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"Green Revolution" and Socio-Economic Implications for Rural Communities in Thailand

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ABSTRACT

The paper attempts to reevaluate the effects of Thailand National Economic Development Plan first started in 1960 on agricultural development. The "Green Revolution" which is specifically identified to rice production, has met with some successes notably in increased productivity, the discovery of new high yielding clones and the opening of new areas for cultivation. But of more importance from the data collected and feedback received the farmer does not benefit from the agricultural development. Production cost has increased tremendously compared with income obtained. The production cost invested is much higher under this plan than under the traditional method of cultivation. The groups that derive benefit from this plan are the middleman and the government officials. The writer suggests that apart from the economic aspect social aspects of development be considered for the planning of the "Green Revolution" in future.

ABSTRAK

Kertas ini cuba meninjau semula kesan-kesan pembangunan daripada Rancangan Pembangunan Ekonomi Kebangsaan Thailand yang bermula sejak 1960. "Revolusi Hijau" yang khusus mengintensifikasikan pengeluaran padi telah mencapai beberapa kejayaan seperti penghasilan yang semakin meningkat, penemuan klon-klon yang lebih tinggi penghasilannya, dan pembukaan kawasan-kawasan baru. Namun yang lebih ketara, daripada maklumbalas dan data-data yang dapat dikumpul, petani tidak menerima sebarang keuntungan daripada perkembangan pertanian itu. Kos pengeluaran meningkat jauh lebih tinggi daripada hasil pendapatan. Tenaga dan modal tunai yang dilaburkan jauh lebih banyak daripada cara penanaman tradisional. Yang lebih beruntung ialah golongan peniaga yang mengendalikan usaha sebagai orang tengah dan golongan pemerintah yang tinggal di pusat-pusat pentadbiran. Penulis menyarankan pengambilkiraan aspek sosial selain daripada ekonomi untuk merancang "Revolusi Hijau" seterusnya.

INTRODUCTION

The 1980 annual survey report, by National Economic and Social Development Board states: "Throughout 16 years of agricultural development since the start of the First National Economic Development Plan (1960 – 64), it must be accepted that there is no achievement so worthy of praise other than the release of RD varieties by Rice Division, Agronomic Research Division which has been an important step for 'Green Revolution' in Thailand..." In 1977, no less than 95 percent of farmers who operate second cropping covering 3 million rais (nearly 500,000 ha) uses the modern varieties. Although statistics of MV users among first cropping is not known, in the Northern part, MV substitutes about 40 percent of the traditional varieties.

Rice which is grown in every one of the 72 provinces of the country is the most important commodity in the Thai economy. About 31 percent of the nation's GDP come from agriculture and of this rice accounts for one third of it. In term of area, rice occupies about 65 percent of the total cultivated area. About 79 percent of the population is engaged in farming, 84 percent of which are rice growers of both subsistence and commercial categories. Rice areas can be classified as irrigated, non irrigated or rainfed, and upland. Irrigated land usually means that a supplementary source of water is available for some time or throughout the year. Rainfed usually means that the only source of water for paddies is rainfall. This non-irrigated or rainfed rice land accounts for about 7.5 million hectares or about 77 percent of the land.

This brief report attempts to describe the agrarian structure, the background stituation of the new rice technology or the "green revolution" and its economic consequences, and to discern some socio-cultural implications of the change to the rural communities.

BACKGROUND OF THE AGRARIAN STRUCTURE

The favourable man-land relationship as characteristic condition of Thailand's history is abundant unused land but not enough manpower. Historically, political control and political power was mainly the problem of manpower which in turn meant control of land. However, as realy as 1930, in the first systematic survey conducted in 1930 – 31 by the well-known American rural sociologist, Carle C. Zimmerman, it was found that there were differences among the four regions of the country not only in farm size, but also land utilization and land tenure system. At present, three conditions have appeared to alter the favourable equilibrum dynamic. Firstly, there are limits for cultivating the uncultivable lands: that land is a limited resource. It has been widely accepted after the fast expansive

periods for rainfed rice cultivation after the second world war and the very fast expansive period for upland crops after the 1960's. Secondly, stagnated productivity: during 1960 – 64 the yield per hectare was 1.7 tons and in 1976 – 77 and 1979 – 80, 1.9 tons and 1.7 tons respectively. The increase in production of rice during these years resulted from expansion of cultivation more than any other factors. Thirdly, population pressure. While expansion in industrial and other sectors have not been able to absorb large labour surplus, much of the population increase have remained in the rural sector. In 1960, there were 3,689 thousand farm household, but in 1975 the number increased to 5,060 thousand. During this 20 year period the number of farm households had increased by about 1362 thousands. If one considers to multiply this with average household of 6 persons, the increase amounts to 8 million people.

