The long term effect of lime on soil pH

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The adverse effects of soil acidity and associated factors such as manganese and aluminium toxicities on a variety of crop and pasture species has been reported (1). Lime is commonly used to overcome problems associated with soil acidity. In North Eastern Victoria, where soils are naturally acid, the transportation cost of lime is high and any economic assessment of the rate of lime to be used to correct soil acidity problems must account for

the expected duration of the effect of lime. Little information is available in Australia on the expected life of a dressing of lime; however, During (2) has estimated that lime should be applied at 2.5t ha^{-1} every 4-5 years on N.Z. soils.

Methods

In the spring of 1972 ground agricultural limestone was applied at four rates (0, 2.5, 5.0 and 10t ha^{-1}) to three acid soils in the Strathbogie Ranges of North Eastern Victoria. There were twelve replications of each treatment. Plots measured 2x5m^2. The lime was incorporated to a depth of 15cm and the plots were sown to lucerne. Over the next three years the lucerne was harvested and an assessment was made of the effect of soil acidity factors on lucerne production (3). Soil pH was measured at various intervals throughout the experiment. At the conclusion of the experiments the plots were permanently marked and the experimental areas were grazed by sheep and cattle in the same way as the remaining area of the paddock. Under the grazing management imposed the lucerne died out and the pasture on the experimental areas reverted to sub clover and annual grasses. In the spring of 1980 soil samples were collected from the plots and the pH in the top 15cm of soil was determined in calcium chloride. The average annual rainfall at each site is 900 mm.

Results and Discussion

Table 1. Effect of Time on Change in pH in Top Soil

Lime t/ha^{-1}	Gooram		Lima		Strathbogie	
	pH in Top Soil					
	1973	1980	1973	1980	1973	1980
0	4.18	4.46	4.00	3.94	4.09	3.99
2.5	4.75	4.60	4.46	4.08	4.36	4.18
5.0	5.17	4.70	4.73	4.25	4.70	4.45
10.0	5.72	5.16	5.43	4.41	5.36	4.84

Over the period when pH was compared the pH on all lime treatments had declined (Table 1). The pH of the soil where 2.5t ha^{-1} had been applied had reverted to the level of the controls. At rates of lime in excess of 2.5t ha^{-1} the pH of the top soil remained higher than the control at each site although the decrease in absolute terms was greater.

In North Eastern Victoria the common rate of lime application is about 2.5t ha^{-1} and so it would seem that on the granitic soils of this region a life of about 8 years could be expected.

1. Foy, C.D. 1976. Horticulture. 53:38-43

2. During, C. 1972. Fertilizers and Soils in N.Z. Farming.

3. Mahoney, G.P., Jones, H.R., Hunter, J.M. Proc. XIV International Grasslands Congress (In Press).