

A second type, derived from calcareous mudstone ten miles west of Waimarama, has remained immature because of its heavy texture and steep slopes, despite a rainfall of 60 in. to 70 in. Where the mudstone grades into sandstone excessive leaching has left poor strips of almost pure sands of practically no carrying capacity.

(b) *Moderately developed Rendzina Soils* are derived from sandstones and mudstones containing thick bands of limestone which, because of its greater resistance to erosion, caps the crests of the hills and sheds down over the slopes, keeping them fertile and highly saturated with bases. A profile nine miles west of Hastings on sandy parent material is—

6 in. sandy loam, free, brownish-black ;
3 in. sandy loam, free, mottled black and dark brown ;
6 in. heavy sandy loam, dark dull-brown ;
On heavy silt loam mottled dull-brown and creamy-grey.

A certain amount of clay has moved down, and chemical figures also show a certain degree of development of a profile. The topsoil is slightly acid, but becomes neutral or alkaline below 12 in. The potash status of the soil is good, but the available phosphate only fair because it was low in the parent material. The subsoil has the high base saturation and free lime characteristic of rendzinas. When the parent material contains mudstone instead of sandstone, as at Raukawa, the profile contains more clay and is not so well drained, but it has a better phosphate status and is considered to be amongst the best sheep country in the province.

(c) *Strongly developed Rendzina Soils* are produced on rolling country from soft chalky limestone and hard sandy limestone. The common profile is—

6 in. sandy loam or clay loam, black ;
On clay or clay loam, chocolate-brown or dark brown.

Chemically this profile shows more development than the moderately developed rendzinas, being less alkaline and less highly saturated and having a lower phosphate status.

Climate is a most important factor in the fertility of the soils in this class. The Te Mata limestone at Havelock North under a rainfall of 30 in. to 35 in. dries out badly, and as the parent rock becomes more sandy a pan develops and the soil grades into the mildly podsolized sandstone series. At Pakipaki a greyish layer is developed between the black topsoil and brown subsoil. This soil dries out badly, but to a distinctly less degree than the Te Mata limestone. West of Te Aute the rainfall is 35 in. and forest was the original cover. The limestone is probably purer and softer than the Pakipaki or Te Mata types, and the following profile has developed—

6 in. sandy loam, blackish-brown ;
8 in. sandy loam to fine sandy loam, greyish or dull brown.
On clay loam to fine sandy clay loam, compact, greyish brown.

The greyish colours are partly due to poor drainage in wet seasons, but this soil does not dry out so rapidly as those at Pakipaki. Although the available phosphate is slightly less than that of the Te Mata type, the forest humus in the soil, together with steep slopes of immature soils, combine to rank this type with the Raukawa immature rendzina in fertility. A slight falling-off in natural fertility has been experienced, and this may be the result of depleting the fertility of the forest humus in the soil under continued grazing.

West of Waimarama there is a belt of limestone under a rainfall of 40 in. to 70 in. Although leaching has been excessive on much of this type, the rainfall is sufficient to prevent the soil from drying out despite its well-drained nature, and this, together with many slopes of immature soils, makes the Waimarama limestone more fertile than the Te Mata or Pakipaki types.

(2) *Podsol Group.*

The podsol soils are derived from Tertiary mudstones, argillites, sandstones, and greywacke, and they depend for their fertility on the base status of the parent rock, together with the degree of development of the soil profile.

(a) *Skeletal Podsol Soils* are developed on recent alluvium or on steep hill country where the rainfall is sufficient to allow constant slipping and thereby constant rejuvenation of the soil profile. Among the hill soils those derived from mudstone are the most fertile in the class, because the parent material contains an appreciable quantity of the plant nutrients—lime, phosphate, and potash. It occurs in small areas in different parts of the coastal belt. The white argillite series has been described in the last annual report and forms a poor belt four or five miles wide on the west of the main south road between Pukehou and Waipawa and on the east of the road south-west from Waipawa to Wanstead. It is subdivided according to the shallowness of the soils.

Soils derived from sandstone occur on the steep Silver Range belt near Elsthorpe under a rainfall of 35 in. In the Dannevirke district west of the Waewaepa Range the same parent rock occurs under a rainfall of 50 in., but whereas on Silver Range the profile consists of a few inches of sands on the parent sandstone and formerly carried fern, &c., in southern Hawke's Bay the sandstone has broken down to form about 3 ft. of silty clay loam under the high rainfall conditions and it carried forest instead of fern.

On flat country, soils derived mainly from fluvial silts and sands of mudstone, sandstone, and limestone are included in this group when they are flood deposits of recent times. They occur throughout the coastal belt and particularly on the Heretaunga and Porangahau plains. They are described in the last annual report as being highly fertile, insufficient time having elapsed to allow appreciable leaching.