Concerning the tenurerial structure, on national aggregate level only 12.25% of the agricultural land was rented in 1973, and only 912,858 farm households or 20.54 percent of all agricultural households were tenant in 1973. However, closer scrutiny on regional level reveals serious differences (Table 1 and 2):

1. The percentage of tenant households is highest in the Central region, i.e. 41.31% in 1976, followed by the North with 20.84% and the lowest is the Northeast with only 8.68%
2. If the number and percentage of tenant households of 1968 and 1976 are considered, we can observe the drastic increase of that number in the North, i.e., by six-fold.
3. Concerning size of holdings, 7 provinces in the upper North have on the average the smallest size in the country, i.e., 80% land holding is under 15 rais (2.4 ha), while the central provinces have on the average of 30 rais (4.8 ha).
4. In the 20 provinces in the Central Plains, percentage of tenant agricultural households is highest on the average. On the top is Pathumthani with 83.9%, followed by Ayuthaya with 76.5%. The seriousness of the problem is partly accomodated by thefact that several provinces in this region are close to industrial and urban centres of Bangkok Metropolitan, the primate city, providing non-agricultural employment opportunities.

RICE PRODUCTION AND THE COMING OF THE HIGH YIELDING VARIETIES

Rice has been or a long time the country's leading earner of foreign exchange, the most important source of income for Thai farmers, and a major source of government revenue through the rice export premium. Rice production has grown about 6.4 percent annually over the past 15 years, largely due to additional land in production, although average

TABLE 1. Agricultural area and rented area classified by region, 1973 (Unit: Rai)

	Total Area	Rented Area	Percentage of Rented Area
Central	27,274,496	7,982,733	29.27
North	23,189,043	3,652,068	15.74
South	13,684,941	605,151	4.42
North-east	48,796,089	1,594,273	3.27
Whole Country	112,943,669	13,834,225	12.25

Note: 6.25 rai = 1 hectare = 2.44 acre = 98.74 are
Source: Ministry of Agricultural and Cooperatives, Land Utilization in 1973. (in Thai)

TABLE 2. Tenant agricultural households in Thailand by region, 1968 – 1969 and 1973

	1968 – 1969[1]		1973[2]		Increased	
Region	No.	%	No.	%	No.	%
Central	201,285	40.66	352,632	41.31	151,347	0.65
North	129,400	18.23	912,858	20.84	783,458	2.61
South	52,245	15.63	101,004	17.48	48,759	1.85
North-east	32,265	2.67	157,967	8.68	125,702	6.01
Whole country	145,195	15.31	912,858	20.84	497,663	5.53

Sources: 1 Adul Niyomvipak, Land Reform (Individual research paper, National Defence College, 1971 – 1975).
2 Ofice of Land Reform for Agricultural, Agricultural Land Holdings and Agricultural Households in Thailand, (Paper No. 1 09).

yields tend to stagnate for along period of time. (Table 3). Almost all the rice produced is consumed in the country. Only about 10 percent has been exported in recent years. Under these circumstances, if rice productivity does not increase, this historicallyfood surplus country will face a shortage of rice for export, and eventually for her own domestic consumption.

After the establishment of the International Rice Research Institute (IRRI) in 1960, Thailand has had close cooperation in it. Thai rice breeding objectives and methods were re-evaluated and new lines of work were started, taking advantage of the training and facilities which became available through IRRI. Hybridisation efforts were revived and a number of crosses were attempted. After several years of experiment including both wet and dry season test in Thailand have been released since the end of 1966. Very often it has been found that those IR or RD varieties performed well under Thai conditions, but grain quality was so poor compared to Thai standards and Thai consumers had been very discriminating in their own taste or rice. In some cases, merchants were reported to have discounted its price by 30 – 40 percent.

