DOUBLE CROPPING OF RICE IN THAILAND

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ABSTRACT

Single cropping of rice has been practiced in Thailand for a long time. Double cropping was initiated in the late sixties in limited areas using local, tall photoperiod-insensitive varieties for the second planting. The use of the dry season crops was expanded after the release of the Thai HYVs.

Double cropping is limited by the availability of water in the dry season and good control in the wet season. The average yield in the dry season was substantially lower than the potential yield. A study was conducted on yield constraints in 1974-1977 and it was found that fertilizer application was the main factor in the yield gap, i.e. 55% in the wet season and 75% in the dry season. Inadequate control of weeds and insects was less significant.

Direct seeding of pre-germinated rice in the puddled soils was modified and improved from the traditional farmers' practice. This practice was found to be as good as the transplanting method in areas where labor is scarce.

It is recommended that future research sould be directed towards minimization of the cost of production and improvement in grain quality.

Introduction

Rice cultivation was practiced in Thailand several thousand years ago. BAYARD (1970) who found rice chaff in an excavation site near Khon Kaen in the Northeast which dated as far back as 3500 B.C. speculated that rice cultivation had been practiced since then. Rice crop used to be planted once a year during the rainy season until the late sixties. After the introduction of the semi-dwarf, high-yielding varieties into tropical Asia, double cropping was then implemented. At that time a few farmers planted tall and photoperiod-insensitive varieties but the yields were low. The semi-dwarf varieties were eventually used for dry season planting in the irrigated areas while the traditional tall type varieties were retained for the wet season cropping.

Before IR8 was named, the original line, IR8-288-3 had been tested at two locations in Thailand. It yielded 6,483 kg/ha at Bangkhen Rice Experiment Station in the wet season of 1965, which was twice the yield of the local, tall and photoperiod-insensitive check variety, Leuang Tawng (CHANDLER, 1982). The yield was impressive but the Thai farmers did not accept the bold chalky grains of the variety. The line was crossed to Leuang Tawng and the progenies were designated as RD1 and RD3 in 1969. They were the first two non-glutinous semi-dwarf varieties ever released in Thailand. In the test at Bangkhen, RD1 yielded 6.7 t/ha and outyielded its parent Leuang Tawng by 100% (JACKSON *et al.*, 1969). RD1 and RD3 were then compared with C4-63 a well-known Philippine high-yielding variety in the following three seasons. The average yield of RD1 and RD3 was slightly higher than that of C4-63.

The adoption rate of the new improved varieties was low at the beginning. Only 0.1% of the rice areas was planted to the new varieties in the crop year 1969/70 (PALACPAC, 1982). As farmers gradually learned proper agronomic practices for cultivating the new varieties these were adopted in both seasons in areas where water control is satisfactory throughout the year. Within 10 years the adoption rate increased to 11.8%.

The hectarage of rice double cropping was relatively small compared to that of the single

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Table 1 Area (1,000 ha), production (1,000 t) and yield (t/ha) of rice in wet and dry season

Crop Year	Wet season			Dry season		
	Planted area	Production	Yield	Planted area	Production	Yield
1970/71	7,974	13,570	1.8	100	280	2.8
1971/72	7,527	13,744	1.8	na	na	na
1972/73	7,139	11,699	1.6	210	744	3.5
1973/74	8,037	13,886	1.7	326	1,013	3.1
1974/75	7,651	12,447	1.6	331	939	2.8
1975/76	8,519	14,092	1.8	377	1,208	3.2
1976/77	8,137	13,674	1.8	438	1,395	3.2
1977/78	8,554	12,335	1.5	477	1,586	3.4
1978/79	9,346	15,206	1.8	681	2,264	3.6
1979/80	9,099	14,646	1.8	336	1,111	3.5
1980/81	9,101	15,405	1.8	516	1,963	3.8
1981/82	9,023	15,758	1.8	572	2,017	3.6
1982/83	8,987	14,774	1.8	634	2,104	3.4
1983/84	9,298	16,943	1.9	717	2,606	3.7
1984/85	9,266	17,275	1.9	706	2,630	3.7

na = not available.

Source: Center for Agricultural Statistics, Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, Bangkok, Thailand.

wet season crop (Table 1). There were approximately 100,000 ha planted in the 1971 dry season with a considerably low yield. The average yield gradually rose to 3.8 t/ha in 1981 and levelled out at around 3.5-3.7 t/ha. The dry season areas were concentrated in the Central Plain where irrigation facilities were better than in the other regions (Table 2). Even so, the averages were still lower than the potential yield.

