4. THE RESPONSES OF NEW LESS PHOTO-SENSITIVE RICE VARIETIES TO DIFFERENT LEVELS OF NITROGEN FERTILIZER APPLICATION DURING THE DRY AND WET SEASONS.

Chalermkiat Saisoong*, Somnuik Glawiggram*
Sujin Suthdhani*, and Sombhot Suwanawong*

Introduction

Thailand is a rice exporting country and for this reason, very keen on the quality of rice. No new varieties were found satisfactory to Thailand in quality until 1968 when some new varieties, good in quality, became available and fertilizer experiments were started on these new varieties.

Objective

1. To study the responses of Less-Photo-Sensitive rice varieties to the different levels of nitrogen fertilizer applications.
2. To compare the relative effects of varying rates of nitrogen application on the yield components of those rice varieties grown during the dry and wet seasons.

Materials and Methods

1. **Experimental sites.** The experiments were conducted at 3 different Rice Experiment Stations; namely, Chainat, Klong Luang, and Supanburi.
2. **Soil at experiment sites.**[1]
   - 2.1 **Soil Genesis.**
     - 2.1.1 **Chainat Rice Experiment Station.** The soil at this experiment station is clay texture, developed on flood plain of Chao-Phraya River, was derived from fresh water alluvial. Vegetations are sugar palm, grasses, bushes. The present use is rice.
     - 2.1.2 **Klong Luang Rice Experiment Station.** The soil is clay texture, developed on flood plain, derived from brackish water alluvial. It is a moderately acid sulphate soil. Vegetation at present is lowland rice.
     - 2.1.3 **Supan-Buri Rice Experiment Station.** The soil is clay texture, developed on semi recent alluvial, derived from mixed sediments of granitic and sedimentary rocks. The vegetations are mainly sugar palm, bushes, and lowland rice.
   - 2.2 **Soil fertility characteristics.**

The chemical properties of composite soil samples at the experimental sites are given in Table I. These soils are low in available phosphate, that of Klong Luang in particular.

3. **Rice varieties.** The rice varieties used in this experiments were a native variety, Leaung Tong; and two new hybrid varieties, C_4-63 and GP x $T(N)_1$ 4-1-2-1.

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* Technical Division, Rice Department, Ministry of Agriculture, Bangkok, Thailand.

[1] The details of these soil genesis was reported in unpublished paper, written by Mr. Pongpit Piyapong, Soil Scientist, Tech. Div., Rice Dept., Thailand.

Table 1 Chemical Properties of Paddy Soils at the Experimental Sites[1]

Location	pH	O. M.	Available		Exchangeable Cation me./100gm.				C. E. C	Base Sat.	Texture		
			P_2O_5 ppm.	K_2O ppm.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	me./ 100gm.	%	Sand %	Silt %	Clay %
Chainat Rice Expt. Sta.	5.2	1.84	7.3	68.0	12.94	3.37	5.32	0.93	18.22	13.46	32.26	9.65	57.09
Supan-Buri Rice Expt. Sta.	5.2	2.79	6.40	90.0	15.78	1.27	0.46	0.96	21.98	16.24	27.36	19.14	52.50
Klong Luang Rice Expt Sta.	4.5	2.45	2.80	70.8	9.60	4.64	0.43	1.00	20.03	11.88	18.43	31.65	49.92

[1] Reported by Mr. Wisit Cholitkul, Soil chemist of Rice Dept. Ministry of Agriculture, Thailand.

3.1 Leaung Tong variety can be characterized as a tall, non-glutinous, less photo sensitive variety, normally harvesting about 130 days after seeding. It is a typical of the **Indica** type used in lowland transplanted areas of the Central Plain.

3.2 C_4-63 is a lowland variety developed at the College of Agriculture, University of the Philippines, from a crossing between Peta and BPI-76. It is a medium short plant stature, and is a moderately high tillering variety. Normally it matures about 120-135 days from seeding.

3.3 GP x $T(N)_1$ 4-1-2-1 is a promising hybrid line which is derived from the crossing of the variety Gumpai 41, which is a recommended variety of Thailand and Taichung native 1, from Taiwan. This line can be characterized as a glutinous variety, normally maturing about 120-130 days after seeding.

4. **Experimental Method**. A split plot experimental design was used with variety being the main plots.

Rates of nitrogen application were sub-plot variables which were randomized within variety plots. All treatments were replicated four times.

The size of each sub-plot was 3 by 5m. The spacing was 25 by 25cm. and 3 seedlings per hill were planted.

