Akademika 30(Januari 1987) 91–108

Technological Change and Socio-economic Conditions in Ayuthaya

PREECHA KUWINPANT

ABSTRACT

This article discuss the effects of technological changes in agriculture on the socio-economic condition of the peasant society in Ayuthaya Thailand. It is found that the use of modern technology such as fertilisers, insecticides and drainage system, tractors and water pumps does not necessarily increase agricultural output. Modern technology, on the contrary, creates problems for the peasants such as indebtedness and many others.

ABSTRAK

Rencana ini membincangkan kesan perubahan teknologi dalam bidang pertanian ke atas keadaan sosio-ekonomi masyarakat tani di Ayuthaya, Thailand. Didapati bahawa penggunaan teknologi moden seperti baja, racun serangga dan sistem peparitan, trektor dan pam air tidak semestinya meningkatkan hasil pertanian. Disebaliknya, penggunaan teknologi moden itu menimbulkan pelbagai masalah kepada para petani seperti hutang piutang dan sebagainya.

INTRODUCTION

It has been asserted that Thai farmers have long been responsive to change (Ingram 1971: 261 – 265). The expansion of land for growing rice after the signing of Bowring Treaty in 1855 and the diversification of cash crops during the last two decades are evidences of Thai farmers' responsiveness to the domestic and international markets. It is also seen that new technology such as fertilizers, insecticides as well as motor pumps, tractors and other farm machinery have been adopted and widely used particularly in the Central Plain, the rice basin of Thailand. In this region irrigation system has extensively been constructed and water control is comparatively more effective. Such changes in the Central Region can be seen from the Agricultural Census. In 1963, for examples, farmers who employed tractors and fertilizers constituted 14.5% and 5.4% of the total agricultural households recpectively, but in 1978 these figures increased to 59.2% and 57.9% respectively. Besides, in 1978 the Central Region consumed 60% of

the total amount of fertilizers and insecticides consumed by the whole country. Furthermore, it was also estimated that 47.5% of th· country's agricultural land under irrigation scheme was found in the Central Region. Despite the impressive changes in technology, however, it is also evident that the increasing yield of rice in the Central Region is still at a very low rate. The average rice in 1961 was 255 kilogrammes per rai and in 1978/79 the yield was about 295 kilogrammes per rai (Ministry of Agriculture and Cooperatives 1962).

To understand the situation I propose to consider Ayuthaya, as a case study. Ayuthaya is a former capital of the country and one of the earliest provinces in which modern technology has been experimented. Most of the agricultural land have been put under government irrigation schemes which have greatly affected farmers' agricultural operation as well as their social and economic life. This paper, however, does not intend to provide a generalization applicable to situations in other areas, neither does it claim to indicate all causes and effects of technological adoption and application on social and economic life of the people. It merely attempts to give a general description of such changes in technological adoption during the last decade and to show that though the rate of modern technological adoption is generally high, this does not immediately lead to the increasing in yields and the improvement of the conditions of life of all farmers. There are many factors such as ecological, social and cultural, which impede the effectiveness of the use of modern technology. Although Thai farmers are responsive to new technology, i.e. they are willing to try and adopt such technology if they are sure of the result particularly in terms of economic gain, they are often discouraged by the low rate of return caused by conditions beyond their control. Among these are high costs of production, the ineffectiveness of water control, land tenure and market problems, to cite a few, which cause many of them to leave the farms and seek other alternatives such as to become wage labourers or to migrate to Bangkok. Finally, it must also be emphasized that changes are dependent on multiplexity of related factors, and this paper does not hope to tackle or understand all at once the relations of these factors. It concentrates primarily on the effects of some technological changes such as the application of irrigation and other farm machinery on the conditions of life of the people in Ayuthaya.

THE AREA

Ayuthaya is a provide in the Central Region about 70 kilometres, through the Asian Highway, to the north of Bangkok(Figure 1). Transportation and communications between the two provinces are execellent. Ayuthaya is almost totally dependent on Bangkok as a centre to export its agricultural produce and to import manufactured goods and other home

consumption items, including various kinds of fruits and vegetables. Intra-communication and transportation between the provincial centre and some other districts such as Lat Bua Luang and Phak Hai are still under construction. Thus, these districts, though as parts of the province, tend to rely on other market centres where communications and transportation are more accessible. In the past, the whole province was criss-crossed by rivers and canls which were used as the main routes for communication and transportation as well as for cultivation. Nowadays, the construction of the Chao Phraya Dam for electricity generation and irrigation purposes has reduced the amount of water to the level that these canals are not usable for transportation for almost half of the year. However, many roads have been constructed connecting various district centres in the province to the extent that communication and transportation conditions have been extensively improved (Figure 2).

