NOTE:

AVAILABLE PHOSPHORUS LEVELS IN SOME SOILS OF THE EASTERN DARLING DOWNS

This note presents additional data on the available phosphorus status in the topsoils of black earths and euchrozems (neutral krasnozems) derived from basalt in part of the Toowoomba soil survey area defined by Thompson and Beckmann (1959). The relevant area occupies some 17 x 25 miles of the low hilly basalt uplands between the Toowoomba plateau and the Condamine Plain, but excludes the western hill margins where both sandstones and basalts contribute to the colluvial black soils. The area has been divided into three approximately equal zones (Fig. 1) defined by minutes of longitude East of the 150° meridian: Western 30'-41' E, central 41'-49' E and eastern 49'-60'E.

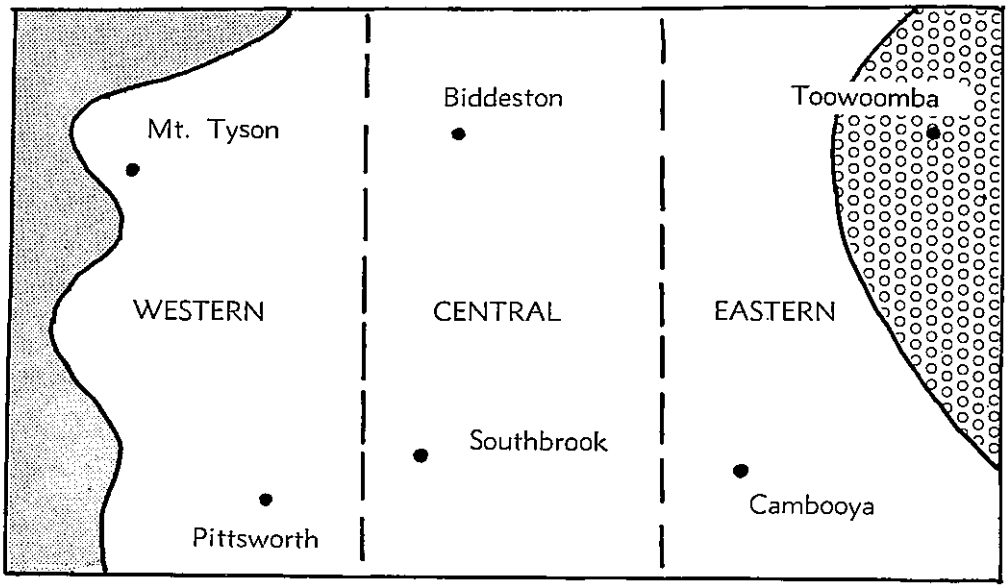

Fig. 1. A map of the Toowoomba soil survey area showing western, central and eastern zones (1 inch equals 6 miles). The area marked by circles represents the Toowoomba plateau and range soils excluded from this survey, and the shaded area the alluvial plain.

This study involved the determination of available phosphorus extracted by N/100 sulphuric acid (Kerr and von Stieglitz 1938) on 102 soils sampled from the above area. Thirty-six of the values have been previously reported (Reeve, Thompson and Beckmann 1960) and sixteen are unpublished data from the same survey. The remaining fifty determinations were made on samples collected during 1968-69. Each analysis was made on a single core. The earlier samples vary in depth but were mostly between 0-5 and 0-15 cm, but recent samples were all 0-10 cm. The distribution of available phosphate levels for the three zones is recorded in Table 1.

Geographically there was no noticeable change in available phosphorus from north to south but there was a marked change from west to east; a greater number of soils in the eastern zone had lower available phosphorus values than comparable soils in the western and central zones. Total phosphorus values for 36 black earths indicate that these lower values are associated with both lower total phosphorus

contents and lower percentage of phosphorus extracted by the "available" method. Where total phosphorus exceeded 900 p.p.m. more than 50% was extracted as available phosphorus, but where it was lower than 250 p.p.m. less than 25% was extracted.

TABLE 1

The distribution of available phosphorus in two soil groups within three zones of the Toowoomba soil survey area

No. of Samples in Each Category

Available P (ppm)	Black Earths			Euchrozems		
	Western	Central	Eastern	Western	Central	Eastern
<25			3			1
25–45			3		2	3
45–100		1	5	1	3	2
100–200	1	1	7	2	2	
200–400	2	8	4	1	2	
400–800	4	8	2		2	
800–1600	16	9	4			
>1600	1	1	1			
Total No.	24	28	29	4	11	6

We have not measured available phosphorus down the profile in black earths where the topsoil values are low, but data for other black earths on basalt suggests that there is little change in available phosphorus with depth in these soils (Reeve, Thompson and Beckmann 1960; Jones 1970).

Whitehouse (1968), determining available phosphorus in heavy-textured alkaline soils by the same method, indicated that values of less than 45 p.p.m. in the black earths represent soils in which wheat will probably respond to phosphorus fertilizer, and values of 45-100 p.p.m. represent soils which may respond. Other soil types are accepted as having critical values in the range of 20-35 p.p.m. (Chippendale, personal communication).

If we assume similar soil critical values for pastures as for wheat, six out of 29 black earths sampled in the eastern zone are likely to respond to phosphorus fertilizer and five others may respond. There was only one soil of the 52 black earths sampled in the remaining two zones which may respond to phosphorus.

Phosphorus application did not increase lucerne yields in six field trials and five pot trials on soils from the central zone (Jones 1970). All of these trials were on black earths with typically high available phosphorus values, in excess of 250 p.p.m. in the topsoil. This survey permits more confident extrapolation of these results to the western and central zones, but suggests they have limited application to the eastern zone where some black earths have lower levels of available phosphorus.

The smaller number of euchrozem soils analysed have a similar trend with a greater likelihood of response to phosphorus in the eastern zone. Low available phosphorus levels in the euchrozems were usually confined to the Burton soil type.

On a more general basis the results suggest that appropriate soil characterization, sampling and analysis can increase confidence in the extrapolation of results from pasture fertilizer trials and should be more widely used. Preferably the sampling should be made in advance of the selection of experimental sites rather than concurrently, as was done in this study.

REFERENCES

KERR, H. W., and VON STIEGLITZ, C. R. (1938)—Technical communication No. 9, Bureau of Sugar Experiment Stations, Brisbane.

JONES, R. M. (1970)—*Australian Journal of Experimental Agriculture and Animal Husbandry*. **10**: 749-54.

REEVE, R., THOMPSON, C. H., and BECKMANN, G. G. (1960)—C.S.I.R.O., Division of Soils, Divisional Report 1/60.

THOMPSON, C. H., and BECKMANN, G. G. (1959)—C.S.I.R.O., Division of Soils, Soils and Land Use Series, No. 28.

WHITEHOUSE, M. J. (1968)—Queensland Wheat Research Institute. Annual Report 1967-68. p. 44.

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