PRELIMINARY REPORT ON THE CHEMICAL STUDIES OF SOME TYPICAL SOILS OF HAWKE'S BAY.

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In this preliminary report it is intended to discuss some of the chemical data obtained in the examination of typical soils collected during the progress of the Hawke's Bay soil survey. Owing to the fact that both the field-work and laboratory examinations are incomplete it is impossible at this stage to make any statement concerning the final classification of the soils.

(1) At Waipukurau, opposite the Pukeora Sanatorium, an interesting soil type has been called by Dr. Grange a rendzina. A rendzina has been defined by G. W. Robinson as a humus carbonate soil, generally of a dark colour with a humus content varying from 3 per cent. to 12 per cent. L. G. Kotzmann states that a rendzina is a dark grey-black soil with a loose crumbly structure containing fragments of limestone, and that organic matter in the A horizon varies considerably and may amount to 20 per cent. to 25 per cent. A high base status prevents an acid type of humification, for the humus is saturated with calcium and possesses complete stability. The exchange capacity depends primarily on the humus content and varies from 30 mg. to 50 mg. equivalents per 100 g. soil. The pH value has been found to vary from 7·8 to 8·4, while the soils are saturated to over 90 per cent. of the base exchange capacity.

The data presented below follow fairly closely the above-mentioned requirements of a rendzina soil.

Rendzina Soil.—Opposite Pukeora Sanatorium, Waipukurau.

Sample No.	Depth.	Available.		Loss on Ignition.	pH.	Base-exchange Capacity.	Exchange Bases.	Exchange H.	Base-saturation.
		P_2O_5.	K_2O.						
	In.	Per Cent.	Per Cent.	Per Cent.		m.e. Per Cent.	m.e. Per Cent.	m.e. Per Cent.	Per Cent.
1563 ..	0–6	0·017	0·047	14·01	7·1	39·9	37·5	2·4	93·6
1564A ..	9–12	0·005	0·017	9·41	7·5	..	..	..	..
1564B ..	15–19	0·002	0·010	8·66	7·6	..	..	..	..

Sample 1564B contains free calcium carbonate. The field description is a black, crumbly clay loam on a yellow clay, which is chocolate on drying out in a road cutting. The lower part of this horizon contains fragments of limestone. The soil type has developed under fern and manuka scrub, but is now carrying danthonia and rye pasture.

It is worth noting the way in which available phosphate and potash decrease in the lower horizons, the phosphate being of particular interest, since the top 6 in. gives a fairly low figure and this decreases to a deficiency level in the 9 in. to 12 in. and 15 in. to 19 in. sections.

(2) Podsolized soils: Certain soils have been characterized by Dr. Grange as podsolized, and in these he has been able to recognize in the field varying degrees of podsolization. It is desirable to confirm this from the chemical data, since it is important in connection with manurial treatments to determine if a soil is well or mildly podsolized. The typical podsolized soil is well leached, and the fact that a podsolized profile shows at all is an indication that the majority of bases have been removed and that the phosphate content will have been reduced to a low level, whatever may have been the nutrient status in the parent material. A mature podsol, then, should definitely respond to lime and phosphates and possibly to potash. Where the podsolization process has not gone so far lime and phosphate will not be needed in so great a quantity, and it is probable that field experiments will be necessary to determine what top-dressings are economic. Apart from the field classification there are certain accepted chemical characteristics of podsolization that make it possible to examine the field evidence critically.

These criteria are:—

(*a*) Low pH, especially in the top horizons of the profile. The A 2 horizon usually has the lowest pH.

(*b*) The A 2 horizon is lower in base-exchange capacity than A 1 or B, while the B horizon usually has a higher capacity than the C horizon. The base-exchange capacity in B is a function of three effects, as the transference of humus downwards and the mechanical washing-down of clay colloids increase the exchange-capacity, while the precipitation of sesquioxides tends to decrease the capacity of the soil complex. Usually, however, the first two effects are the greater, but where it is possible to differentiate the eluvial horizon into B 1 and B 2 horizons these factors can be better evaluated.

(*c*) Percentage base saturation is higher in A 1 and B than in A 2.

(*d*) A low base content in A 1 with a relatively high content in C is indicative of strong podsolization.

(*e*) The B horizon should attain a more loamy structure than the A layers owing to a downward mechanical movement of the clay particles.