The topography of Ayuthaya is of uneven flat land which makes the distribution of water during the dry season difficult. Some villages receive excessive water whereas others do not have enough water for cultivation. Prior to the construction of the dam, in the wet season the area would normally be inundated every year. At present, farmers find that the control of water is unpredictable. In 1978, for example, there was a great flood causing the failure of rice cultivation, but in 1979, disaster was brought about by drought, and then in 1980 the area was again inundated (Provincial Industrial Office 1981: 14).

POPULATION

According to the National Statistical Office, the total population of Ayuthaya in 1973 was 595,400. The rate of population growth is rather low. During 1960 – 1970 the rate of growth in Ayuthaya was 1% whereas it was 3% for the whole kingdom . In addition to the success of government birth control programmes, otu-migration was noticeable. It was estimated that between 1965 and 1970, a total of 47,000 people had moved out to other areas in the Central Plain and 50% of this migrated to Bangkok. Table 1 shows that during 1971 – 1973, about 8,205 people had migrated out of Ayuthaya Province. Out of the 16 districts, 10 districts faced the problem of out migration, the rate of which was higher than that of in-migration. In Sena, Phak Hai and Bang Sai, the net-migration were 4,207, 2,174 and 1,173 respectively.

THE ECONOMY

The economy of Ayuthaya depends mainly on rice cultivation. About 80% of the total agricultural land are under rice cultivation. It was estimated

