

TOPOGRAPHY, GEOLOGY, CLIMATE AND VEGETATION.

Only 5 per cent. of the area described has been mapped geologically in detail, a factor that has made the work of the pedologists considerably slower and more difficult. Topographically, three distinct units are recognized—(1) Western ranges and rolling country, (2) central plains, and (3) coastal belt of steep and rolling country.

(1) The *western ranges* are formed of the indurated sandstones and mudstones called greywacke and argillite, probably Trias-Jura in age. These rocks contain a good deal of volcanic ash. Ancient gravels, sands, and silts derived from these old rocks form the rolling country on the eastern flank of the ranges and narrow belts north and east of the central plains. Volcanic ash showers of pumice and andesite ash, derived from Lake Taupo and Tongariro volcano respectively, cover the northern portion of these ranges from a line drawn west of Hastings, and also the Tertiary limestone, mudstone, and sandstone beds which outcrop in the high country north-west of Napier. The rainfall over the southern portion of the ranges rises from 60 in. to over 80 in., but over the rest of the belt the rainfall is 50 in. to 60 in.

(2) The *central plains* stretch from the southern boundary of the province to the north of Tikokino. They include the Takapau Plains, the sediments of which are derived from greywacke sands, silts, and gravels; but a few miles south of Dannevirke mudstone and sandstone alluvium is incorporated with the greywacke and the soils are more fertile. The rainfall is mainly between 40 in. and 50 in. On the extreme west of the plains the rainfall is 50 in. to 60 in.

(3) The *coastal belt* contains the fairly steep to rolling country between the plain and the sea, formed of tertiary mudstones, sandstones, and limestones. In general the rainfall is below 40 in., except over the high limestone country west of Waimarama, where it rises to 70 in.

The vegetation in the area mapped was mainly fern, &c., except on the Kaweka and Ruahine Ranges and on a portion of the foothills and plains south of the Ngaruroro River on the extreme west, and in the "40 mile bush" belt stretching south of Norsewood, where fern gave place to forest. Isolated patches of forest grew in a few scattered valleys and on the limestone country south of Te Aute.

GENETIC SOIL PROCESSES IN HAWKE'S BAY.

Sufficient work has now been done to indicate the main soil types likely to be encountered in the province and the soil processes under which these types were developed. Parent rock, topography, vegetation, and climate usually govern the characteristics of the soil profile, and in Hawke's Bay, where the soils are very young, parent rock is chief among these factors. In fact, different classes of parent material give rise to distinctive groups of soils.

Where the topography is gentle, soils are subject to the fullest influence of rainfall and climate, and leaching has its greatest effect, and, although such soils give the greatest response in their particular groups to top-dressing, the rainfall is generally too low for extreme leaching such as that found in North Auckland. Where the slopes are steep a well-developed profile is rare in the area described. On steep topography it is general for constant slumping under high rainfall to distribute fragments of the parent rock throughout the profile, keeping it fertile.

The effect of vegetation on the soils is fairly striking. The forest humus raises the fertility above that of soils formed under light scrub vegetation, but the advantage of a former forest cover does not last more than fifteen or twenty years.

CLASSIFICATION OF SOILS.

With the recognition of the major soil types in the area surveyed it becomes possible to make a preliminary genetic classification based on the processes under which the various soils were developed. Over one hundred distinct soil types have been recognized, and these are classified into three broad groups according to the physical and chemical characters of their soil profiles. These are:—

- (1) Rendzina group, derived from limestones.
- (2) Podsol group, derived from mudstones and sandstones.
- (3) Brown loam group, derived partly or exclusively from volcanic ash.

Each group is further subdivided into sub-groups according to the stage of development reached in the soil profile by its particular set of soil processes. The sub-groups are provisionally subdivided into series according to parent rock, and the series are further subdivided into soil types according to changes in the textural characteristics of the soil profile.

DESCRIPTION OF SOIL TYPES.

(1) *Rendzina Group.*

The rendzina soils are derived from calcareous rocks, mainly limestone, and are regarded as among the best sheep country in Hawke's Bay.

(a) *Immature Rendzina Soils* are usually developed on very steep slopes in soft limestone country where slumping is considerable, and this type is well shown on the steep scarp west of the Hastings-Otane main south road. The profile is: 6 in. black sandy loam on cream sandy loam consisting mainly of limestone fragments. As the limestone becomes more sandy it gradually gets harder until steep slopes tend to develop into massive bluffs which resist slumping and do not allow a soil to form. This type has a high base status and near Greenmeadows is high in phosphate, but under the rainfall conditions generally prevailing (below 35 in.) it dries out badly during the summer.