

It is not known whether the 400-acre swamp, "No Man's Land," should be considered free from bush sickness or not. North of Rotorua, where the thin layer of Tarawera gravelly sand rests on Kaharoa ash, sheep become sick, and occasionally cattle; similar soils on Galatea must therefore be regarded as liable to bush sickness.

The water-sorted group of soils, with the possible exception of some that appear to consist entirely of pumice, should be healthy for stock. Water-sorted soils with a surface layer of Tarawera gravelly sand should also be healthy.

WAIHAHA, TIHOI, POUKANI, AND TIROHANGA BLOCKS.

While Mr. W. Traill, of the Lands and Survey Department, was making a topographical survey of the Waihahe, Tihoi, Poukani, and Tirohanga Blocks the writers visited his camp on two occasions, remaining each time for a week in order to make a reconnaissance soil survey of those parts of the blocks lying east of the Mangakino and Huruhuru streams.

*Topography**.—The area examined, some 114,000 acres, is situated close north-north-west of Lake Taupo on a plateau most of which slopes gently northward to the Waikato River. Near the southern end of the blocks the plateau is 2,000 ft. and in the north 1,000 ft. above sea-level. Much of the country is steep and broken, but there are five areas of easy to rolling country totalling approximately 49,000 acres. One of these areas (about 13,000 acres), lying north of the Waihora Stream, is well watered, but the others are poorly watered.

Climate.—There is no meteorological station near the blocks, but Kidson's maps show the rainfall between 60 in. and 70 in., heaviest in October, lightest in February, and moderate in December and January. As it is so far inland, summer temperatures will be high and winter temperatures low, compared with other parts of New Zealand. Heavy frosts are common, these being more severe in the wide valley-bottoms.

Vegetation.—The steep and broken areas are covered with heavy fern and tutu, with manuka in the easier basins and tussock on the dry valley-floors. On the rolling country, fern, tutu, and to some extent manuka occupy the knolls and slopes; while on the easier country the dominant growth is tussock, with manuka, monao, and celmisia.

Soils.—The blocks are covered with about 3 ft. of Taupo rhyolitic pumice. Underlying the Taupo pumice is a brown sandy loam derived from the weathering of an earlier andesitic ash which has been named Tongariro. Along the stream-valleys are terraces which are formed mainly of Taupo pumice washed from neighbouring slopes.

The main soil types are (1) Taupo sand; (2) Tongariro sandy loam; (3) water-sorted sands and gravelly sands.

The Taupo sand covers almost the whole of the rolling and easy country and the greater part of the moderate to steep areas. Where the pumice is undisturbed the section is—

Taupo ..	{	3 in. dark grey sand.
		15 in. brown to buff sand, slightly compacted.
		18 in. cream gravelly sand, free.
Tongariro		on brown sandy loam.

The brown *Tongariro sandy loam* forms the surface soil over only a small proportion of the blocks. It appears at the surface on the crests of knolls and ridges and on some of the steeper slopes, where, in some places, it is mixed with Taupo pumice.

The *water-sorted sands and gravelly sands* probably form much less than 5 per cent. of the total soils. The most extensive terrace formation is the upper one, generally 50 ft. above the larger streams, and composed entirely of resorted pumice. In streams draining from the greywacke hills in the west the lower terraces are formed in part from greywacke detritus, and a better soil results.

Strips of rich loamy soil occupy the floors of many stream-valleys but are rarely more than half a chain wide.

The *moisture content* of soils derived from the Taupo pumice is much greater than that of the average soil of the same texture. The sandy top layer can be expected to be fairly retentive of moisture, although it allows free drainage. The soils of the lower terraces are generally overdrained. The Tongariro sandy loam and the loamy soils bordering the streams are well supplied with moisture.

Bush Sickness.—As the soil is derived mainly from Taupo pumice, stock grazed on these blocks will probably be subject to bush sickness; in fact, bush sickness has appeared among stock on some of the farms lying farther north. It must be pointed out, however, that the "available" iron and the total iron and lime content of the Taupo sands on the blocks are unusually high for a normal Taupo soil. Stock grazed on Tongariro sandy loam are free from bush sickness, but there appear to be insufficient areas of this soil on the rolling country to make farms healthy.

Possibilities of Development.—The soils on the whole area are so similar that topography and drainage determine the value of the land. The five easy rolling areas could be used for dairying. The fact that four of the areas are badly watered is not a serious drawback, for water could be raised from one or more strong streams that cross them or form their boundaries. The area north of the Waihora River could be developed first, and later the rolling country that is badly watered.

In considering the development of these areas the following disadvantages, some of which are serious, have to be taken into account: (1) Although the soil resembles that of Ngakuru, it is coarser in texture, and the subsoil is less compact and more gravelly. This means that the soil will probably be less fertile than at Ngakuru. (2) As a result of the severe winters and the lower fertility of the soil the carrying-capacity will be less than at Ngakuru. (3) The blocks are farther from the Government railway than Ngakuru, though this is somewhat offset at present by cheap fares on the light railway to Mokai. (4) The area is probably subject to bush sickness; but this form of anæmia can now be successfully combated by using a lick made of equal parts of limonite and salt.

With such a large tract of easy country, it is advisable that experiments be conducted to obtain exact data, for as yet no successful farms have been established on Taupo soils of this texture.

* A detailed report on the topography of these blocks has been prepared for the Lands and Survey Department by Mr. Traill.