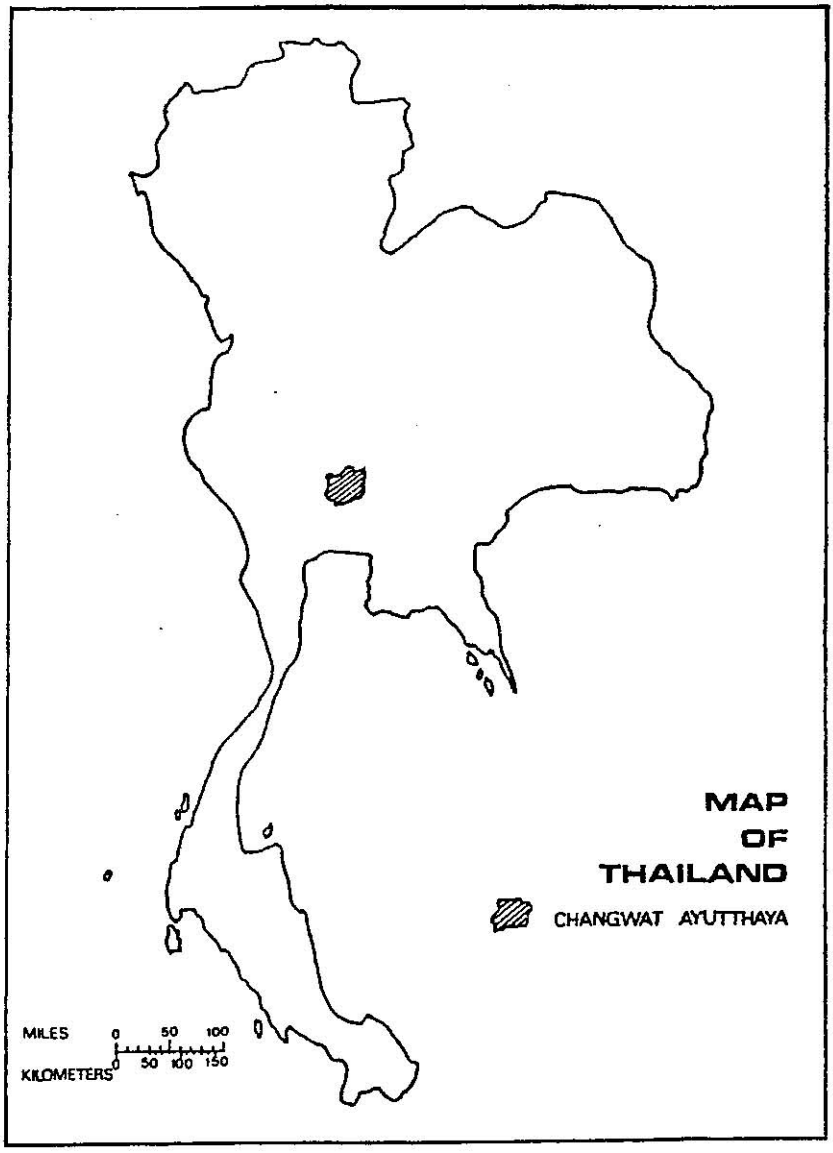

FIGURE 1. Changwat Ayuthaya, Thailand

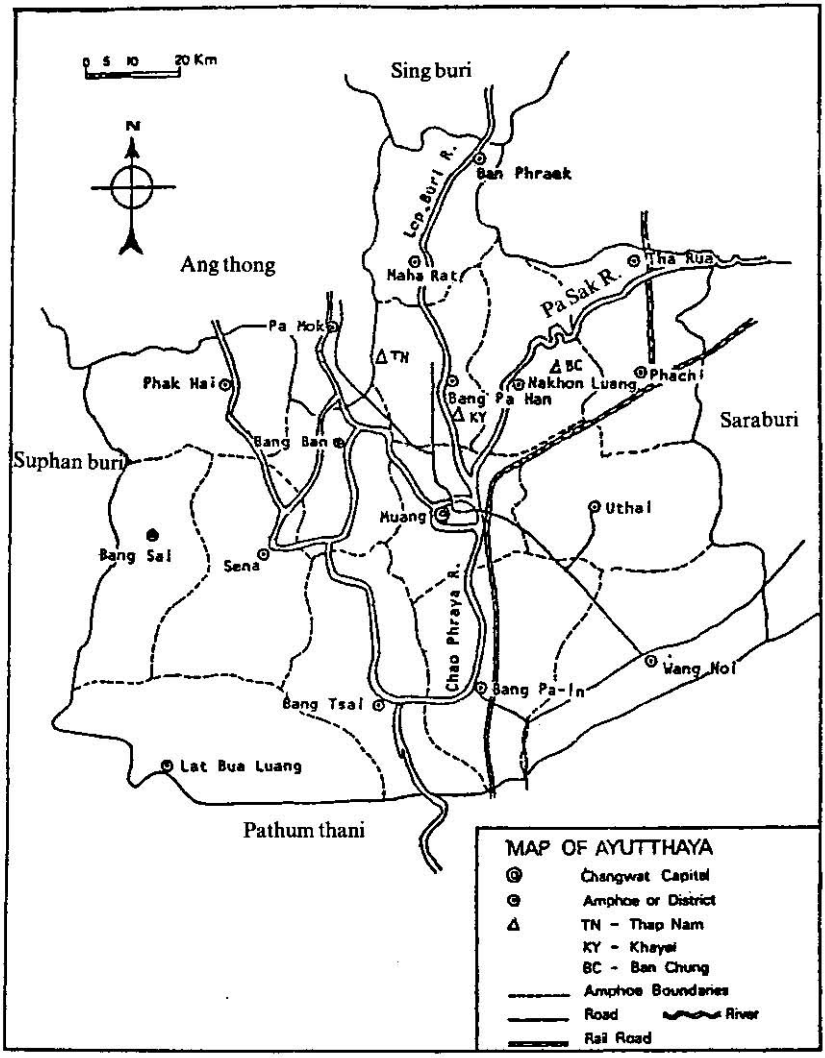

FIGURE 2. Changwat Ayuthaya, Thailand: Communication network

TABLE 1: Population composition by districts, 1971 – 1973

Districts	Population		Change		Change in Composition			
	1973	1971	Number	Percent	Birth	Death	Net Migration Number	Net Migration Percent
Total	595,400	584,795	10,605	1.8	26,003	7,193	−8,205	−1.4
Muang	95,833	91,844	3,989	4.3	3,690	896	1,195	1.3
Tha Rua	40,884	40,406	478	1.2	1,777	567	−732	−1.8
Nakhon Laung	30,936	30,565	371	1.2	1,127	405	−351	−1.1
Bang Sai (Tasi)	20,461	18,980	1,481	7.8	1,010	219	690	3.6
Bang Sai	39,280	39,135	145	0.4	1,774	456	−1,173	−3.0
Bang Ban	32,828	32,034	794	2.5	1,172	452	74	0.1
Bang Pahan	34,482	33,901	581	1.7	1,443	479	−393	−1.1
Bang Pa-in	49,212	47,457	1,755	3.7	2,233	672	194	0.4
Ban Phraek	9,185	9,086	99	1.1	464	111	−254	−2.8
Phak Hai	47,822	48,765	−943	−1.9	1,890	665	−2,174	−4.5
Phachi	27,230	26,920	310	1.2	1,189	281	598	−2.2
Maha Rat	21,876	21,840	36	0.2	916	289	−582	−2.7
Lat Bua Luang	26,373	25,663	710	2.8	1,345	240	−395	−1.5
Wang Noi	33,560	32,066	1,494	4.7	1,735	359	118	0.4
Sena	54,407	56,607	−2,200	−3.9	2,767	760	−4,207	−7.4
Uthai	31,031	29,526	1,505	5.1	1,465	333	373	1.3

Source: National Statistical Office, Office of the Prime Minister, Statistical Handbook of Changwat Phra Nakhon Si Ayuthaya, tables 6 – 7 pp.11 – 12.