Sub-plot A was a zero fertilizer, control plot. Sub-plot B through G-received 37.50kg. of P_2O_5 and 37.50kg. of K_2O per hectare as a basal application at the transplanting time. The nitrogen fertilizer was applied to the sub-plot C through G at the rate of 18.75, 37.50, 56.25, 75.00 and 112.50kg. per hectare respectively. Each rate of nitrogen fertilizer was divided into two equal portions, the first portion was applied at 1 day before transplanting, and the second at 25 days before flowering stage.

Grain weights and 10 samples for yield component determination were adjusted to 14 percent moisture before data were analyzed. The other characteristics of economic importance were recorded.

The following outline gives a description of each treatment.

Treatment	**First fertilizer application** kg/ha			**Second fertilizer application** kg/ha
	N	P_2O_5	K_2O	N
A	—	—	—	—
B	—	37.50	37.50	—
C	9.375	37.50	37.50	9.375
D	18.750	37.50	37.50	18.750
E	28.125	37.50	37.50	28.125
F	37.500	37.50	37.50	37.500
G	56.250	37.50	37.50	56.250

Note

Source of N = Ammonium sulphate (20%N).
Source of P_2O_5 = Superphosphate (20%P_2O_5).
Source of K_2O = Muriate of potash (60%K_2O).

Dates of Transplanting and Harvesting 1968.

			Dry Season	Wet Season
Supanburi	: Transplanted :	-	Mar. 16, 1968	Sept. 17, 1968
Rice Expt. Sta.	Harvested :	LT -		Dec. 25, 1968
		C_4-63 -	July 15, 1968	Dec. 20, 1968
		GP/2 $T(N)_1$-	July 12, 1968	Dec. 26, 1968
Klong Luang	: Transplanted :	-	Mar. 8, 1968	
Rice Expt. Sta.	Harvested	LT -	June 24, 1968	Nov. 28, 1968
		C_4-63 -	June 22, 1968	Nov. 30, 1968
		GP/2 $T(N)_1$-	June 24, 1968	Dec. 6, 1968
Chainat	: Transplanted :	-	Mar. 16, 1968	Jul. 19, 1968
Rice Expt. Sta.	Harvested :	LT -	Jul. 12, 1968	Oct. 17, 1968
		C_4-63 -	Jul. 5, 1968	Oct. 20, 1968
		GP/2 $T(N)_1$-	Jul. 11, 1968	Nov. 4, 1968

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Result and Discussion

5. Grain Yields.

Supanburi Rice Experiment Station.

Rates of application of nitrogen fertilizer affected grain yields of C_4-63 variety differently and to a greater extent than those of Leaung Tong and GP/2 $T(N_1)$. The yield difference between these varieties was less in wet season than in dry season. Average grain yields for these 3 varieties did differ significantly.

Greater efficiency was obtained from the same application rate when the nitrogen was applied in dry season than in wet season.

Highest grain yields from 112.5kg. of nitrogen per ha. were obtained from C_4-63 in both dry and wet seasons.

A trend of increasing response to increased nitrogen rate was established in both dry and wet seasons at this station. It should be noticed that even the high yielding variety could not be expected to obtain high yield due to unfavorable natural condition as in wet season.

Klong Luang Rice Experiment Station.

At this station, the soil is very poor. In the check plots the rice plant did not produce any grain. It was evident that the grain yields of all varieties obtained in dry season planting were better than in the wet season. The increased grain yields by varying rates of nitrogen were limited. In general, for native varieties, Leaung Tong and GP/2 $T(N_1)$ the grain yields dropped if the nitrogen level was over 75.0 kg. N/ha.

This response to nitrogen was not true for C_4-63 variety. The grain yield was gradually increased as the nitrogen was increased over 75.0kg. N/ha. The greatest amount of grains was obtained from 112.5kg. N/ha. in both dry and wet season.

Table 2. Yield Comparison of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Supanburi Rice Experiment Station in 1968.

