

## Optimising rice growth under continuous cropping

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In previous times fertilizer recommendations for rice were based on test crops sown after 2 to 5 years of pasture. This situation is no longer always relevant, as many farmers grow continuous rice. The experiments below were undertaken to assess changes necessary to optimise fertilization practices under continuous rice cropping.

### Methods

Growth and yield of first, second, third and fourth Inga rice crops were measured within factorial experiments at Yanco. Nitrogen fertilizer was applied either at permanent flood (P.F.) or panicle elongation (P.R.).

### Results and Discussion

In the first year of rice, fertilization at P.E. increased yield relative to fertilization at P.F. (Table 1). Fertilization time had little effect in the second and third year, but in the fourth year plots fertilized at P.F. out-yielded plots fertilized at P.E.

Nitrogen fertilization at P.F. in year one resulted in excessive vegetative growth, mutual shading and increased floret sterility. In the first year there was sufficient native soil N mineralization to enable good growth up to P.E. even on unfertilized plots. Fertilization at P.E. stimulated reproductive growth without influencing vegetative development.

By the fourth rice crop early fertilization was essential for adequate tillering and dry matter production. In the first crop there were 710 tillers  $m^{-2}$  and 400 g D.M.  $m^{-2}$  on zero N plots at P.E. After 4 years of rice the zero N plots had only 397 tillers  $m^{-2}$  and 160 g D.M.  $m^{-2}$  at P.E. Nitrogen application at P.E. in year 4 led to late tiller production, but these had small heads. Plots fertilized at P.F. yielded 1.5 g head<sup>-1</sup>, while there were only 1.0 g of grain per head on plots fertilized at P.E.

**Table I. Effect of fertilization time on yield ( $t\ ha^{-1}$ ) of continuous rice.**

	Fertilization time			LSD 5%
	Zero N	Permanent Flood	Panicle Elongation	
1st Crop	6.9	8.2	9.8	0.8
2nd Crop	5.4	7.0	7.4	0.7
3rd Crop	4.6	6.0	6.0	1.0
4th Crop	4.8	7.0	5.6	0.3

Increased rates of N were necessary to maintain yield under continuous rice.

In the first year 50 kg N  $ha^{-1}$  at P.F. resulted in 790 tillers  $m^{-2}$  and 510 g  $m^{-2}$  of D.M. at P.E. In the fourth year of rice, 140 kg N  $ha^{-1}$  at P.F. was necessary to achieve the same tiller number and quantity of D.M. In the first rice year a maximum yield of around 8  $t\ ha^{-1}$  was obtained with 50 kg N  $ha^{-1}$  at P.F. In year 4, 210 kg N  $ha^{-1}$  at P.F. was necessary to achieve similar yield.

These experiments demonstrate the need to re-evaluate crop management recommendations under major changes in cropping patterns occur. In the above example it became necessary to adjust the application time and increase the N rate when a more intensive cropping system was introduced.