that in 1980/81, about 344,322 tons of rice were produced (see Table 2). However, the average yield per rai was still low (the average of 290 kgs/rai during 1976 – 1980). In addition, the total yield produced each year varies very widely depending on water supply. In 1976 the total rice yield was 561,619 tons, but this was reduced to 196,104 tons in 1978. This was partly due to the fact that though the whole cultivated lands have been designated as lands under irrigation schemes, the control of water was inefficient or ineffective. Cultivation is, to a certain degree, subject to such natural conditions as the amount of rainfall, flood and drought. Rice failure was also due to the attack of field rats, the number of which has been greatly increased in the last five years because of changes in the environment. Finally, Table 2 also shows that the amount of land under rice cultivation has substantially been reduced. In 1981, an area of 160,744 rai which used to be rice land have been left uncultivated.

Second rice crop has been practised in some villages though in a small-scale at the banks of rivers and canals where water is available. At present, the condition of water supply is uncertain for farmers and thus limits the area cultivated and the number of farmers practising second rice cultivation. Although the costs of growing second rice crop are higher than those of wet-rice cultivation due to the high costs of expenditure on high-yield variety seeds, fertilizers and insecticides, the yields are very satisfac-

TABLE 2. Rice: Cultivated area, total and average yield

Year	Wet Season			Dry Season			Total Yield
	Area Cultivated (rai)	Total Yield (kwian)	Average Yield (tang/rai)	Area Cultivated (rai)	Total Yield (kwian)	Average Yield (tang/rai)	Both Seasons (kwian)
1976/77	1,322,022	442,942.03	34	118,749	73,449	61.9	516,391.03
1977/78	1,306,205	387,285	33	160,199	101,872.87	63	489,157.87
1978/79	1,287,215	125,306.30	22	128,445	70,798	55.7	196,104.30
1979/80	1,161,287	270,047	37.1	195,521	71,443.73	36.5	532,334.73
1980/81	1,161,287	270,047	22.7	105,237	74,275	50	344,322

Source: Study of Ayuthaya Provincial Industrial Economics, Provincial Industrial Office, Ayuthaya, 1981, p.96
1 rai – 0.395
1 kwian – 1,000 kilogrammes
1 tang – 10 kilogrammes

tory (an average of 550 – 600 kilograms/rai). In one particular area (Lat Bua Luang), many farmers have stopped practising the traditional broadcast method during the wet season but concentrated mainly on the transplant method during thd dry season for the yield is much higher. Table 3 shows that in 1977 the cultivated area for wet rice in Lat Bua Luang doubled that of second rice cultivation, but in 1980 the figure was reversed. This confirms the hypothesis on positive responsiveness of farmers towards modern practices. Nevertheless, often farmer are discouraged by the uncertainty of the availability of water. Sometimes even after land has been ploughed and rice has been planted, farmers face the problem of water shortage. Already invested, small farmers are likely to suffer most and it is not surprising that they have to seek other alternative by becoming wage labourers or giving up farming and migrating to other areas where they can find jobs. According to Land Department, 37.5% of the total farming households in Ayuthaya during 1974 – 1979, have to employ themselves out as farm labourers to earn cash for the family (Pinit Lapthanahond 980: 127).

Land tenure is but another aspect of social and economic problems in Ayuthaya. In 1976 the tenurial households constituted 76.49% of the total agricultural households (see Table 4). In terms of rented area, in 1973 more than half of the total agricultural land were rented land (see Table 5) and Ayuthaya occupied second highest rank among the provinces in the Central Region facing tenurial problem. In 1978 land tenure was still a general characteristic of land holding of all districts in the province as shown in Table 6.

There is no restriction on land purchasing in Ayuthaya. It was recorded in 1969 that during the preceding five years one main reason for changes in land holdings was that those owned land particularly large land

TABLE 3: Cultivated area for first and second rice crop in Lat Bua Luang District, 1977 – 1980

Tambon (coomune)	Land Holding (rai)	Area Cultivated (rai)							
		1977/1978		1978/1979		1979/80		1980/1981	
		First Crop	Second Crop	First Crop	Second Crop	First Crop	Second Crop	First Crop	Second Crop
Lat Bua Luang	16,049	13,457	– 11,802	2,418	141	5,270	765	7,474	
Sam Muang	12,834	1,521	8,025	8,587	1,998	925	12,830	4,595	9,800
Lak Chai	18,385	11,417	1,648	14,138	4,587	40	6,900	630	10,325
Phaya Bun Lue	9,960	6,189	1,324	5,713	1,728	115	2,020	1,030	5,533
Ku Salot	20,019	12,675	84	15,760	6,518	538	12,834	2,385	7,738
Singhanat	23,685	8,334	8,971	19,411	5,648	940	23,655	2,375	11,395
Total	100,932	53,593	20,052	75,411	22,897	2,699	63,509	11,771	52,265

Source: District Agricultural Office, Lat Bua Luang District, 1981.