Table 2 Dry season rice areas (1,000 ha) and yield (t/ha) by region, 1976-1985

Year	North		Northeast		Central Plain		South	
	Area	Yield	Area	Yield	Area	Yield	Area	Yield
1976	57.0	3.5	4.2	1.2	304.0	3.2	12.3	1.9
1977	39.8	3.5	4.0	2.8	360.3	3.1	33.6	2.9
1978	46.7	3.0	7.7	2.3	392.5	3.4	29.8	3.0
1979	91.8	2.6	25.4	2.6	554.2	3.5	9.8	3.2
1980	40.8	2.9	11.5	2.2	281.0	3.4	3.2	2.8
1981	56.3	3.5	23.7	2.6	424.3	3.9	12.0	2.9
1982	58.2	3.3	15.5	2.1	484.2	3.6	14.6	2.9
1983	66.6	3.0	35.0	2.3	506.9	3.5	25.6	2.6
1984	89.6	3.7	61.1	2.5	535.7	3.9	30.1	2.6
1985	98.4	3.6	34.4	2.5	537.8	3.9	35.8	2.5
Average	64.5		22.2		438.1		20.7	
%	11.8		4.1		80.3		3.8	

Source: Center for Agricultural Statistics. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, Bangkok, Thailand.

Production constraints

As mentioned earlier, IR8 and RD1 yielded more than 6 t/ha at Bangkhen Rice Experiment Station in both the dry and wet seasons which indicated that the farmers' yields could still be improved. A study on the constraints to high yield was conducted from the 1974 wet season up to 1977 in the area Northwest of the Central Plain (ADULAVIDHAYA *et al.*, 1979). The area selected was representative of the double cropping areas of the Central Plain. The factors tested in 1974–1976 were fertilizer management, weed control and insect control. Variety was included as an additional factor in 1977. Farmers' practices were used as control. It was concluded that the average yield gap was about 1 t/ha in the wet season and about 2 t/ha in the dry season (Fig. 1).

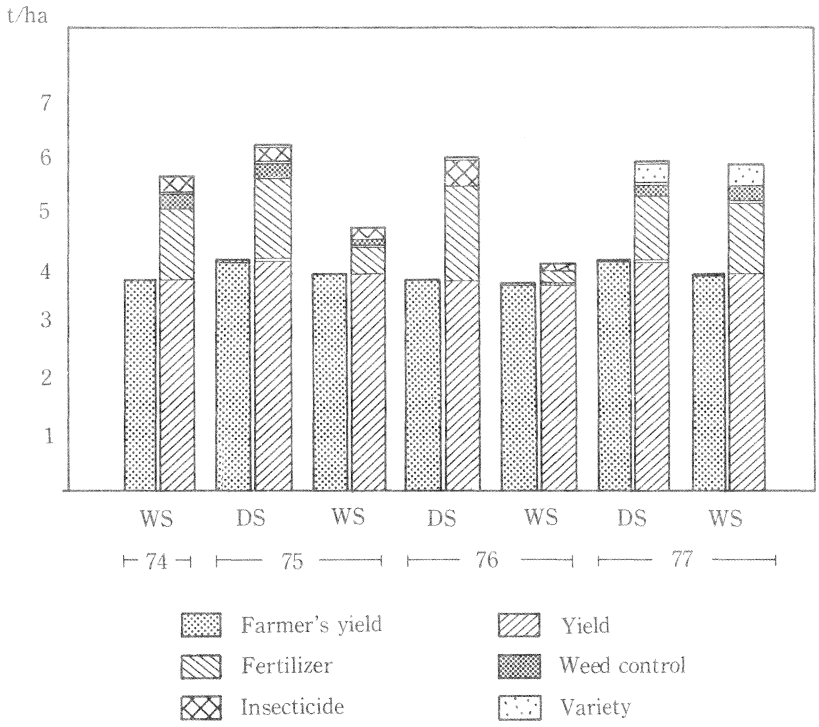

Fig. 1 Farmer's yield (F) with high level inputs (H) in 1974–77.

The main factor in the yield gap was fertilizer application with about 55% in the wet season and 75% in the dry season. In the 1975 dry season, 62% of the farmers in the study area used a low level of fertilizer and 8% used no fertilizer. In the dry season of 1977, only 1% of the farmers used a high level of fertilizer while 94% used a low level. The reason for not using or using low levels of fertilizer were the high and fluctuating price of fertilizer. This is still true at present.

Inadequate control of weeds contributed 27% in the wet season cropping and 15% in the dry season one. The fact that 69% of the farmers in the study area did not use herbicides was mainly due to the lack of information on the chemicals. About 38% of the farmers claimed that they did not believe in the effectiveness of the chemicals and that they had more confidence in hand weeding. At present, farmers tend to use more herbicides since they recognized their

efficiency and became more familiar with the technology. The application of herbicides was found to be more economical and practical for large scale direct seeding cultivation.

The use of insecticides was found to be the least limiting factor as only 9% contributed to the yield gap in the wet season and 5% in the dry season. In the 1975 and 1977 dry season surveys the farmers who reported having severe insect infestation but used no insecticides reasoned that they did not know how to use them or that the insecticides were too costly. At present as insect outbreaks tend to increase in both seasons, the farmers are using more insecticides in addition to the cultivation of resistant varieties.

Economic evaluation of the tested input management packages compared with the farmers' level of input, showed that the optimum input package gave the best net return.

