

(d) *Weakly Podsolized Soils* are among the most leached of the podsolized soils in Hawke's Bay, but the processes have not nearly reached the stage that has been produced in North Auckland. This means that the natural fertility of the podsol and rendzina groups which cover half of Hawke's Bay is much greater than that of many other areas in New Zealand.

With rainfall below 45 in. soils derived from muddy sandstone on the rolling country remain sufficiently stable for profiles of this class to develop, and a hard pan is formed. The largest area occurs in the Matapiro-Sherenden-Crownthorpe district and is described in the last report. A distinct change takes place in the profile when the rainfall rises above approximately 40 in. Though a pan is still formed, the profile is not quite so mature because the soils are slightly less stable and there is a tendency to slipping. Above 45 in. slipping is so important that a weakly podsolized soil cannot develop, and this series grades into the immature class. Where limestone bands traverse the parent rock the fertility of the country is improved and the soil is then classed as another type.

On flat country conditions are more favourable for leaching processes, and weakly podsolized soils derived from mudstone or sandstone alluvium are not uncommon. They are particularly well shown near Waipukurau, where the profile is—

6 in. sandy loam, black ;
10 in. sandy loam, mottled creamy-brown and grey ;
On clay, creamy-brown, cemented to form a hard pan.

Such soils are low in phosphate and often acid, but they respond well to superphosphate and lime and can be made to carry very good pastures.

(e) *Moderately Podsolized Soil*.—In this class is included a well-leached soil derived from a marine conglomerate of greywacke boulders. Its coarse texture allows ready leaching, but as it often caps ridges in the weakly podsolized country it is appreciated by the sheep-farmer because it rapidly warms up in the spring to provide feed at lambing-time. However, it dries out rapidly and is of small extent.

(3) *Brown Loam Group.*

The brown loams include soils high in iron oxide and alumina and derived exclusively or in part from volcanic ash. The free iron oxides present generally colour the profile shades of chocolate brown or golden, and the base status of the soils is extremely low, being highest in soils derived from greywacke, less in soils derived from andestitic ash, and lowest in the Taupo pumice soils.

(a) *Skeletal Soils* are developed on greywacke alone in the hill country, and where the rainfall exceeds 60 in. mixed forest formerly grew and still covers a large area on the crest of the ranges. A deep profile west of Dannevirke on forest country is—

6 in. fine sandy silt loam to heavy silt loam, dark brown and greyish-brown ;
6 in. heavy silt loam, light chocolate-brown to golden, with pink mottling and fragments of greywacke ;
6 in. to 24 in. heavy silt loam to silty clay loam, paler in colour, creamy yellowish-brown, with fragments of greywacke ;
On greywacke.

Other types are recognized according to the depth of soil and the degree of erosion, both of which are correlated with the angle of slope to a large extent. The golden colours in the profile are probably due to the highly hydrated iron oxide—limonite—which is formed under high rainfall from the free iron oxides in the soil. At Kumeroa, twenty miles south-east of Dannevirke, a hill of the shallow soil type under a rainfall of 50 in. to 60 in. is above the average fertility of this type. Being well drained, though not drying out under the prevailing rainfall, and having a high surface area per map-acre on account of the steep slopes, it is considered to be ideal sheep country in that district. Although this soil has a much lower base status than the argillite skeletal podsol soil, the higher rainfall gives a longer growing-period to the pasture, which gives a corresponding increase in the carrying capacity throughout the year. West of Hastings, on Big Hill station, a good pasture is growing on this type and the carrying capacity is above the average for this district.

South-west of Dannevirke some very fertile flats have been formed from silt loams and shingle of greywacke and mudstone origin ; these show certain affinities with the brown loams, but border on the podsol group. At Kuripapanga and on the Hastings plains flats of low fertility are derived from alluvium of pumice sands and gravels.

(b) *Immature Brown Loams* are developed almost entirely on the young Taupo pumice or the two older Tongariro andesite ash showers which cover the high country on the north-west of the province from a line due west of Hastings. They are described in the last annual report. The Taupo ash soil has a distinctly lower base status and fertility than the Tongariro ash soils. Soil types are recognized according to the rocks underlying the volcanic ash, because on these depend the topography and the degree of erosion. Although the texture of these soils approximates to a heavy silt loam in the field, mechanical analyses give the texture as a medium sand and this appears to be due to the high humus content of the soil, represented by a loss on ignition of up to 20 per cent. and apparently sufficient to effect this change in field texture. The significance of this result is seen in the higher nitrogen content which has long been recognized in such soils. Where harsh burning has been carried out it is distinctly more difficult to get the pasture to take than after a normal burn, and not only this, but erosion by wind and water quickly gets a footing. The loss-on-ignition figure in two sets of analyses is about 3 per cent. lower in the harshly burned areas, and although the exact significance of this is not yet definite, the presumption in conjunction with field evidence is that the soil humus has been partly destroyed both in structure and chemical composition, with the result that the soil approaches more closely to the medium sand texture and is therefore more liable to