TABLE 3. Area, production, and yield of rice by region, Thailand 1962 – 63 to 1979 – 80

Region	Crop Year						
	1962 – 72	1972 – 73	1973 – 74	1974 – 75	1975 – 76	1976 – 77	1970 – 80
			Area (1000 ha)				
Northern	1,446	1,515	1,839	1,662	1,921	1,727	–
North-eastern	2,887	1,959	3,552	3,309	4,003	3,802	–
Central	2,149	2,298	2,479	2,397	2,409	2,424	–
Southern	538	617	493	614	564	623	–
Total	7,020	6,389	8,363	7,982	8,897	8,576	9,435
			Production (1000ct)				
Northern	3,218	2,710	3,984	3,872	4,322	4,111	–
North-eastern	3,749	4,198	4,638	3,795	5,326	4,686	–
Central	3,926	4,483	5,451	4,829	4,647	5,103	–
Southern	864	1,022	825	890	1,005	1,168	–
Total	11,757	12,413	14,898	13,386	15,300	15,068	15,758
			Yield (t/ha)				
Northern	2.2	1.9	2.2	2.3	2.2	2.3	–
North-east	1.3	2.1	1.3	1.1	1.3	1.2	–
Central	1.8	1.9	2.2	2.0	1.9	2.1	–
Southern	1.6	1.7	1.7	1.5	1.8	1.9	–
Average	1.7	1.9	1.9	1.7	1.8	1.9	1.7

Source: Division of Agricultural Economics, Agricultural Statistics of Thailand 1979 – 80. Ministry of Agriculture and Cooperatives.

ADOPTION OF HIGH YIELDING VARIETIES AND ITS CONSTRAINTS

With the release of the three new varieties in late 1969, that coming wet season became the first opportunity for many Thai farmers to adopt them. Thai farmers were very eager to try them. It has been estimated that in the 1970 wet season 100,000 hectares were planted with the new varieties, primarily RDI, and 250,000 hectares in 1971 wetseason. These cultivation were primarily in the irrigated areas in western and northern parts of the Chao Phraya Delta, and in some areas in Chiangmai Valley.

In wet season, rice cultivation depends largely on rainfall. Most varieties grown in this season (May/August – November/February) are locally improved varieties that are well suited to the environment, for example, floating rice. In the 1971/72 wet season, it was estimated that 5 percent of the nature's total rice area was planted with these modern varieties. At present, only in areas where land consolidation has been completed and irrigation system dependable, such as Chanasutr Project of Singburi, modern varieties are widely grown. The case of dry season is

more accommodating for modern varieties. In this season, rice is planted from December/May and harvested in April/August. The time varies according to the harvesting of wet season crop and the availability of irrigation water in each zone area. Rice planted in this second crop are mostly modern varieties.

Slight increase in the total volume of rice production in Thailand during these twenty years or so have come from adoption of modern varieties, increased use of modern inputs such as fertilizer, insecticides and herbicides etc., and from land expansion (Table 4). On the aggregate level, we can observe the increase of these modern inputs in the following terms.

TABLE 4. Second rice: Planted area, production and average yield by region crop

Region	Crop Year				
	1975–76	1976–77	1977–78	1978–79	1979–80
			Planted area (1000) ha)		
Northern	57	40	47	92	41
Northeastern	4	4	8	25	12
Central	304	360	392	554	281
Southern	12	34	30	10	3
Total	377	438	477	681	336
			Production (1,000 t)		
Northern	197	139	142	240	119
Northeastern	5	15	18	65	26
Central	983	1,144	1,338	1,927	958
Southern	23	96	88	31	8
Total	1,208	1,393	1,586	2,264	1,111
			Yield (t/ha)		
Northern	3.5	3.5	3.0	2.6	2.9
Northeastern	1.2	3.8	2.3	2.6	2.2
Central	3.2	3.2	3.4	3.5	3.4
Southern	1.9	2.9	3.0	3.2	2.8
AV	3.2	3.2	3/3	3.3	3.3

Source: Division of Agricultural Economics, *Agricultural Statistics of Thailand 1979 – 80.* Ministry of Agriculture and Cooperatives.

