Journal of Tropical Agriculture 36 (1998) : 83-86

ECONOMIC EVALUATION OF RICE CULTIVARS UNDER DIFFERENT NUTRIENT LEVELS

Rice, the main crop in the low-lying areas of Kerala often suffers due to occasional drought / flooding as a result of unpredictable rains. Cultivation of rice in the rainfed areas is a function of time, amount and distribution of rainfall. The highly diverse agro-ecological characteristics of the rainfed environment require precise and location specific technology. Selection of a variety suitable for each agro-ecological situation and proper management of nutrients will help in improving the productivity and enhancing the economic returns from these areas.

Experiments were conducted at the Cropping Systems Research Centre, Karamana, Trivandrum during the first crop season *(virippu)* of 1991 and 1992. The treatment consisted of six varieties, viz., Jaya (V1), Culture-4 (V2), M-1029 (V3) (medium duration varieties), Rasi (V4), Ravi (V5) and Tulasi (V6) (short duration varieties) and three nutrient levels (100[F1J, 75[F2] and 50 [F3] per cent of the recommended dose), the recommended dose being 90:45:45 kg N, P_2O_5 and K_2O ha ^{1}. The experiment was laid out as a factorial experiment in RBD with 18 treatments and three replications.

The soil of the experimental site was riverine alluvium, acidic in reaction (pH 5.3), low in CEC (6.8 cmol $[p^+]$ kg^{-1}) and medium in organic carbon (0.72%), available N (287 kg ha ^{1}), P (40 kg ha ^{1}) and K (129 kg ha ^{1}). The seeds were dibbled in rows of 20 cm apart on 8th May during the first year and 22nd May during the second year on receipt of the pre monsoon showers. Thinning was done on the twelfth day and plant to plant spacing adjusted to 10 cm. The required quantity of fertilizers, as per the treatments were applied to the individual plots. One third N, full P and half K were applied after thinning, one third N at active tillering stage and one third N and half K applied at panicle initiation stage. Hand weeding was done at 20 and 40 days after sowing. The experiment was conducted under rainfed condition and no irrigation was provided to the crop. Observations on growth characters and yield were recorded.

The rainfall patterns during the cropping period of 1991 and 1992 were different. During 1991, 141.6 cm of rainfall was received and its distribution was adequate to maintain standing water during the early growth stage, panicle initiation, flowering and milk stage. In the second year, there was heavy rainfall immediately after sowing. Though a total rainfall of 124.6 cm was received, the quantity received was more during the early growth stage and the crop, especially the medium duration varieties experienced moisture stress in late vegetative stage and milk stage.

Jaya produced the highest grain yield of 4.70 t ha^{-1} during 1991 followed by Tulasi, Culture-4 and Rasi, the latter three being on par. During 1992, Tulasi registered the highest grain yield of 2.92 t ha^{-1} and was comparable with M-102 and Rasi. Pooled analysis of the two year data revealed that varieties like Jaya, Tulasi and Rasi can perform well under rainfed conditions. The yield increase in these varieties was attributed to the high number of productive tillers, more number of grains per panicle and low sterility percentage of Rasi and Tulasi and increased panicle length and panicle weight of Jaya. Similar varietal variation in yield of rainfed rice was also reported by Dubey *et al.* (1991) and Sharma and Reddy (1991).

For all varieties, the grain yield was higher during 1991 than 1992 due to the higher grain

Table 1. Influence of varieties and nutrient levels on the yield attributes of rainfed rice

Treatment	No. of productive tillers per hill		Wt. of panicle, g		No. of grains per panicle		Sterility %	
	1991	1992	1991	1992	1991	1992	1991	1992
Varieties								
V1	5.90	5.22	2.74	2.03	116.44	75.00	13.86	5.77
V2	5.93	5.13	2.46	1.87	112.67	75.22	14.78	6.82
V3	3.88	4.14	2.87	2.11	129.56	84.44	18.00	6.54
V4	6.41	6.30	2.47	1.84	100.89	79.33	.13.98	5.59
V5	4.03	5.67	1.93	1.71	81.11	74.00	14.35	6.54
V6	6.26	6.59	2.64	1.86	98.11	85.11	11.40	5.69
F	42.89**	21.57**	12.13**	4.51**	36.20**	8.56**	5.36**	0.75**
SE	0.174	0.191	0.094	0.068	2.896	1.690	0.935	0.605
CD (0.05)	0.499	0.547	0.269	0.195	8.027	4.851	3.893	NS
Nutrient levels								
F1	5.56	5.81	2.70	2.06	112.72	80.06	13.97	4.13
F2	5.38	5.72	2.61	2.06	104.94	81.57	13.58	5.35
F3	5.27	4.99	2.25	1.60	101.72	74.94	15.64	9.00
F	1.40	11.29**	13.00**	30.35**	8.18**	8.42**	2.83	35.18**
SE	0.123	0.135	0.066	0.048	1.977	1.195	0.661	0.428
CD (0.05)	NS	0.387	0.191	0.138	5.676	3.430	NS	3.581

* = Significant at 0.05 level

number per panicle and increased panicle weight. The adequate and well distributed rainfall during 1991 helped the varieties to express their full yield potential and Jaya being a medium duration variety was most benefitted by this. In 1992, two weeks delay in sowing due to the relatively late pre-monsoon showers and heavy rainfall immediately after sowing adversely affected the growth and production. Among the varieties, the medium duration ones were more affected by moisture stress at flowering and milk stages whereas the short duration varieties escaped the moisture stress at these stages. Nallathambi and Robinson (1992) also reported similar yield reduction in rice varieties when moisture stress was experienced in late vegetative and milk stage.