TABLE 4. Agricultural tenurial households in the region by province, 1976

Province	Agricultural Households	Tenurial Households	Percentage
Pathum Thani	22,837	19,165	83.92
Ayuthaya	46,447	35,527	76.49
Samut Prakan	13,069	9,350	71.54
Nakhon Nayok	20,360	13,784	67.76
Chachoengsao	39,063	24,860	63.64
Saraburi	38,843	20,800	53.60
Ang Thong	29,585	14,764	49.92
Nonthaburi	20,353	10,091	49.58
Chon Buri	48,300	22,948	48.48
Lop Buri	61,555	27,700	45.00

Source: Agricultural Land Reform Office, Ministry of Agriculture and Co-operative, "Agricultural Land Holdings in Thailand", quoted in Pinit Lap tananond, *Land Holdings in Ayuthaya*, Chulalongkorn University Social Research Institute, 1980, p.133.

TABLE 5. Ranking of the top ten provinces in the Central Region facing broblems of land tenure, 1973

Province	Agricultural Land Holdings (rai)	Rented Area (rai)	Percentage
Pathum Thani	841,112	619,311	73.63
Ayuthaya	1,431,477	840,518	58.72
Nakhon Nayok	898,101	505,990	56.34
Chachoengsao	1,630,488	763,362	46.82
Saraburi	1,473,495	505,358	34.15
Suphan Buri	2,557,296	734,455	28.72
Lopburi	2,469,287	622,152	25.82
Phicit	2,580,679	619,879	24.02
Nakhon Sawan	3,841,532	886,793	23.08
Prachin Buri	2,281,493	461,960	20.25

Source: Ministry of Agriculture and Co-operatives, Land Use in Thailand, 1973.

TABLE 6. Percentage of tenurial households in Ayuthaya by province, 1978

District	Land Owner	Land Tenant	Percentage of Land Renter
Muang	1,056	863	44.72
Tha Rua	851	1,296	60.17
Nakhon Luang	524	1,578	74.53
Bang Sai (Tsai)	570	1,261	68.87
Bang Sai	1,160	2,218	62.69
Bang Ban	1,049	1,380	56.72
Bang Pahan	1,562	1,438	74.84
Bang Pa-in	1,113	1,978	63.68
Ban Phraek	440	255	36.69
Phak Hai	1,488	1,708	53.24
Phachi	478	1,629	76.98
Maha Rat	998	1,133	52.50
Lat Bua Luang	816	1,963	70.54
Wang Noi	589	2,319	79.66
Sena	1,524	2,282	59.96
Uthai	652	2,197	76.79
Total	14,870	25,508	62.97

Source: National Statistical Office, Office of the Prime Minister, Agricultural Census 1978.

owners had acquired more land simply through purchasing. As mentioned above, small farmers who cannot afford the cost of modern rice cultivation would prefer to sell their land or seek out other jobs to supplement their income. The average per capita income of Ayuthaya as shown in Table 7 is far below that of the whole Central Region and of the whole kingdom. In 1979, per capita income in Ayuthaya was 7,715 baht whereas it was 12,623 and 12,067 baht for the whole region and the country respectively. Finally, many farmers also lost their land through indebtedness (Uthis Nagsawas 1958; Ministry of Agriculture 1978).

TABLE 7. Per capita income of Ayuthaya, Central Region and the whole kingdom, 1975 – 1979

	Per Capita Income (baht)				
Area	1975	1976	1977	1978	1979
Ayuthaya	5,556	6,276	7,096	7,004	7,715
Central Region	8,184	8,898	10,232	11,066	12,623
Whole Kingdom	7,132	7,830	8,879	10,502	12,067

Source: National Social and Economic Development Board, quoted in Study of Ayuthaya Provincial Industrial Economics, Provincial Industrial Office, Ayuthaya, 1981, p.93.

US 1$ = 20 baht approximately

IRRIGATION AND MODERN TECHNOLOGY

Ayuthaya is one of the earliest provinces experimented on modern agricultural technology. Irrigation was introduced into the area as early as 1855 after the signing of the Bowring Treaty when rice became a major export of Thailand (Pinit Lapthananond 1982). Canals had been excavated not solely for irrigation purpose but rather to extend communication and transportation routes to open up new land for cultivation. Nevertheless, it was since then that the importance of development of irrigation has been realized by the Royal Government. The first extensive irrigation scheme, "The Greater Chao Phraya Irrigation Project", was proposed by J. Homan Van De Heide, a Dutch expert, in 1902. It was estimated that four and a half million rai of land would benefit from the scheme. However, it was not materialized until 1950 when a budget was given by the World Bank. At present, most of the plan has been accomplished and the major dam, the Chao Phraya Dam, was constructed in Chainat province. According to an official record, the total area served by the scheme is 5,718,000 rai covering the area in 15 provinces in the Central Region.