Firstly, the use of fertilizer has increased by about 15 percent a year during 1962 – 1975. During the early 1970s, about 60% of the total fertilizer use was for rice production, according to the Division of Agricultural Economics, Ministry of Agriculture and Cooperatives. Furthermore, from Agricultural Statistics 1980/1, during 1967 – 1979, fertilizer use for first rice crop increase about 1.75 times from 171,092 to 300,000 ton, and for second rice crop, 17.7 times from 10,000 to 178,500 ton.

Secondly, farm machinery, especially farm tractors, has been rapidly adopted. By 1967, there were about 17,500 four-wheel tractors and about 2,000 two-wheel tractor power tillers; about 52% of the large tractors were used in upland crop farming, and 58% for land preparation for broadcast rice. Furthermore, what should be noted is the drastic increase of tractor use among farmers in the span of 15 years between 1975 – 80, i.e., 156% for two-wheel walking tractors, 114% for a wheel tractors, and 150% for big tractors. Similar trends of increase though at lower rate are found for other farm equipments (Table 5).

TABLE 5. Changes in the use of farm equipments by the farmers,

Item	1975/76	1979/80	%
2-wheel walking tractor	90,001	230,591	+ 156.21
4-wheel tractor	14,575	31,158	+ 113.78
big tractor	13,338	33,285	+ 149.55
motor roller	9,882	8,000	– 19.04
sprayer	1,310,464	1,604,884	+ 22.47
water wheel engine	56,891	107,730	+ 89.36
water pump	251,288	473,975	+ 88.62
cleaning machine	42,342	66,806	+ 57.78
corn threshing machine	5,721	9,000	+ 57.32
rice threshing machine	3,955	6,224	+ 57.37
feed mixing machine	374	588	+ 57.22
wind mill	1,937	3,047	+ 57.31
sugar cane cutter	–	5	
rice mill	24,658	25,682	+ 4.15

Source: Agricultural Statistics in Brief Crop Year 1980/81

Thirdly, increase of the use of insecticides, pesticides and herbicides during the last ten years are no less drastic. According to Agricultural Statistics, in the period of 1973 – 1980, insecticides use increases by 200% from 6,446 to 13,464 ton, pesticides by 34% from 3.6 to 12.5 ton, and herbicides by 360% from 1,945 to 7,000 ton. (Table 6).

TABLE 6. Import of insecticides 1973 – 1980 .

Year	Quantity (tons)			Value (million baht)		
	Technical Grade	Finished Product	Total	Technical Grade	Finished Product	Total
1973	4,686,928	7,905	12,592,909	74,650	187,801	262,451
1974	2,069,128	8,843,746	10,912,874	52,799	244,716	297,515
1975	620,406	4,821,432	5,441,838	24,153	199,785	223,938
1976	2,604,833	6,597,565	9,202,398	104,388	296,929	401,317
1977	5,188,720	9,190,522	14,379,242	175,695	403,687	579,382
1978	7,167,720	12,076,103	19,243,923	248,491	551,015	799,506
1979	5,308,326	13,895,447	19,203,773	325,966	770,660	1,096,626
1980	4,515,000	16,123,500	20,638,500	275,862	964,050	1,239,912

Source: Agricultural Statistics in Brief Crop Year 1980/81

There are several constraints to further adoption of high yielding varieties. Firstly, inadequate control over irrigation and rain water seem to be very crucial both in inducing farmers to adopt and holding down yields. Secondly, government price policy has kept fertilizer and agro-chemical prices high and, at the same time, rice price low. In 1968, it was estimated that of the export price 2493 baht for the equivalent of 1,000 kg. of padi, the farmers got only 48.13% (1,200 baht) while the government took 32.4% (rice premium and other taxes = 808 baht), the rest was the middle men's profit (7.26%) and other expenses (12.60). As for the price ratio of a kilogram of nitrogen fertilizer to a kilogram of paddy rice, in 1971 it is about 7 to 1, compared with a ratio of 3 to 1 or less in many other parts of Asia. Thirdly, farmers appear reluctant to commit to higher level of inputs. Most important reasons given were increasingly high price of inputs such as fertilizer, insecticides, and the fluctuating selling price of paddy. In recent years, there are evidence supporting this rationale. The rate of returns for investment in traditional farming became higher than in advanced agricultural area in which modern inputs (and the expensive petrol) were intensively used. Fourthly, government policy related to land reforms and associated measures related to farmers' institutions have not been consistent and thorough enough. In fact, the policies are more biased for urban, industrial and bureaucratic interests.

