously rising and is presently two times as high as that of a paddy (Upadhyay, 1983) even though the international tendency has been a rapid reduction in the price of fertilizer with the increase of industrial development.

In addition, the price of merchant-supply-fertilizer is 40-50 Bahts per 50 kg higher than those of Agricultural Co-operatives (it is equal 20–25 per cent higher) (Sanyu Consult. Inc., 1976a, Upadhyay, 1983). But in terms of convenience, the farmer tend to do business with the merchants who not only deliver their goods by car, but also serve as threshers and buyers in purchasing the rice product directly from the fields. The Co-operatives do not offer such a service.

ACKNOWLEDGEMENTS

This work was supported by a Grant-in-Aid for Overseas Scientific Survey (No. 59042007 and 60041051) from the Ministry of Education, Science and Culture, Japan. The author wish to thank the National Research Council of Thailand for their permission to conduct research in Thailand. We are deeply indepted to the Royal Irrigation Department, the Ministry of Agriculture and Co-operatives of Thailand and Faculty of Agriculture, Khon Kaen University for their kind help with the field survey.

REFERENCES

Ayabe, T. 1971 *Taizoku ; Sono Shakai to Bunka* (Thai; Its Society and Culture). Koubundou, Tokyo (in Japanese)

Chamlomwong, Y. 1979 Land Fertility in Central Plain of Thailand ; A Path Analysis. Kasetsart Univ., Bangkok (Thailand)

Ishii, Y. ed. 1975 *Taikoku ; Hitotsuno Znasakushakai* (Thailand ; A Rice Growing Society). Soubunsha, Tokyo (in Japanese)

Itou. S. 1984 *Genchihoukoku Tai Saiteihen ; Honno Kinouno Nippon* (The Field Reports of the Lowest Base of Thailand ; Japan just like a Yesterday). Keisoushobou, Tokyo (in Japanese)

Kaida, Y. 1975 Kangai Haisui no Genjyo to Tenbou (Present and Future in Irrigation and Drainage). *In* "Taikoku (Thailand)", ed. by Y. Ishii, Soubunsha, Tokyo, pp. 280–310

Kitahara. A. 1985 *Kaihatsu to Nogyo ; Tonanajia no Shihonshugika* (Development and Agriculture ; Capitalization in South-eastern Asia). Sekaishisousha, Kyoto (in Japanese)

Ministry of Agriculture and Co-operatives 1984 *Agricultural Stastics of Thailand Crop Year 1983/84*, Bangkok

Mizuno, K. 1973 Tonanajia no Sonraku Kenkyu ; Shakaijinruigakuteki Kanten (Village Study in South-eastern Asia ; In Aspect to Socio-Anthropology), *In* "Tonanajia o Kangaeru (Concider to South-eastern Asia)", ed. by S. Ichimura, Soubunsha, Tokyo. pp. 157-188

Mizuno, K. 1982 *Tai Noson no Shakaisoshiki* (Social Structure of Rural Community in Thailand). Soubunsha. Tokyo (in Japanese)

Nogi, T. 1985 *Tai no Nogyo ; Kome no Shouhinka o megutte* (Agriculture in Thailand ; Commercialization of Rice). Nagasaki Univ., Nagasaki (in Japanese)

Onchan, T. and Y. Chamlomwong and C. Hongladaron 1984 Land Tenure Security and Agricultural Development of Thailand. Kasetsart Univ., Bangkok (Thailand)

Palacpac, A. C. 1977 World Rice Statistics. The International Rice Research Institute, Manila (Philippines)

Phumitawon, N. 1973 Num Chaona (Tai Noumin no Shiki). *In* "Noson Kaihatsu Tenmatsuki (The Circumstances of Development in the Country)". 1983 Ed. and transl. by K. Nonaka, Imura Bunka Jigyosha, Tokyo, pp. 1–73

Pramot, K. 1973 Nangsu an Prakop Phunthan Arayatham Thai; ton Phunthan Prawathisat Sangkhom lae Kanmuang (Kukuritto Pramoto no Rekishi). *In* "Tai no Kokoro (The Mechanism of Thai Society)", ed. and transl. by C. Tanaka, Mekon, Tokyo, pp. 121-165

Sanyu Consultants Inc. 1976a Study Report on Credit and Marketing, Nagoya,

Sanyu Consultants Inc. 1976b Study Report on Economic Internal Rate of Return, Nagoya

Sanyu Consultants Inc. 1976c Study Report on Socio-Economy, Nagoya

Sanyu Consultants Inc. 1979 Terminal Report for the Third Term Assignment on Agriculture Institution, Nagoya

Seesutrapan, S (C. Phmisak) 1974 Chom Na Sakdina Thai (Chitto Pumisaku no Rekishi). *In* "Tai no Kokoro (The Mechanism of Thai Society)". 1975 ed. and transl. by C. Tanaka, Mekon, Tokyo. pp. 167-270

Tanaka, T. 1981 *Shin Tai Jijyo (jyo); Tai Shakai no Ronri (New* Conditions in Thailand ;Logics in Thai Society) Nicchu Shuppan, Tokyo (in Japanese)

Takaya, Y. 1985 *Tonanajia no Shizen to Tochiriyou* (Nature and Land Utilization in South-eastern Asia). Keisoushobou, Tokyo

Tsuchiya, K. and S. Kai 1987 Agricultural Development through Irrigation in Thailand, *J. Fac. Agr., Kyushu Univ., 31 : 101-143*

Upadhyay, S. K. 1983 Terminal Report on Rural Institutions and Cooperative; Main Report Volume 1, Nong Wai Irrigation Management Project, Khon Kaen, Thailand

Yano, T. 1975a *Nippon no Nanshin to Tonan Ajia* (Southward Advance of Japan and South-eastern Asia) Nippon Keizai Press, Tokyo. (in Japanese)

Yano, T. 1975b 'Inasaku Kokka' no Seiji Kouzou (Political Structure of 'The Nation depend on Rice Planting'). *In* "Taikoku (Thailand)", ed. by Y. Ishii, Soubunsha, Tokyo, pp. 112-161 (in Japanese)

Yano, T. 1983 *Tonanajiagaku e no Shotai (Ge); Soukatsu to Tenbou* (Invitation to South-eastern Asianology (II); Supervision and Observation). Nippon Hoso Shuppan Kyokai, Tokyo (in Japanese)

Yano, T. 1984 *Tonan Ajia Sekai no Kouzu; Seijiteki Seitai-Shikan no Tackiba* (A Composition of South-eastern Asia ; from Political Ecologic Histrical Viewpoint). Nippon Hoso Shuppan Kyokai, Tokyo (in Japanese)

Yoshikawa, T. 1966 *Taikoku Gaikyo* (A General Situation of Thailand). Osaka Univ. of Foreign Studies, Osaka (in Japanese)

Zimmerman, C. C. 1931 *Siam ; Rural Economic Survey 1930-31,* Bangkok Times Press, Bangkok (Thailand)