At the beginning, the opening up of new land through canal excavation had led some wealthy families, including some royal families, mostly

residents of Bangkok, to acquire land which was believed to be very fertile and suitable for rice cultivation. Because of their privileges and wealth, the total number of land in the canal areas owned by these rich families was enormous. It was estimated that in one particular area (Thung Luang Rangsit, an area south of Ayuthaya), the total number of land owners during 1892 – 1901 was 694 with the total owned land of 235,822 rai. Almost 50% of the land or 113,539 rai were owned by only 5% of the owners who were from rich families. Such investment in land was lucrative for they could be sold later at higher prices or rented out to farmers who highly valued them for their accessible communication and fertility. Farmers themselves did not have opportunities to claim the land.

Similar cases happened in Ayuthaya. In 1969 it was recorded that there were 29 large land owners, each owned more than 1,000 rai. The total amount of land owned by these absentee landlords was 86,368 rai (Pinit Lapthananond 1980: 152 – 153). As indicated above, more than 50% of the total agricultural land holdings were rented land. Thus, it is historically evident that many farmers in Ayuthaya as well as in some nearby provinces became land renters since the time when land was opened up through canal excavation under the Greater Chao Phraya Irrigation Project. At present, there are 15 sub-project stations to control the operation of irrigation in Ayuthaya, covering an area of 1,173,820 rai (Pinit Lapthananound 1982: 16 – 17). The figure, however, has to be adjusted for, in practice, not the whole area receive water equally for the whole year. During the wet season, some area is flooded whereas others enjoy better control of water. This results in differences in cultivation practices. Where amount of water is less excessive, transplant method is adopted, but where the land is inundated, the traditional practice of broadcast method is applied. As mentioned earlier, during the dry season, second rice growing is even more uncertain. Farmers do not know in advance and are not certain about the availability of water, except those which are close to the main canals. Indeed, if possible, many prefer to invest in second rice crop using transplant method, such as in some villages in Lat Bua Luang District, for the yield is almost double that of the wet rice cultivation which still employs the traditional broadcast method. In other areas, however, many farmers are discouraged and less interested in investing in the second rice crop because of the uncertainly of the availability of water. Disputes over the distribution of water is quite common, for those farmers who have water pumps and/or are close to the canals take the advantage of draining more water into their farms and thus leaving those who cultivate land further away not having enough water for their fields. Therefore, the total amount of land under cultivation during the dry season is still low: the average of five years during 1970 – 1980 is about 141,630 rai or 12% of the total agricultural land. The lack of information concerning the availability of water during each season confuse not only the farmers but also the extension workers

who often encourage farmers to grow second crop. They often fail because no water is available or if any, the quantity is too small to be useful for cultivation. Evidences on communication and cooperation between government officials from different departments for the good of farmers are very few.

Therefore, with rather extensive irrigation projects, farmers in Ayuthaya are still very insecure and in doubt about the effectiveness of the work of the irrigation department. It is not so much that modern irrigation technique has changed the environment and the rythm of their life, but the inefficient control of water which made them suffer. They are certainly responsive to changes and are in good cooperation with government workers but at the same time are often discouraged by the result.

Such responsiveness can also be seen in the of other modern technology, such as improved rice seeds, fertilizers, insenticides and other farm machinery — two wheels and four wheels tractors. In the city of Ayuthaya, there are six small-scale factories producing both two wheels and four wheels tillers (Chesada Laohawenchit 1981).

Chulalongkorn University Social Research Institute (CUSRI) had made longitudinal studies of three communities in Ayuthaya in 1970 and 1980, and the following discussion mainly relies on data collected by the Institute (CUSRI, 1982). The three communities are Khayal and Thap Nam in Bang Pahan District, and Ban Chung in Nakhon Luang District. Table 8 compares the number of farmers who owned or hired tractors in the three communities. It is apparent that in Ban Chung the number of farmers who employed tractors has increased more than 60% during the past decade. The trend is that the larger the size of the farm the more likely that tractors are owned by farmers. In Ban Chung, owners of tractors in all farm size groups increased about 65% and those who owned more than 45 rai (11 households) had their own tractors. Nevertheless, in Khayai and Thap Nam, the situation was in the reverse direction. The number of tractor users dropped almost 100% and only those who owned tractors themselves reported to maintain the employement of tractors. This was due to the flood in 1980, a good indicator of the inefficiency of irrigation. In 1970 the use of tractors in Khayai and Thap Nam doubled that of those in Ban Chung, but in 1980 the figure was reversed. The employment of modern machinery is thus always subject to many factors and in the case of Ayuthaya, the control of water.

