Influence of tobacco cropping frequency on (2) soil acid extractable phosphorus levels in North Queensland

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In the virgin state, the granitic soils of the Mareeba-Dimbulah tobacco producing area are deficient in nitrogen, phosphorus and sulphur (1).

The fertilization practices adopted on these soils involve the application of a compound fertilizer mixture at rates equivalent to 1000 kg ha^{-1}.

Tobacco crops grown on these soils remove approximately 6 to 10 kg P ha^{-1} and after a history of cropping have cured leaf levels of up to 0.89% P (Tonello, unpublished data).

Methods

The trial site had grown one previous tobacco crop. The trial consisted of twelve cropping sequences in which continuous tobacco was compared to a 1 in 2 and 1 in 4 year cropping frequency.

All tobacco crops received 55 kg N, 68 kg P and 168 K per ha. Composite soil samples were taken before transplanting each year from the 0 to 15, 15 to 30, 30 to 45, 45 to 60, 60 to 90 and 90 to 120 cm depths. Soil samples were anslysed foracid extractable P (0.01 N H2SO4).

Results and discussion

Following local fertilizer practices, resulted in a significant build-up in soil P levels (Table 1). This is an agreement with (2) who found that the build-up was a result of farmers applying P in excess of tobacco crop requirements. Movement of phosphate down the profile into the 90 to 120 cm depth is evident from the B.S.E.S. extractable P figures. The build-up at the 15 to 30 cm depth is partly a reflection of mixing of the soil and applied fertilizer by tillage operations. The extent of the build-up at greater depths indicates leaching losses and possibly the percolation of precipitates down the sandy profile.

Table 1

Profile build-up in acid (BSES) extractable soil P (ppm) with cropping frequency.

Cropping Frequency	DEPTH (cm) 0-15	15-30	30-45	45-60	60-90	90-120
Virgin	2.0	1.0	0.5	1.0	1.0	1.0
3 Tobacco Crops (1:4)	48.8	48.5	19.2	7.5	4.7	4.3
5 Tobacco Crops (1:2)	69.9	68.5	28.3	11.2	6.7	5.8
9 Tobacco Crops (1:1)	80.1	86.4	55.8	22.8	8.8	8.9
LSD P = 0.05	10.5	12.1	13.9	9.3	1.9	1.9

It is apparent that on similar soils, with a history of tobacco production, the continued application of low analysis fertilizer mixtures, has resulted in the application of excessive and unnecessary superphosphate dressings. Phosphorus should he applied at the rates at which it is being removed in harvested plant material and becoming unavailable through leaching losses or slow 'fixation' reactions.

1. Ward, D.K. Old. J. Agric. and Anim. Sci. 24 (3): 253-260.

2. Tonello, P.E., and Warrell, L.A., and McNee, P. 1981. Old. J. Agric. and Anim. Sci. 38(1): 97-107.