The different nutrient levels did not cause any significant variation in grain yield during 1991 whereas, 100 and 75 per cent recommended dose were on par and superior to 50 per cent recommended dose during the second year. During the first year, the well distributed

Table 2. Influence of varieties and nutrient levels on yield and income of rainfed rice

Treatment	Grain yield, t ha^{-1}		Straw yield, t ha^{-1}		Net income, Rs ha^{-1}		B : C ratio	
	1991	1992	1991	1992	1991	1992	1991	1992
Varieties								
V1	4.70	2.63	5.48	3.31	11632.89	2863.44	1.13	0.28
V2	4.02	2.55	4.96	3.45	8720.67	4370.39	0.84	0.42
V3	3.21	2.92	6.26	3.39	7189.00	4329.22	0.70	0.42
V4	3.84	2.84	5.36	3.88	8766.78	4227.61	0.85	0.41
V5	2.67	2.16	3.82	2.70	2841.78	384.06	0.28	0.04
V6	4.11	2.92	5.91	3.40	9985.67	4059.83	0.97	0.39
F	27.13**	19.27**	17.40**	17.05**	42.76**	44.68**	42.04**	44.23**
SE	0.138	0.067	0.207	0.098	460.309	234,677	0.045	0.023
CD (0.05)	0.3%	0.192	0.595	0.281	1321.48	673.724	0.129	0.066
Nutrient levels								
F1	3.86	2.85	6.22	3.82	9157.89	3943.17	0.87	0.37
F2	3.85	5.39	5.39	3.49	8549.94	3950.75	0.83	0.38
F3	3.57	4.23	4.23	2.92	6860.56	2223.36	0.68	0.22
F	2.77	27.43**	37.45**	43.32**	13.37**	35.96**	9.76**	30.89**
SE	0.097	0.047	0.146	0.069	325.428	165.942	0.032	0.016
CD (0.05)	NS	0.136	0.420	0.199	934.427	476.395	0.091	0.047
Cost of cultivation excluding treatment							Rs 10,302 ha^{-1}	
Price of paddy							Rs 3.75 kg^{-1}	
Price of straw							Re 1 kg^{-1}	
Cost of inputs	Nitrogen						Rs 5.45 kg^{-1}	
	Phosphorus						Rs 7.80 kg^{-1}	
	Potassium						Rs 3.33 kg^{-1}	

** - Significant at 0.01 level

rainfall resulted in better fertilizer use efficiency and higher crop yields even at 50 per cent level. Experiments conducted at the Kerala Agricultural University also revealed no significant variation in grain yield of dry sown Mashoori rice between 70:45:45 and 50:25:25 kg N, P_2O_5 and K_2O (Kerala Agricultural University, 1984). The moisture

stress experienced during the later stages of the second year reduced the fertilizer use efficiency resulting in lower crop yield at 50 per cent level.

The interaction effect was significant only during the first year. Jaya at 100 per cent recommended dose and Tulasi at 75 per cent recommended level were comparable and superior to others.

The net income per and the benefit : cost ratio varied among varieties during both the years. In 1991, Jaya produced the highest net income and benefit : cost ratio due to higher grain and straw yields. During the second year, maximum net income of Rs 4370.39 ha^{-1} was registered by Culture-4 and it was on par with Rasi, Tulasi and M-102.

Reduction of the fertilizer level by 25 per cent did not bring about any reduction in net income and benefit : cost ratio. This indicated that 75 per cent of the recommended dose is sufficient for rainfed rice in South Kerala.

The results of the study clearly point out the suitability of varieties like Jaya, Rasi and Tulasi for the rainfed areas of South Kerala. For these varieties, 75 per cent of the fertilizer dose i.e., 67.50 ; 33.75 : 33.75 kg N, P_2O_5, K_2O ha^{-1} is sufficient to realise economic yield.

College of Agriculture
Vellayani 695 522, Trivandrum, India

K. R. Sheela, V. Thomas Alexander
P. Saraswathy

REFERENCES

Dubey, O. P., Upadhyaya, S. P., Dixit, J. P. and Garg, D. C. 1991. Response of short duration paddy varieties to nitrogen under rainfed conditions. *Indian J. Agron.* 36(2) : 255-256

Kerala Agricultural University, 1984. *Research Report 1983-84.* Kerala Agricultural University, Trichur, p. 60-61

Nallathambi, G. and Robinson, J. C. 1992. Perfonnance of shallow water rice to drought tolerance. *IRRN.* 17(4) : 11

Sharma, A. R. and Reddy, M. D. 1991. Performance of different rice (*Oryzasativa)* varieties in shallow rainfed lowland under late planted conditions. *Indian J. Agron.* 36(3) : 403-405