Field verification of model (ORYZA_0) recommended N application strategy for dry season rice in IRRI

M.C.S. Wopereis[1,3], H.F.M. ten Berge[2], A.R. Maligaya[1], M.J. Kropff[1] and K.G. Cassman[1]

1 International Rice Research Institute, P.O.Box 933, 1099 Manila, Philippines
2 Research Institute for Agrobiology and Soil Fertility, P.O.Box 14, 6700 AA Wageningen, The Netherlands
3 Department of Theoretical Production Ecology, Wageningen Agricultural University, P.O.Box 430, 6700 AA, Wageningen, The Netherlands

Introduction

The experimental information from several SARP teams about nitrogen (N) uptake and utilization by irrigated wet land rice crop enabled the development of a simple summary model (ORYZA_0), which could be used to derive the optimum application strategy for N fertilizer application under specified varietal and environmental conditions using numerical optimization techniques (ten Berge et al., 1994). This paper is about the results of a verification trial conducted at the experimental farm in IRRI, Los Baños, to evaluate the site tailored model recommendation in comparison with other current N application strategies.

Materials and methods

Field site

The field experiment was conducted at the International Rice Research Institute (IRRI) during the dry season (DS) 1994. The soil was classified as a mixed, isohyperthermic Typic Tropudalf (Soil Survey Staff, 1975). The experimental plot size was 4.0 x 7.0 m and the treatments were completely randomized in four replicates.

Treatments

The treatments consisted of different timing (0 to 3 splits) and rate (0 to 160 kg ha^{-1}) of N fertilizer as shown in Table 1.

Fertlizer N levels 120 and 160 kg ha^{-1} were applied with three application strategies i.e. previous IRRI recommendation (IRRI-old), current IRRI recommendation (IRRI-new) and

Eds. T.M. Thiyagarajan, H.F.M. ten Berge & M.C.S. Wopereis. Nitrogen management studies in irrigated rice. SARP Research Proceedings, AB-DLO, TPE-WAU, Wageningen and IRRI, Los Baños (1995), pp 39-41.

model recommended (Model) timings. The IRRI-new recommendation has been based on empirical optimization over the past 4 years. The level of 120 kg ha^{-1} was based on the current IRRI recommendation for DS and the level of 160 kg ha^{-1} was chosen to test the effect of a higher dose of N. The N application vs. biomass response curve simulated by the model ORYZA_0 *version 1.0* was derived by using the data collected from the experiment conducted during 1993 (Wopereis et al., 1994). The splits and timing of splits for the model recommendation were derived from the cumulative N application curve as described by ten Berge et al. (1994). The grain yields were recorded at maturity.

Table 1. Fertilizer N application details.

Treatment	Strategy	Split number	Time of application	Rate of N (kg ha^{-1})	Total N applied (kg ha^{-1})
T1	Zero	-	-		
T2	Model	1	28 DAT	60	
		2	38 DAT	60	120
T3	IRRI- old	1	21 DAT	0	
		2	42 DAT	40	120
T4	IRRI-new	1	0 DAT	80	
		2	PI*	40	120
T5	Model	1	24 DAT	53.3	
		2	33 DAT	53.3	
		3	42 DAT	53.3	160
T6	IRRI-old	1	15 DAT	53.3	
		2	30 DAT	53.3	
		3	42 DAT	53.3	160
T7	IRRI-new	1	0 DAT	107	
		2	PI*	53	160

* PI = Panicle Initiation

Results and discussion

The grain yield data showed that there was not much difference between the three different timing of N applications as well as for the levels of application (Figure 1).

At 120 kg N ha^{-1}, the model recommendation was equally good as the new IRRI recommendation. At 100 kg N ha^{-1}, the new IRRI recommendation performed slightly better. Given the situation that the model recommendation is based on biophysical parameters derived from a single experiment at other N input levels, these results of the numerical approach are considered satisfactory.

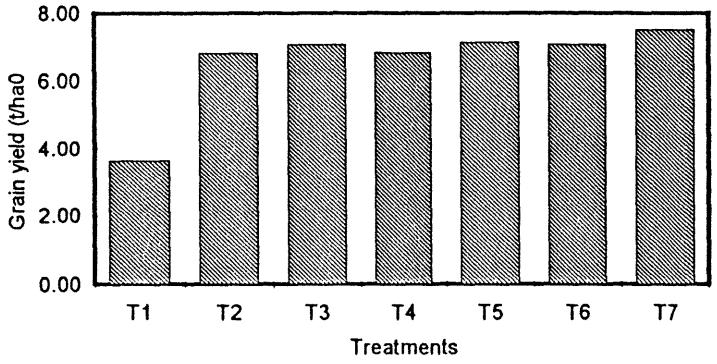

Figure 1. Grain yield of cvar IR72 at the different N application strategies. IRRI, dry season, 1994. Treatment codes are explained in Table 1.

References

Berge, H.F.M. ten, M.C.S. Wopereis, J.J.M. Riethoven, T.M. Thiyagarajan & R. Sivasamy, 1994. The ORYZA_0 model applied to optimize nitrogen use in rice. In: Nitrogen economy of irrigated rice: Field and simulation studies. Eds. H.F.M. ten Berge, M.C.S. Wopereis & J.C. Shin, SARP Research Proceedings, AB-DLO, TPE-WAU, The Netherlands and IRRI, Los Baños, Philippines, pp. 235-253.

Soil Survey Staff, 1975. Soil taxonomy. A basic system of soil classification for making and interpreting soil surveys. USDA-SCS Agric. Handb. 436. U.S. Government Printing Office. Washington, D.C.

Wopereis, M.C.S., H.F.M. ten Berge, A.R. Maligaya, M.J. Kropff, S.T. Aquino & G.J.D. Kirk, 1994. Nitrogen uptake capacity of irrigated lowland rice at different growth stages. In: Nitrogen economy of irrigated rice: Field and simulation studies. SARP Research Proceedings, DLO Research Institute for Agrobiology and Soil Fertility, Wageningen, ISBN 90-73384- 22-2, pp. 108-129.