Direct seeding of pre-germinated rice in irrigated areas

Recently, the concept of direct seeding has caught the attention when farmers in some rice-growing areas were faced with labor shortage. Transplanting is labor-intensive. Improved direct seeding was adapted from the farmers' traditional method. The modified method required improved land preparation, pre-germinated seeds, application of herbicides, insect control and fertilizer application. The practice proved to be applicable in the areas where control is not a problem.

In 1983, the method was tested at the rice experiment stations nationwide and compared with the transplanting method. The results indicated that the pre-germinated direct seeding method was not well-suited to the northern, northeastern and southern regions. Data on yield and the cost of production are shown in Table 3. There were differences among locations and

Table 3 Yield (t/ha) and cost of production ($/t) of transplanted (T) and direct-seeded (D) wet season rice in the Central Plain rice experiment stations

		1983		1984		1985	
0		T	D	T	D	T	D
PSL	Yield	5.2	3.7	4.2	4.0	2.1	2.5
	Cost	69	97	90	86	176	143
KSR	Yield	-	-	3.4	4.4	1.7	1.4
	Cost	-	-	85	74	146	186
CNT	Yield	-	-	3.8	3.9	4.5	3.1
	Cost	-	-	65	66	93	120
PTT	Yield	3.5	2.5	3.6	3.5	3.0	3.5
	Cost	93	107	93	76	83	113
KLG	Yield	4.1	3.0	3.8	3.3	3.0	1.7
	Cost	75	83	86	83	83	126
BKB	Yield	-	-	-	-	3.8	3.7
	Cost	-	-	-	-	83	126
SPR	Yield	-	-	-	-	3.5	1.9
	Cost	-	-	-	-	120	197
RBR	Yield	-	-	4.7	4.9	4.1	4.2
	Cost	-	-	69	62	80	75

Source: Rice Research Institute, Department of Agriculture, Bangkok, Thailand.

years both in yield and cost of production. Out of the 17 plots, eight showed yield differences of less than one-half ton. The transplanting method outyielded direct seeding in 7 plots and in only two instances did direct seeding yield more than transplanting.

When the cost of production was calculated, the direct seeding method was found to cost more than the transplanting method in nine occasions. In four instances the transplanting method was more expensive. Otherwise no difference was observed.

It may be concluded that the expenditure for the pre-germinated direct seeding method is not essentially lower than that for the transplanting method. Direct seeding can save labor for transplanting but the cost for land preparation, herbicides and insecticides can be high. This practice may be advantageous in the areas where hired labor is scarce or costly. For example our Rainfed Project on direct-seeded rice with the use of a mechanical seeder proved to be successful in many areas in the North and South of Thailand.

Future outlook

As a rice-exporting country, Thailand is suffering from the reduction of price in the world market and the increase in the bargaining power of other rice-exporting countries. The future for rice production is not too bright indeed. We have to focus more on research to reduce the cost of production and maintain grain quality in order to stabilize our rice market.

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Discussion

Kaneda, C. (Japan): Do you have any program for breeding rice varieties adapted to direct seeding?

Answer: Yes. We are aiming at developing the panicle type.

Nozaki, M. (Japan): What is the reason for the higher production cost of direct seeding culture compared with transplanting culture?

Answer: The higher cost of production associated with direct seeding culture is due to the high land preparation cost.

Perez, A.T. (ADB): With Thailand experiencing surplus rice production, is the government directing its efforts toward crop diversification?

Answer: Yes. We are trying to reduce the hectarage of the dry season rice crop by encouraging the farmers to grow other short duration crops in rice fields in order to save water.

Balasuriya, I. (Sri Lanka): In Sri Lanka, despite intensive effort to increase the transplanted area, the extent transplanted is still small, about 10-12% of the total rice area. The

farmers broadcast seed into the wet puddled soils. They start with a clean seedbed and if there is adequate water to maintain the submergence, weed control is good. Dry direct seeding is associated with problems of high weed growth.

Pushpavesa, S. (Thailand): The private sector along with the government is now implementing a pilot project involving transplanting to complete a full cycle of rice production up to the marketing stage. The objective is to use machines given by Japan to the government of Thailand which have remained in the country after the JICA* team left. Up to now only a few thousand hectares have been managed in this way.

Buhiran, K. (Malaysia): What is the average size of the direct-seeded plot which makes land preparation difficult and expensive?

Answer: The plot size is about 2 hectares.

Balasuriya, I. (Sri Lanka): The levelling of the seedbed is difficult to achieve in case of direct seeding. In Sri Lanka we use small parcels which requires a great deal of attention.

Kennedy, J.M. (Liberia): You mentioned that the availability of water during the dry season was one of the limiting factors of the double cropping system. Is the Thailand government implementing a system whereby irrigation water could be stored in sufficient amounts during the rainy season so as to use it in the dry season?

Answer: The government is keen in expanding the irrigation facilities. Also since the rice plant consumes a large amount of water compared with legumes or short duration crops and since Thailand is experiencing difficulties in the marketing of rice, attempts are made to reduce the rice hectarage in the irrigated areas, particularly in the dry season, and to promote rice-based cropping systems.

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