Phosphorus application strategies for rice (Starbonnet) in the lower Burdekin area, Queensland

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In the Lower Burdekin two rice crops are grown per year: winter crops (June to December) and summer crops (December to May). Pot and field trials have shown yield responses to phosphorus addition, but producers still require information on application strategy. The aim of this experiment was to determine the optimum superphosphate application strategy in terms of constant maintenance applications and residual value of initial applications.

Methods

The soil type was Ug 5.29, representative of local rice-growing soils. A four-replicate randomized block design was used with pertinent superphosphate treatments, comprising (a) initial rates band-applied to the first crop only at 10, 20, 40 kg P ha $^{-1}$ and (b) maintenance rates band-applied to each of three sequential crops at 0, 2.5, 5, 10, 20, 40 kg P ha'. The sequence of crops was winter (crop 1), summer (crop 2), winter (crop 3). Urea was applied to all plots as a split application: 60 kg N ha^{-1} drilled to 7 cm depth before planting and 60 kg N ha ^{1} top-dressed at panicle initiation. All other nutrients were adequate for maximum growth.

Results and Discussion

Table 1 Relative Grain Yield (%)

	Initial P Rates on Crop 1 only (kg ha^{-1})			Maintenance P Rates (kg ha^{-1})						L.S.D. P <0.05)
	10	20	40	0	2.5	5	10	20	40	
Crop 1	98	98	100	98	96	96	98	98	96	ns
Crop 2	73	98	86	71	86	100	98	97	99	15
Crop 3	65	88	84	64	86	100	92	96	93	12

Relative yields in Table 1 show that the crop grown on the first flooding of virgin ground (crop 1) gave no P response even though the .005 M H2SO4 extractable soils P (1) level in the surface 0-10 cm was 4 pg P g^{-1}. This result confirmed previous studies. Thereafter, P responses occurred and small applications of superphosphate to each crop were more efficient than a single initial heavier rate, pointing to a low residual value of phosphorus in these soils. Regression analysis of .005 M H_2SO_4 soil-extractable P with relative yield (crop 3) indicate that 90% of maximum yield could be achieved at an extractable soil P level (0-10 cm) of 7 pg P g (R^2 = .78, P <.05). This low level suggests that Starbonnet rice is an efficient utilizer of P, as proposed earlier (2). However, this is confounded by the fact that soil P may be more available under waterlogged conditions (3).

1. Kerr, W.H., and Von Stieglitz, C.R. 1938. B.S.E.S. Old. Tech. Com. No. 9.

2. Turner, F.T. 1978. IRRN 3(3): 13-14.

3. Ponnamperuma, F.N. 1972. Adv. Agron. 24: 29-96.