Average Crain Yield (kg/ha)

Treatment	Dry season			Mean	Wet season			Mean
	Grain yieid kg/ha				Grain yield kg/ha			
	LT[1]	C_4-63	GP/2T(N_1)		LT	C_4-63	GP/2T(N_1)	
A	—	2, 898. 7	3, 046. 2	2, 972. 4	1, 340. 0	2, 126. 2	2, 175. 0	1, 880. 4
B	—	3, 188. 7	3, 243. 7	3, 216. 2	1, 820. 0	3, 468. 7	2, 447. 5	2, 578. 7
C	—	3, 841. 2	3, 767. 5	3, 804. 3	1, 841. 2	3, 048. 7	3, 022. 5	2, 637. 5
D	—	4, 365. 0	4, 123. 7	4, 244. 3	1, 937. 5	3. 710. 0	3, 302. 5	2, 983. 3
E	—	4, 456. 2	4, 421. 2	4, 438. 7	2, 148. 7	3. 600. 0	3, 345. 0	3, 031. 2
F	—	4, 870. 0	4, 638. 7	4, 754. 3	2, 092. 5	4. 357. 5	3, 690. 0	3, 380. 0
G	—	5, 503. 7	4, 395. 0	4, 949. 3	2, 613. 7	4, 680. 0	4, 083. 7	3, 642. 5
Tr. mean	—	4, 160. 5	3, 948. 0	4, 054. 2	1, 906. 2	3, 570. 2	3, 152. 3	2, 876. 2

	LSD . 05	**LSD . 05**
Two var. means	—	251. 2
Two tr. meeans	473. 7	231. 2
Two tr. means, same var.	—	401. 2
Two vat. means, same or diff. tr.	—	448. 7

[1] wrong variety was grawn

Table 3. Yield Comparison of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.

Average Grain Yield (kg/ha)

Treatment	Dry Season			Mean	Wet season			Mean
	Crain yieid kg/ha				Grain yield kg/ha			
	LT	C_4-63	GP/2T(N_1)		LT	C_4-63	GP/2T(N_1)	
A	—	—	—	—[1]	228. 7	222. 5	236. 2	229. 1
B	1, 107. 5	942. 5	1, 417. 5	1, 155. 8	1, 056. 2	1, 937. 5	1, 000. 0	1, 151. 2
C	2, 043. 7	1, 715. 0	2, 085. 0	1, 947. 9	1, 211. 2	1, 881. 2	1, 566. 2	1, 552. 9
D	2. 601. 2	2, 061. 2	2, 802. 5	2, 488. 3	1, 188. 7	1, 868. 7	1, 657. 5	1, 571. 6
E	2, 970. 0	2, 482. 5	3, 216. 2	2, 889. 6	1, 413. 7	2, 262. 5	1, 796. 2	1, 824. 1
F	3, 367. 5	2, 588. 7	3, 708. 7	3, 221. 6	1, 477. 5	1, 856. 2	2, 023. 7	1, 785. 8
G	2, 682. 5	3, 228. 7	3, 152. 5	3, 021. 2	1, 430. 0	2, 350. 0	1, 842. 5	1, 874. 2
Tr. mean	2, 462. 1	2, 169. 8	2, 730. 4	2, 454. 1	1, 143. 7	1, 691. 2	1, 446. 0	1, 427. 0

	LSD . 05	**LSD . 05**
Two var. means	—	201. 2
Two tr. means	296. 2	191. 2
Two tr. means, same var.	—	331. 2
Two var. means, same or diff. tr.	—	366. 2

[1] nothing yield obtained from three varieties in the check plot.

Table 5. Comparison on the Number of Panicle per Hill of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Supanburi Rice Experiment Station in 1968.

Average number of panicle per hill

Treatment	Dry season			Mean	Wet season			Mean
	No. of panicle per hill				No. of panicle per hill			
	LT[1]	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	9.3	7.2	8.2	8.0	8.5	6.6	7.7
B	—	11.4	8.0	9.7	7.7	8.8	7.5	8.0
C	—	11.6	8.8	10.2	7.2	10.2	7.6	8.3
D	—	12.1	9.4	10.7	8.5	10.4	8.5	9.1
E	—	13.1	9.6	11.3	8.1	10.5	8.3	9.0
F	—	12.6	10.4	11.5	8.4	12.8	8.5	9.9
G	—	14.1	12.0	13.0	8.5	12.4	9.6	10.2
Tr. mean	—	12.0	9.3	10.7	8.1	10.5	8.1	8.9

	LSD .05	**LSD .05**
Two var. means	0.964	0.981
Two tr. means	2.692	0.69
Two tr. means, same var.	—	1.196
Two var. means, same or diff. tr.	—	1.473

[1] wrong variety was grown.

Table 6. Comparison on the Number of Panicle per Hill of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.