Table 9 shows that the number of farmers who employed water pumps in Ban Chung between 1970 and 1980 had increased about 10%. Farmers who occupied large farm size tended to own water pumps whereas those with small farm size hired or borrowed from others. In Khayai and Thap Nam, farmers of all size groups preferred to have their own water pumps which could be used for many other purposes, such as fixing them to boats or generating electricity.

TABLE 8. Family households who own or hire tractors by farm size group

Village	Ban Chung						Khayai						Thap Nam					
Farm Size (rai)	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users
	1980			1970			1980			1970			1980			1970		
1–14	25.0	75.0	8	–	100.0	3	–	–	–	–	100.0	14	–	–	–	–	100.0	9
15–44	79.1	20.9	43	12.5	87.5	16	100.0	–	1	2.6	97.4	39	–	–	–	–	100.0	19
45 +	100.0	–	11	–	100.0	3	–	–	–	–	100.0	3	100.0	–	1	13.3	86.7	15
All Size	75.8	24.2	62	9.1	90.9	22	100.0	–	1	1.8	98.2	56	100.0	–	1	4.7	95.3	43

TABLE 9. Farm households who own or hire power by farm size groups

Village	Ban Chung						Khayai						Thap Nam					
Size (rai)	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users	owned	hired borrowed	total users
	1980			1970			1980			1970			1980			1970		
1–14	38.5	61.5	13	–	100.0	7	100.0	–	2	50.0	50.0	2	100.0	–	1	100.0	–	1
15–44	81.4	18.6	43	79.1	20.9	43	90.0	10.0	10	45.5	54.5	11	100.0	–	6	62.5	37.5	8
45 +	90.0	10.0	10	100.0	–	5	100.0	–	8	100.0	–	1	100.0	–	4	80.0	20.0	10
All Size	74.2	25.8	66	70.9	29.1	55	95.0	5.0	20	50.0	50.0	14	100.0	–	11	73.7	26.3	19

The use of fertilizers, herbicides and pesticides is also widespread in Ayuthaya. Table 10 shows that in 1980 almost 90% and 82% of the total farming households in Ban Chung used fertilizers and pesticides respectively. In Khayai and Thap Nam, the use of fertilizers was less impressive because of flooding and the application of fertilizers in such case would not be very effective. On the other hand, the employment of herbicides and pesticides was generally high in both villages.

One of the main problems concerning farming in Ayuthaya is the ever increasing number of field rats that bring disaster to the provincial officers to the extent that a team of farmers is organized in each village to combat againsts the field rats. It is reported that more than one million rats were killed each year, but this is not an effective solution. Paddy fields are still being destroyed by the rat army. Pesticides have also been applied by almost every household and the average amount of money spent is between 200 – 300 baht. However, farmers realize that unless a large-scale cooperation among villages is organized, the problem cannot be fully solved.

CONCLUSION

At present, Ayuthaya, despite its former reputation as one of the richest areas for rice growing, is one of the least developed in the Central Region. Many officials and outsiders are deceived by the fact that it is under a very extensive irrigation scheme and is criss-crossed by many canals and rivers. Furthermore, figures on the use of modern technology are also impressive. But farmers' complaints have often been raised against the irrigation operation.

Rice cultivation is a risky and least profitable business. Many farmers have turned to other jobs such as migrating to Bangkok and other cities to become wage labourers which would offer them at least regular cash income. Those who remain in the villages have to take up other sideline jobs — whatever comes up. Ten years ago, Ayuthaya was known to farmers in the nearby provinces such as Lop Buri, Sing Buri, Chainat and Saraburi, as a place where they could become wage labourers. Nowadays, it is Ayuthaya people who employ themselves out to other provinces. Not surprising then, when asked what they most wanted in their villages, an answer is a factory where they could work without leaving home. Certainly, they did not like to leave their land but they did not have other alternatives.

Modern farming, at present, requires high cost of investment which many poor farmers cannot afford. They have to rent land and to borrow money for hiring labourers, tractors, water pumps and for buying seeds, fertilizers and insecticides. Many have failed and lost their land. Thus, farmers are inclined to leave the farms rather than to borrow money for investing in rice cultivation which is very risky. According to the provincial

