

Fertility decline in Queensland cropping soils and its implications for the future.

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Information is required on the fertility status of western downs soils (original vegetation principally brigalow/belah), both for cost-effective farm fertilizer decisions and for rational planning by fertilizer manufacturers. A survey of the area was made in January, 1984 and results considered in relation to the cost of restoring fertility where its decline had been ignored.

Methods

Samples were taken from the 0-10cm layer of soils giving poor crop yields in 1983, a year of above average rainfall at all centres. Sites were selected at Meandarra (40 sites), Miles (33), Moonie (7), Roma (36), St. George (39), Tara (54), Chinchilla (42), Condamine (48), Wallumbilla (20), Wandoan (13) and Surat (5). Results were considered in relation to fertilizer responsiveness of forage oats growing on a brigalow/belah soil near Oakey. No fertilizer had been applied to cereal crops there during 80 years of cultivation. Nitrogen response on this site was tested with five rates of N up to 200 kg N ha⁻¹. Two rates each of potassium, sulfur and zinc were used on a background of 30 kg P ha⁻¹,

Results and Discussion

Table 1. Mean percentage of sites with given soil properties

Property	O.C. %	pH	SO ₄ -S ppm	Bicarb. P ppm	DTPA-Zn ppm	Na % cations	
Level	<1.0	>7.0	>5.0	>20	<10	<0.3	>5.0
Percent sites	80	61	64	21	41	56	37

The data indicate widespread potential problems with phosphorus and zinc deficiencies, declining organic carbon (compared to virgin levels often above 1.5%) and soil sodicity. Particular areas have pressing problems. At Wallumbilla 65%, at Tara 59%, and at Surat 60% of 'problem' soils contained less than 10 ppm bicarb P. At Moonie and Chinchilla more than 83% of soils contained less than 0.3 ppm DTPA zinc. At Miles (73% of soils), Roma (58%), Tara (65%) and Wallumbilla (60%), soil sodicity (exch. Na:>5%) was of concern. Most sites had been cultivated for 40 years or less and nitrate nitrogen levels were above 15 ppm in most cases.

The basis of fertility of many of these soils is thought to be the organic pool from leaf litter and the leguminous nature of *Acacia* spp. Whilst N levels were acceptable in the soils surveyed, the consequences of continuous cropping such soils could be serious. On a brigalow soil at Oakey, data were collected from a replicated fertilizer trial in forage oats on an 80 year old site. The site was responsive to P, S and zinc. The response to N was linear up to 200 kg N ha⁻¹. Data from an unfertilized adjacent 10 year old plot were then included in a response function. The results indicated that 380 kg N ha⁻¹ would be required to match the productivity of the 10 year old site after 80 years of cultivation with no fertilizer.