Average number of panicle per hill

Treatment	Dry season			Mean	Wet season			Mean
	No. of panicle per hill				No. of panicle per hill			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	—	—	—[1]	3.4	3.9	3.7	3.7
B	6.6	7.4	6.4	6.8	5.6	7.9	5.0	6.2
C	8.4	10.6	7.8	8.9	6.2	8.4	5.7	6.8
D	9.3	12.2	9.0	10.2	7.1	9.7	6.5	7.8
E	10.3	12.7	10.6	11.2	6.5	10.0	7.0	7.8
F	11.0	13.5	11.4	12.0	7.6	9.3	7.0	8.0
G	12.0	13.1	12.8	12.7	7.6	10.1	8.0	8.6
Tr. mean	9.6	11.6	9.7	10.3	6.3	8.5	6.1	7.0

	LSD .05	**LSD .05**
Two var. means	0.489	0.878
Two tr. means	1.028	0.670
Two tr. means, same var.	—	1.162
Two var. means, same or diff. tr.	—	1.383

[1] nothing yield obtained from three varieties in the check plot.

Table 7. Comparison on the Number of Panicle per Hill of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Chainat Rice Experiment Station in 1968.

Average number of panicle per hill

Treatment	Dry season			Mean	Wet season			Mean
	No. of panicle per hill				No. of panicle per hill			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	6.0	13.2	10.1	9.8	7.0	12.2	8.8	9.3
B	7.1	12.8	10.0	10.0	6.9	12.0	9.1	9.3
C	7.3	15.6	10.8	11.2	7.3	11.5	8.8	9.2
D	7.9	15.3	11.0	11.4	7.4	11.9	8.6	9.3
E	5.0	14.2	10.4	9.9	8.2	12.9	8.9	10.0
F	5.4	13.7	11.3	10.1	7.7	12.9	8.1	9.6
G	3.8	13.7	12.5	10.0	7.7	13.1	9.2	10.0
Tr. men	6.1	14.1	10.9	10.3	7.5	12.4	8.8	9.5

	LSD .05	LSD .05
Two var. means	1.179	0.692
Two tr. means	1.113	0.618
Two tr. means, same var.	1.929	—
Two var. means, same of diff. tr.	2.125	—

Table 8. Comparison on the Panicle Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Supanburi Rice Experiment Station in 1968.

Average panicle weight (gm)

Treatment	Dry season			Mean	Wet season			Mean
	Panicle weight				Panicle weight			
	LT[1]	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	18.9	22.2	20.5	12.5	13.9	14.5	13.6
B	—	21.4	23.7	22.5	13.0	16.2	17.3	15.5
C	—	22.1	27.0	24.5	12.4	21.1	20.4	18.0
D	—	24.7	29.5	27.1	16.2	23.0	22.6	20.6
E	—	30.5	30.0	30.2	14.3	24.2	24.0	20.8
F	—	31.2	31.8	31.5	16.3	29.4	25.4	23.7
G	—	37.5	32.3	34.9	16.2	29.4	26.5	24.0
Tr. mɘan	—	26.6	28.1	27.3	14.4	22.5	21.5	19.5

	LSD .05	LSD .05
Two var. means	—	2.112
Two tr. means	2.822	2.204
Two tr. means, same var.	2.28	3.819
Two var. means, same or diff. tr.	4.706	4.102

[1] wrong variety was grawn.

Table 9. Comparison on the Panicle Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.

Average panicle weight (gm)

Treatment	Dry season			Mean	Wet season			Mean
	Panicle weight[1]				Panicle weight			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	—	—	—	2.7	3.3	4.0	3.3
B	—	—	—	—	9.5	13.2	10.8	11.2
C	—	—	—	—	10.6	16.1	12.3	13.0
D	—	—	—	—	10.8	19.3	14.1	14.7
E	—	—	—	—	6.5	19.4	16.0	14.0
F	—	—	—	—	12.5	18.9	16.0	15.8
G	—	—	—	—	12.8	20.4	16.7	16.6
Tr. mean	—	—	—	—	9.3	15.8	12.8	12.7

	LSD . 05	LSD . 05
Two var. means		2.882
Two tr. means		1.461
Two tr. means, same var.		2.531
Two var. means, same or diff. tr.		3.698

[1] panicle weight is misunderstood.

Table 10. Comparison on the Panicle Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Chainat Rice Experiment Station in 1968.