SOCIO-ECONOMIC CONSEQUENCES OF THE "GREEN REVOLUTION"

Perhaps it is more appropriate to use the term 'new rice technology', of which key components are high yielding varieties or modern varieties, and associated inputs. This new rice technological change has certain characteristics inherent to them: one is that the requirements of the new seeds with time-bound operations intensify the seasonal peaks of labour demand in farm work. This is due to the fact that they have a shorter maturing period, and harvesting must be completed quickly for land preparation for the next crop. This affects patterns of labour utilization and relates to mechanization. The other requirements of the new seeds are bio-responsive, which creates investment in inputs.

1. because of the time-bound peaks of labour, there is a strong tension to mechanize, or
2. pattern of labour utilization changes from exchange and cooperative labour to hired labour;
3. pattern of land utilization changes from one crop to double-cropping or multiple-cropping. The second crop may be rice, or other cash crops;

4. the new rice technology requires modern inputs from outside sector external to the village community. This is a trend for input commoditization, and farmers need capital to invest, i.e., demand for credit.

5. Modern inputs are products from industrial sectors be they national or international. This means farmers must rely more on external input markets than before.

TABLE 7: Diffusion of mechanization in Lan Laem Village, Nakorn Pathom (1980)

Farm size (rai)	Number of farm having ownership of											Number of farms renting and having for rent of									
0.1 – 4.9	23	–	–	–	–	9	–	5	–	1	2		–	1	–	4	–	1	1	–	
5 – 9.9	14	–	7	–	2	5	1	6	–	–	7		–	3	–	1	–	–	–	–	
10–19.9	26	–	18	3	2	17	4	13	–	2	15		1	3	–	5	–	3	–	–	
20–29.9	10	–	9	2	3	9	–	7	–	–	9		–	–	–	1	–	2	–	–	
30–44.9	12	–	12	1	5	13	8	8	3	–	13		–	1	–	1	–	5	–	–	
45–59.9	2	–	3	–	1	2	2	3	–	–	3		–	–	–	–	–	1	–	–	
60–79.9	1	–	2	–	–	2	1	1	1	–	1		–	–	–	–	–	–	–	–	
over 80	1	–	2	–	1	2	2	2	1	1	4		1	–	–	–	–	1	–	–	
others	1	3	–	–	–	4	1	–	–	1	1		1	–	–	–	–	–	–	–	
Total	90	3	53	6	14	63	19	45	5	5	55		3	8	0	12	0	13	1	0	

Note: 6.25 rai is equipment to 1 ha.

Source: Tasaka Toshio, Tai ni Okeru "Midori a kakumei" to Ngoyo Seisan Ryoku Tenkai (Green Revolution and the Development of Agricultural Production Forces in Thailand) Osaka Keizai-Hoka Daigaku, Keizai-Gaku Ronshu, Vol. 6 no. 4, March 1982, p.38.

SOCIOLOGICAL IMPLICATIONS OF TECHNICAL CHANGE AND SOME RESEARCH DIRECTIONS

We have considered the background, the situation and the socio-economic consequences of the 'green revolution' or new rice technology, in Thailand, by way of conclusion we shall discern some sociological implications of this technical change, and raises some issues for research.

1. new rice technology is constrained by socio-political factors, i.e., government policy on institutional reform and price policies.

3. definite trend to replace traditional cooperative labour of rural communities is there. This trend has significant implications for village institutions. It should be studied about how this affects other aspects of village social life: and what the responses are.

4. villages are linked in further aspects to the national and international markets, especially in relations to inputs and markets. As existing agrarian structures remain intact, these new linkages are market-oriented, it is very important to appreciate these relations.

5. as inputs and credits becomes more important, and the agrarian structure where the rural poor are the landless workers and tenant far-

mers remain intact, the question of accessability of different socio-economic groups to bureaucracy and these inputs become very crucial. We need to investigate further the effects of the existing rural development policies. While agricultural productivity increases only slightly or mostly stagnate, expenses on consumer goods due to urban commercials and rural electrification are on the rise. The ways to meet for these expenses is migratory labour intensification of farm work by other members of households.

Rural development policy must integrate these factors into consideration.

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