TABLE 10. Expenditure chemical fertilizer, pesticides and herbicides

Village	Ban Chung				Khayai				Thap Nam			
Amount Spent (bath)	Fertilizer		Pesticides Herbicides		Fertilizer		Pesticides Herbicides		Fertilizer		Pesticides Herbicides	
	1980	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980	1970
350 or less	12.8	60.0	77.7	100.0	50.0	100.0	83.7	100.0	–	50.0	64.2	100.0
351 - 750	12.9	29.0	15.9	–	–	–	16.3	–	33.3	50.0	23.9	–
751 or more	74.3	11.0	6.4	–	50.0	–	–	–	66.7	–	11.9	–
Total	70 (100.0)	55 (100.0)	63 (100.0)	47 (100.0)	2 (100.0)	13 (100.0)	49 (100.0)	85 (100.0)	3 (100.0)	2 (100.0)	42 (100.0)	31 (100.0)

TABLE 11. Costs of farming

Village	Ban Chung			Khayai			Thap Nam		
Farm costs	Baht	in of % total	Baht per rai	Baht	in of % total	Baht per rai	Baht	in % of total	Baht per rai
Seeds	2,086	6.7	71.7	519	6.7	14.2	1,771	16.8	42.2
Fertilizers	2,007	6.4	68.9	–	–	–	–	–	–
Insecticides	271	0.9	9.3	355	5.8	12.4	262	2.5	6.2
Livestock feed	–	–	–	–	–	–	2,003	19.0	47.7
Machine hire	62	0.2	2.1	1,716	22.1	46.9	3,339	31.7	79.5
Animal hire	–	–	–	–	–	–	–	–	–
Breeds	–	–	–	–	–	–	355	3.4	8.4
Animal health	–	–	–	–	–	–	78	0.7	1.8
Transport	369	1.2	12.7	880	11.3	24.0	–	–	–
Hired labor	7,042	22.6	242.0	4,168	53.7	113.0	2,178	20.7	51.8
Repair and depreciation	2,355	7.6	80.9	–	–	–	–	–	–
Fuel	2,414	7.7	83.0	28	0.4	0.8	308	2.9	7.3
Machine	399	1.3	13.7	–	–	–	–	–	–
Land rent	14,168	45.4	40.6	–	–	–	–	–	–
Others	–	–	–	–	–	–	239	2.3	5.7
Total farm costs	31,173	100.0	624.9	7,766	100.0	211.2	10,533	100.0	250.6

record, almost 200,000 rai of rice land in Ayuthaya had been left uncultivated in 1980 (Provincial Industrial Office 1981: 14).

Table 11 shows the cost of rice farming. Total farm costs in Ban Chung was three times higher than that of Khayai and Thap Nam. In Ban Chung, 45.4% of the total costs was spent on land rent whereas in Khayai and Thap Nam, the cost of land rent had altogether disappeared because of crop failure. Similarly, machine hiring in Ban Chung cost less than in the other two villages, but more money was spent on fuel, repair and depreciation and hired labour for most farmers had their own tractors and water pumps. Seeds and fertilizers also required high costs of investment (13% of the total costs of Ban Chung).

As it is, the high degree of adoption and application of modern technology such as the use of fertilizers, insecticides and the employment of irrigation, tractors and water pumps do not promptly lead to long-term development. The inefficiency of water control, the high costs of investment, the threat from field rats, the market problems and the proximity to Bangkok are some of the problems which discourage farmers to remain in the farming business. They are certainly responsive to change and are ready to take risk in trying and modern techniques only to the extent of getting a satisfactory result. At present, this is not always possible especially to many of the small farmers who do not have resources to make modern farming effective and profitable. Social and economic condition such as indebtedness and land tenure have to be improved, if the adoption of modern technology is to be successful.

Modern technology is subject to many conditions mentioned above. It relies on the multiplexity of factors to be effective. Figures on the employement of modern technology alone can be misleading because they imply certain level of economic development. As shown in the case of Ayuthaya, modern technology is highly employed but poor social and economic conditions still prevail.

REFERENCES

Chesada Laohawenchit. 1981. Evolution and role of farm machinery in Thailand. Thammasat University Journal **10** (3), September.

Chulalongkorn University Social Research Institute, 1982. *Rural Dynamics in Ayuthaya.*

Ingram, J.C. 1971. *Economic Chance in Thailand 1850 – 1970.* Stanford University press.

Ministry of Agriculture and Co-operatives. 1978. *A Survey of Conditions of Indebtedness of Farmers, 1977/78.* Bangkok.

Pinit Lapthananond. 1980. *Land Holdings in Ayuthaya.* Chulalongkorn University Social Research Institute Bangkok.

Provincial Industrial Office. 1981. *Study of Ayuthaya Provincial Industrial Economics.* Ayuthaya.

Uthis Nagsawas. 1958. *A Survey of Indebtedness and Rice Marketing in Central Thailand 1957/58*. Ministry of Agriculture and Co-operatives Bangkok.

Department of Sociology and Antropology
Faculty of Political Science
Chulalongkorn University
Bangkok 10500
Thailand.