Average panicle weight (gm)

Treatment	Dry season			Mean	Wet season			Mean
	Panicle weight				Panicle weight			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	13.1	25.5	27.2	21.9	18.2	22.3	18.2	19.6
B	13.7	26.3	22.5	20.8	18.4	23.6	19.2	20.4
C	14.7	27.8	25.0	22.5	18.7	23.9	18.5	20.4
D	13.8	32.2	25.1	23.7	22.2	26.7	17.6	22.2
E	7.2	31.8	26.3	21.8	24.3	29.7	16.9	23.6
F	7.1	30.5	25.1	20.9	22.9	31.1	16.6	23.5
G	6.5	31.4	20.1	19.3	21.6	31.2	17.8	23.5
Tr. mean	10.9	29.4	24.5	21.6	20.9	26.9	17.8	21.9

	LSD . 05	LSD . 05
Two var. means	3.781	2.638
Two tr. means	—	1.977
Two tr. means, same var.	6.558	3.424
Two var. means, same or diff. tr.	7.01	4.105

Table 11. Comparison on the Number of Filled Grain per Panicle of the New Less-Sensitive Rice Varieties Coudncted in Dry aud Wet Seasons at Supanburi Rice Experiment Station in 1968.
Average number of grain per panicle

Treatment	Dry season			Mean	Wet season			Mean
	No. of grain/panicle				No. of grain/panicle			
	LT[1]	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	77.2	83.7	80.4	51.7	66.7	66.1	61.5
B	—	69.9	83.5	76.7	57.4	74.8	62.1	64.8
C	—	77.8	87.1	82.4	55.8	79.8	67.3	67.6
D	—	76.1	88.6	82.3	60.1	88.3	70.6	73.0
E	—	80.6	84.0	82.3	59.2	89.5	74.8	74.5
F	—	95.4	92.9	94.1	61.0	89.3	77.3	75.9
G	—	94.3	72.1	83.2	53.7	92.0	70.1	71.9
Tr. mean	—	81.6	84.6	83.1	57.0	82.9	69.8	69.9

	LSD .05	LSD .05
Two var. means	1.594	7.067
Two tr. means	5.087	6.073
Two tr. means, same var.	2.050	—
Two var. means, some or diff. tr.	6.806	—

[1] wrong variety was grown.

Table 12. Comparison on the Number of Filled Grain per Panicle of the New Less Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.
Average number of grain per panicle

Treatment	Dry season			Mean	Wet season			Mean
	No. of grain/panicle				No. of grain/panicle			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	—	—	—[1]	21.2	27.6	26.1	25.0
B	54.6	37.3	53.5	48.5	54.4	60.2	57.9	57.5
C	59.5	49.7	61.5	56.9	57.8	70.3	55.4	61.2
D	63.4	41.8	53.9	53.0	46.5	73.8	56.6	59.0
E	67.9	53.9	56.2	59.3	54.4	70.6	56.6	60.5
F	70.1	51.9	63.3	61.8	51.5	75.6	57.3	61.5
G	61.6	57.6	53.6	57.6	53.0	72.5	50.9	58.8
Tr. mean	62.8	48.7	57.0	56.2	48.4	64.4	51.5	54.8

	LSD .05	LSD .05
Two. var. means	3.986	8.178
Two tr. means	5.492	7.307
Two tr. means, same var.	—	—
Two var. means, same or diff. tr.		

[1] nothing yield obtained from three varieties in the check plot.

Table 13. Comparison on the Number of Filled Grain per Panicle of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Chainat Rice Experiment Station in 1968.

Average number of grain per panicle

Treatment	Dry season			Mean	Wet season			Mean
	No. of grain/panicle				No. of grain/panicle			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	68.5	80.1	63.0	70.5	100.1	72.1	52.0	74.7
B	57.5	81.0	52.5	63.7	103.9	78.8	51.9	78.2
C	63.8	77.7	60.3	67.3	100.5	77.5	50.3	76.1
D	57.8	79.0	55.2	64.0	115.4	89.2	51.6	85.4
E	41.3	84.3	59.5	61.7	115.1	87.0	45.4	82.5
F	36.5	78.3	52.4	55.7	113.1	93.6	49.1	85.3
G	20.7	83.4	36.6	46.9	108.7	93.4	41.7	81.3
Tr. mean	49.4	80.5	54.2	61.4	108.1	84.5	48.9	80.5

	LSD .05	LSD .05
Two var. means	10.057	5.356
Two tr. means.	10.000	6.316
Two tr. means, same var.	17.320	10.940
Two var. means, same or diff. tr.	20.229	11.040

Table 14. Comparison on 1000 Grain Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Supanburi Rice Experiment Station in 1968.

