

fertility level of the subsoil is low. The topsoils contain a big percentage of humus—more than that in most market-garden soils. The base saturation of the topsoil is low, indicating that the reserve of lime is small, and consequently that the soils will not endure for long, fertilizers that produce acid conditions.

#### SOILS OF MATAKAOA COUNTY.

Following a request by the Department of Internal Affairs for a report on the agriculture of Matakaoa County, a soil survey was made, this marking the first stage in the attack on the project.

Matakaoa County, covering 295 square miles, lies at the northern end of the Gisborne Land District. The relief, in general, is steep, interspersed with dissected high-level terrace remnants and alluvial terraces and flats along the numerous streams and rivers, and portions of the coast-line. Steep and very steep country makes up 65 per cent. of the land, other topographic divisions accounting for—moderately steep, 21 per cent.; rolling and terraces, 6 per cent.; and alluvial flats, 8 per cent.

The soils are derived from mudstone, sandstone, shale, greywacke, basalt, and rhyolite pumice deposits. Altogether twenty-three soil types have been recognized and mapped on a scale of one mile to the inch. The soils have a fairly wide range of fertility—from rich alluvial soils of the valley bottoms to poor pumice soils of the high-level terraces. Of the soils on steep and very steep slopes about a third can be classed as moderate in fertility, lacking, according to chemical analyses, only phosphate for good pasture cover, and on moderately steep slopes as much as five-sixths of the soils are of moderate fertility. Soils on rolling country and high-level terraces are in general very infertile, being derived from rhyolite ash deposits. Besides being deficient in phosphate, potash, and lime, they are also low in magnesia. The alluvial soils are highly fertile except where light in texture.

#### CHEMICAL WORK AT THE CAWTHRON INSTITUTE.

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As in previous years, the Cawthron Institute has co-operated with the Soil Survey Division of the Department of Scientific and Industrial Research in the chemical examination of soil samples taken by the pedologists during the conduct of soil surveys in North Auckland, Hawke's Bay, and the Waikato. In addition, soil samples have been received from Marlborough, the Grey-Reefton Valley, and from the Nelson district. These samples have been examined in the chemical laboratory and reports prepared thereon for the benefit of different Government Departments and for the Tobacco Research Committee.

#### NORTH AUCKLAND SOILS.

Most of the samples have come from Whangarei County, where soil-survey work is in active progress. Great variation in soil types occurs in the county, such widely different soil groups as Rendzinas, brown loams, and mature podsoils being found. For the most part the general trend of the chemical data indicates rather low natural fertility, as measured by content of available phosphoric acid and by the percentage of base saturation. Base-exchange analyses on these soils show that the topsoil has a much better supply of bases than the subsoil and lower horizons of the soil profile.

The parent material from which many of these soils are derived is low in bases. Through the growth of vegetation there has been a transference of fertility to the topsoil at the expense of the subsoil and lower depths in the profile. Under these conditions the prevention of soil erosion is a matter of great importance.

Owing to poor supply of phosphoric acid and inadequate base content, the use of phosphatic fertilizers and of lime will be important in the rapid improvement of fertility on many of these soils.

#### HAWKE'S BAY SOILS.

Routine examination of soil samples forwarded by the pedologists from the Hawke's Bay soil surveys has been continued. In general the fertility level of Hawke's Bay soils is comparatively high. Percentage base saturation ranges from 40 to 100, while the amounts of available plant food, particularly on the Heretaunga Plains, are notably high.

Base-exchange data suggest that for many soils lime treatment will not be required. Phosphatic fertilizers, however, will be necessary to secure optimum returns from many pasture lands.

In striking contrast to the soils of the Heretaunga Plains, samples from the surrounding hill country—particularly soils under high rainfall—show a much lower fertility level. Available phosphoric acid is frequently low, while the soils of several well-defined groups are more acid in character.

#### WAIKATO SOILS.

Studies have been made of nitrate and ammonia production in four typical Waikato soils when held at different moisture levels. The samples were representative of the Horotiu silt loam, Ohaupo silt loam, Te Kowhai loam, and the Kereone silt loam types. They were examined for nitrate and ammonia contents after incubation for definite periods at wilting-point and half-moisture-holding-capacity levels. At wilting-point, Te Kowhai and Horotiu soils showed no increase in nitrate nitrogen, the figures all being low. Figures for ammonia on these soils, although rather high, did not show any marked increase when the soils were incubated at wilting-point moisture-level. In the case of the Ohaupo and Kereone soils, nitrates remained high at wilting-point moisture-level. Ammonia increased in the Ohaupo soil, but remained low in the Kereone soil.

At half-moisture-holding-capacity level all four soils showed a pronounced increase in nitrate nitrogen, particularly marked in the case of the Ohaupo and Kereone soils.