

## II. AGRONOMY: STUDIES ON YIELDING CAPACITY OF RICE VARIETIES UNDER HIGH TEMPERATURE

### a. COMPARISON OF FERTILIZER-RESPONSE OF VARIETIES UNDER HIGH AND LOW TEMPERATURE

Tsin-san Miu

(Department of Agronomy, TARI)

Three places at different sea levels, i. e. Taipei (15 M above the sea level) Wu-lai (220 M, 1-2°C lower than in Taipei) and Chu-tsu-fu (660 M, 3-4°C lower than in Taipei) were selected as the sites of the experiment. During 1959, five varieties were planted in pots in order to evaluate the effect of temperatures on fertilizer response. The plants were grown in pots filled with the same soil with the same amount of fertilizers and were investigated. The results of this experiment indicated that Wu-lai, at a relatively low temperature showed the highest yield on the average, while Taipei (high temperature) gave the lowest yield. Chu-tsu-fu being intermediate. In straw yield the highest was Chu-tsu-fu, and at Wu-lai the lowest. In the weight of 1,000 grains the highest was Chu-tsu-fu, and lowest was Taipei, These figures are shown in Table 1.

Table 1. Measurements of three characters of rice grown at different sea-levels

Sea level	Grain yield (%)	Straw yield (%)	1,000 grain wt.
1st crop (1959)			
660 M	109.14	111.51	25.6
220 M	120.02	69.51*	24.1
15 M	100.00	100.00	22.9
2nd crop (1959)			
660 M	0**	68.88	26.9
220 M	105.51	97.40	26.9
15 M	100.00	100.00	26.3

Note: \* The low straw yield was due to the infection of rice blast disease.

\*\* No grains were harvested on account of low temperatures in the fall.

In the second crop, Wu-lai showed the highest yield again, Taipei being lower, but no grains could be harvested at Chu-tsu-fu on account of low temperature in the fall, and all of the grains are sterile.

It was found that the high yield at Wu-lai was related to the large number of effective tillers, and the high 1,000 grain weight. So far as varieties used (Japonica type) are concerned, it seems that a high yield results when the plants were grown

at a relatively low temperature. It was suggested that the relatively low temperatures at Wu-lai may induce a high fertilizer response.

Secondly, for looking into the effect of planting time to heading time, rice seedlings at the age of 15 days were planted at 10-day intervals from June 1 to August 11, 1959. It was found from the results that varieties of the Japonica type were mostly insensitive to photoperiod, though they may be sensitive to temperature. When the varieties were planted so late as on August 11, the yield was nearly normal, though it declined after this date. Taichung No. 65 and Kaoshiung No. 53 showed the lowest photoperiodic sensitivity. In 1960, the comparative test at different sea levels was continued. In addition to three levels of fertilizer treatment, four Japonica and two Indica varieties were used so as to make the experiment more complete. The results are shown in Table 2.

Table 2.

Sea level	Fertilizer applied	Grain yield (g) (with Index)	Total	Straw yield (g) (with Index)	Total	1,000 grain wt.	Average
<b>1st crop (1960)</b>							
660 M	(A) 0	121.50 (85.60)	387.8	1,179.40 (70.43)	4881.6	25.5	24.7
	(B) Normal	141.90 (100.00)		1,674.50 (100.00)		24.7	
	(C) 2 times	124.40 (87.70)		2,027.70 (121.00)		23.8	
220 M	(A) 0	208.20 (186.30)	701.5	1,200.60 (87.20)	4,109.5	26.9	25.9
	(B) Normal	241.10 (100.00)		1,376.30 (100.00)		26.0	
	(C) 2 times	252.20 (104.60)		1,532.60 (111.30)		24.7	
15 M*	(A) 0	202.90 (106.50)	570.5	890.69 (70.60)	3,662.4	26.8	25.9
	(B) Normal	190.50 (100.00)		1,260.70 (100.00)		25.8	
	(C) 2 times	177.10 (92.90)		1,511.40 (119.80)		25.0	
<b>2nd crop (1960)</b>							
660 M	(A) 0	158.50 (100.60)	460.5	737.50 (66.50)	3,006.6	25.3	22.8
	(B) Normal	157.50 (100.00)		1,109.10 (100.00)		23.5	
	(C) 2 times	144.50 (91.70)		1,160.00 (104.50)		19.5	
220 M	(A) 0	145.20 (55.10)	687.4	437.80 (49.40)	2,367.8	27.6	26.8
	(B) Normal	263.30 (100.00)		884.50 (100.00)		26.7	
	(C) 2 times	278.90 (105.90)		1,045.50 (118.20)		26.0	
15 M	(A) 0	144.90 (61.60)	650.2	449.90 (63.30)	2,103.0	25.8	25.8
	(B) Normal	235.00 (100.00)		710.30 (100.00)		26.1	
	(C) 2 times	270.30 (115.00)		942.80 (132.70)		25.4	

\* Lower yield due to the damage of stem borer.

From the results shown above, we find that the grain yield in both first and second crops was again highest at Wu-lai due to the greater number of effective tillers and higher 1,000 grain wt.. The fertilizer response is then more effective at Wu-lai where the temperature is 1-2°C lower than Taipei.

After 2 year's research, we also find that the varieties of cultivated rice in Taiwan seem to be more adapted to the lower temperature condition as at the place of 220 M over the sea level, and is not so tolerate high temperature on the plain. Thus it should be better to use tropical varieties (as Southern Island system) as one of the parents during cross-breeding in order to make new system of Ponlai varieties to raise the yielding capacity of rice varieties in this Island.

### DISCUSSION

Oka: Your experiment has been made in pots. I think you can do the same experiments in the field.

Miu: Yes, I can. In order to eliminate the difference in soil, pot culture was used. After the pot experiments is over, field experiments will be carried on as suggested.

Oka: Five varieties used are almost the same in agronomic characters. You had better use varieties possessing different agronomic characters so as to evaluate varietal differences.

Miu: Yes, we will do in the next year.