Average 1,000 grain weight of rough rice

Treatment	Dry season			Mean	Wet season			Mean
	Wt. of 1,000 grains				Wt. of 1,000 grains			
	LT[1]	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	22.8	32.3	27.5	24.3	21.2	31.0	25.5
B	—	23.0	32.0	27.5	24.4	20.9	31.6	25.6
C	—	23.2	32.4	27.8	25.0	21.6	32.1	26.2
D	—	23.9	32.6	28.2	24.8	21.6	32.9	26.4
E	—	24.2	32.5	28.3	24.0	22.0	32.6	26.2
F	—	24.1	32.4	28.2	25.1	22.0	33.5	26.9
G	—	24.6	33.4	29.0	25.3	22.5	33.4	27.1
Tr. mean	—	23.7	32.5	28.1	24.7	21.7	32.4	26.3

	LSD .05	LSD .05
Two var. means	0.302	0.257
Two tr. means	0.380	0.283
Two tr. means, same var.	0.540	0.492
Two var. means, same or diff, tr.	1.067	0.520

[1] wrong variety was grown.

Table 15. Comparison on 1000 Grain Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.

Average 1,000 grain weight of rough rice (gm)

Treatment	Dry season			Mean	Wet season			Mean
	Wt. of 1,000 grains				Wt. of 1,000 grains			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	—	—	—	—[1]	23.0	23.1	30.2	25.4
B	24.9	22.3	31.7	26.3	25.3	24.2	31.6	27.0
C	27.0	22.3	33.2	27.5	25.1	23.1	32.4	26.9
D	27.1	23.1	34.0	28.1	25.1	23.2	32.6	27.0
E	27.9	24.2	34.3	28.8	25.7	22.8	33.1	27.2
F	28.1	23.4	35.1	38.9	25.7	23.1	33.3	27.4
G	27.4	23.7	33.9	29.3	25.8	23.2	33.2	27.4
Tr. mean	27.1	23.2	33.7	28.0	25.1	23.2	32.3	26.9

	LSD .05	LSD .05
Two var. means	0.822	0.910
Two tr. means	0.921	0.694
Two tr. means, same var.	—	1.204
Two var means, same or diff. tr.	—	1.434

[1] nothing yield obtained from three varieties in the check plot.

Table 16. Comparison on 1000 Grain Weight of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Chainat Rice Experiment Station in 1968.

Average 1,000 grain weight of rough rice (gm)

Treatment	Dry season			Mean	Wet season			Mean
	Wt. of 1,000 grains				Wt. of 1,000 grains			
	LT	C_4-63	GP/2T(N)$_1$		LT	C_4-63	GP/2T(N)$_1$	
A	26.9	21.9	31.4	26.7	22.0	22.9	30.9	25.3
B	26.4	21.8	31.7	26.6	21.6	22.7	31.0	25.1
C	27.1	22.0	31.5	26.9	21.1	23.1	31.6	25.3
D	26.8	22.4	31.4	26.9	21.9	22.8	31.3	25.3
E	27.6	22.5	31.9	27.3	21.4	23.2	31.6	25.4
F	27.4	22.9	31.8	27.4	21.4	22.8	31.0	25.1
G	26.4	23.2	32.5	27.4	21.4	22.6	31.6	25.2
Tr. mean	26.9	22.4	31.7	27.0	21.5	22.9	31.3	25.2

	LSD .05	LSD .05
Two var. means	0.477	0.462
Two tr. means	0.453	—
Two tr. means, same var.	0.790	—
Two var. means, same or diff. tr.	0.868	—

Table 17. Straw Yield Comparison of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Supanburi Rice Experiment Station in 1968.
Average straw yield (kg/ha)

Treatment	Dry season			Mean	Wet season			Mean
	Straw yield				Straw yield			
	LT[1]	C_4-63	GP/2T(N_1)		LT	C_4-63	GP/2T(N_1)	
A	—	3,887.5	4,443.7	4,165.6	2,633.7	2,632.2	2,078.7	2.449.5
B	—	5,243.7	4,206.2	4,724.9	2,972.5	2,780.0	2,488.7	2,747.1
C	—	5,900.0	4,431.2	5,165.6	3,392.5	3,615.0	3,047.5	3,351.7
D	—	6,831.2	5,318.7	6,074.9	4,027.5	4,030.0	3,165.0	3,740.8
E	—	7,056.2	5,687.5	6,371.8	4,375.0	3,652.5	3,578.7	3,868.7
F	—	7,600.0	7,800.0	7,700.0	4,736.2	4,525.0	3,758.7	4,340.0
G	—	8,787.5	12,300.0	10,543.7	4,981.2	4,663.7	4,637.5	4,760.8
Tr. mean	—	6,472.3	6,312.5	6,392.4	3,874.1	3,700.3	3,250.7	3,608.7

	LSD .05	LSD .05
Two var. means	—	391.25
Two tr. means	902.5	258.75
Two var. means, same var.	1,276.20	—
Two var. means, same or diff. tr.	1'383.70	—

[1] wrong variety was grown.

Table 18. Straw Yield Comparison of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Klong Luang Rice Experiment Station in 1968.
Average straw yield (kg/ha)

Treatment	Dry season			Mean	Wet season			Mean
	Straw yield				Straw yield			
	LT	C_4-63	GP/2T(N_1)		LT	C_4-63	GP/2T(N_1)	
A	—	—	—	—[1]	853.7	602.5	545.0	667.1
B	3,007.5	1,835.0	2,248.7	2,363.7	2,753.7	2,816.2	2,996.2	2,855.4
C	3,753.7	3,028.7	3,348.7	3,377.0	3,715.7	4,301.2	3,491.2	3,836.6
D	4,120.0	3,860.0	4,621.2	4,200.4	3,915.0	4,641.2	4.142.5	4,232.9
E	6,856.2	4,320.0	5,990.0	5,722.1	4,358.0	4,531.2	4,166.2	4,351.8
F	7,255.0	4,811.2	7,217.5	6,427.9	5,085.0	4,716.2	4,685.0	4,828.7
G	8,413.7	6,408.7	7,095.0	7,305.8	4,638.7	5,866.2	5,900.0	5,468.3
Tr. mean	5,567.7	4,043.9	5,086.8	4,899.5	3,617.4	3,925.0	3,703.7	3,748.7

	LSD .05	LSD .05
Two var. means	868.75	—
Two tr. means	907.50	137.50
Two tr. means, same var.	—	—
Two var. means, same or diff. tr.	—	—

[1] nothing yield obtained from three varieties in the check plot.

Table 19. Straw Yield Comparison of the New Less-Sensitive Rice Varieties Conducted in Dry and Wet Seasons at Chainat Rice Experiment Station in 1968.

Average straw yield (kg/ha)

Treatment	Dry season			Mean	Wet season			Mean
	Straw yield				Straw yield			
	LT	C_4-63	GP/2T(N_1)		LT	C_4-63	GP/2T(N_1)	
A	1,0512.5	7,331.2	8,708.7	8,850.8	2,822.5	4,110.0	2,030.0	2,987.5
B	1,0372.5	6,421.2	8,523.7	8,439.1	3,201.2	4,488.7	1.790.0	3,160.0
C	1,2836.2	5,570.0	9,325.0	9,243.7	3,455.0	4,081.2	2,136.2	3,224.1
D	1,1083.7	8,413.7	9,256.2	9,584.5	4,087.5	5,118.7	2,091.2	3,765.8
E	1,0855.0	7,681.2	9,835.0	9,457.1	3,961.2	5,440.0	2,377.5	3,926.2
F	1,2385.0	9,205.0	8,405.0	9,998.3	4,385.0	5,626.2	2,412.5	4,141.2
G	1,0826.2	9,668.7	8,472.5	9,655.8	4,986.2	5,850.0	2,231.2	4,355.8
Tr. mean	1,1267.3	7,755.9	8,932.3	9,318.5	3,842.7	4,959.3	2,152.7	3,651.5

	LSD .05	LSD .05
Two uar. means	923.75	655.00
Two tr. means	—	396.25
Two tr. means, same var.	—	687.50
Two var means, same or diff. tr.	—	908.75

yield components. In both dry and wet season, for all 3 varieties, the panicles per hill, panicle weight, filled grains per panicle and 1000 grain weight were increased as the nitrogen rates applied were increased. The main factors were the panicles per hill and number of filled grains per panicle which determined the total grain yields. The other factors (panicle weight and 1000 grain weight) appeared to be less important than the mentioned factors. Increased nitrogen rate resulted in increasing panicle weight but failed to increase number of filled seeds per panicle. The 1000 grain weight was not changed sharply when the increased nitrogen fertilizer was applied; but the trend to increased grain weight was not the same between varieties. The high yielding variety seemed to respond to increased nitrogens rate better than other less yielding varieties. The 1000 grain weight difference between these three varieties was sharp. C_4-63 variety produced the lowest 1000 grain weight but highest grain yield due to its capability of increasing panicles per hill and number of filled grains per panicle much more than the other two varieties, Leaung Tong and GP/2 T(N_1).

The effect of varying nitrogen rates on the yield components was also the same at Klong Luang and Chainat Rice Experiment Stations.

Conclusion.

From this study, it was reasonable to assume that the rice planting in dry season produced the higher grain yields than in wet season. The effect of nitrogen applications on yield components appeared to differ factor by factor. The most important factor was the panicles per hill and the other was number of filled grains per panicle. It was also very interesting to notice that, as the rate of nitrogen was increased the panicle weight increased sharply also, but the number of filled grains per panicle increased only gradually. This meant that the increased rate of nitrogen failed to fullfil the unfilled or sterile grains and

it was one of the reasons of less response to increased nitrogen rate. Why the rice plants failed to fulfill the empty grains or sterile grains per panicle was unanswerable from this study. The possibility of solving this problem in the future was to consider the suitable timing of nitrogen top-dressing to rice plants and also the planting time as one of the adjustable cultural practices.

It was well known increasing yield by fertilization is more likely in the poor soil than in the fertile soil. The same pattern of response was also obtained from this study.

These data indicated that there was a variation in the response to nitrogen in different locations. Based on present information it can be said that if the rice was planted under high light intensity, low humidity, long day length, (in dry season) the maximum response will occur ; Conversely if the rice was planted in cloudy condition, high humidity, low light intensity (wet season) the maximum response probably would be obtained when the nitrogen was applied at the higher rate.

C_4-63 variety showed a somewhat greater advantage over Leaung Tong which will lodge at high rate of nitrogen. The fact that GP/2 T(N_1) variety was seriously susceptible to bacterial leaf blight in the highly fertile soil areas resulted in obtaining low yield.

The important factors preventing the rice culture in dry season were the insufficient supply of irrigation water and prevalence of leaf diseases though this must be examined carefully in future. Rodents and birds were the other limiting factors to get the high yields.

In order to obtain the full benefit from planting rice either in the dry season or in wet season, sufficient knowledge is required on the use of the optimum and economic rate of fertilizers, time and method of nitrogen application for each variety, and identification of soil and plant characteristics should greatly reduce the lodging problem, uneconomical and other undesirable results.

Summary.

Separate field tests for three of the less photo-sensitive varieties were conducted at three different rice experiment stations in both dry and wet seasons on different soil fertility levels, in 1968. Within each variety the grain yield, and the yield components were studied in relation to the response of six rates of nitrogen. All treatments were the same in the dry and wet seasons. The source of nitrogen was ammonium sulfate.

Primary objectives of the tests were.

1. To determine the effect of varying rates of nitrogen on grain yields and yield components of three less photo-sensitive varieties in dry and wet seasons.
2. To obtain information on the comparative effects of the dry and wet season plantings upon rates of nitrogen and rice varieties.

Data indicated that grain yields obtained in dry season was higher than in wet season. C_4-63 variety produced higher yield than the native variety Leaung Tong and the hybrid GP/2 T(N_1). The main factors in the yield components which determined the grain yield were the panicles per hill and the number of filled grains per panicle.

These studies are being continued to provide information for further refinement of the results so that reliable figures could be obtained for future recommendations.

Discussion

S. K. De Datta : IRRI : Why are you calling varieties like C_4-63 as less-photo sensitive variety ? As far as I know it is essentially non-photoperiod sensitive variety.

Answer : Usually we call C_4-63 as Non-Photo sensitive variety, but in this paper, I am not sure that we can say it is the non-photo sensitive variety because the age of plant dur-

ing dry and wet season are not quite the same. If you have any comment, I would appreciate.

S. C. Hsu, China: Please explain about Rice Quality in your case?

Answer: The rice quality in my case are cooking quality and milling quality.

K. Hayashi, Japan: May I ask why the yield for C_4-63 was the lowest in dry season at Klong Luang Rice Experiment Station in 1968, as compared with the highest yield of C_4-63 in wet season?

Answer: The soil in Klong Laung Rice Expt. Sta. is very poor in P_2O_5 and insufficient water in the field during flowering stage. The other reason, the high temperature may cause more empty grain, so the low yield of C_4-63 is occurred.