FIELD WORK ON SOILS OF ASHBURTON DISTRICT.

(By L. I. Grange.)

From the beginning of February to early in May the writer was engaged in making a soil survey of the plains of Ashburton County, an area of 1,080 square miles.

The plains of Ashburton County are part of the Canterbury Plains. The Rakaia River forms the northern boundary and the Rangitata the southern boundary of the area described. Midway between these rivers is the Ashburton River, and between the Ashburton and the Rangitata is the Hinds, the courses of all these rivers being roughly parallel.

In classifying the soils consideration had to be given to (1) climate, (2) the origin and mode of deposition of parent material, and (3) vegetation. As is well known, the climate of the plains is not uniform. South of Lauriston, Westerfield, and Carew the rainfall averages between 25 in. and 28 in., whereas in the belt lying between these settlements and the foot of the Southern Alps the rainfall is between 33 in. and 45 in. A line through the towns mentioned form an arbitrary boundary of the two rainfall belts—no doubt the change to the higher rainfall is gradual. Ashburton County, like other portions of the Canterbury Plains, is subject to warm dry winds of high evaporating-power. Again, the plain rises gradually from the seacliffs to the foothills. At the seacliffs at the mouth of the Ashburton River the plains are 65 ft. above sea-level and gradually rise inland till at the foothills they reach, in places, a height of 1,500 ft. With lower temperatures on account of height above sea-level, the soils of the higher portions of the plain suffer less from evaporation than the coastal belt, and consequently in the former area there must be a higher percentage of the rainfall available for leaching. Thus the Ashburton lowland can be divided on climate into two main belts, one with a low rainfall and high evaporation, and the other with a moderate rainfall and high evaporation, which, however, is less than that of the low rainfall belt. From the moderate rainfall belt is separated the belt lying close to the foothills of the Southern Alps, where temperatures are fairly low.

The soils of the plains are derived practically entirely from greywacke. The plains consist of a series of coalescing fans of greywacke gravel formed by the Rakaia, Rangitata, and Ashburton Rivers. They were mainly built up during the Pleistocene glaciation. The gravels consist of tightly packed subangular pebbles with coarse sand filling the interspaces. While the gravels were being deposited, the winds carried rock flour from abandoned channels of the braided rivers, and deposited it on the neighbouring hills and upland surfaces. Such deposits, which are called loess, mantle the mature surfaces standing 150 ft. or more above the plain at the back of Mount Somers. Probably towards the close of the glacial period the rivers started to entrench themselves on their fans. Although entrenched, the rivers remained in braided channels and the north-westers which swept down the mountain gorges carried dust from the river-beds on to the wide areas lying between the rivers. The building-up of loess deposits on the interfluves continues to the present day. As is to be expected, the loess is thickest and coarsest in texture near the banks of the rivers. Several miles north of Rakaia Township the loess is 15 ft. thick, and thins to 12 in. at eight miles away from the river. While the loess was being deposited the Ashburton and Hinds Rivers overflowed their banks, and deposited alluvial sediments mainly of a loamy texture.

With these data it is possible to consider further the classification of the soils. The soils are all of the same geological origin, so that factor does not enter into the classification, though important in considering the soil process operating in the Ashburton County. The age factor comes in; the old loess at the back of Mount Somers must be classed differently from the young loess deposits, as it has been subjected to more leaching. The mode of formation allows of two broad divisions within the climatic belts: (1) The loess deposits, and (2) the alluvial deposits. The recognition of loess deposits aids in the mapping of soil-textures, for it is to be expected that such deposits will maintain a uniform texture over fairly wide belts, trending parallel to the rivers.

Vegetation is a simple consideration, for the native vegetation was low tussock, matagauri, scrub, &c., except for small areas of forest at Alford Forest and Starcly, near the foothills. The soils under the forest, which occupied about 10 square miles, are much lighter in colour than those under tussock vegetation, and hence have to be classed separately. There are differences in humus content of the soils of the tussock area, due to the density of the vegetation. Where shallow loess rests on gravel, the soils are lighter coloured than where the loess is thick.

Further factors in classification are depth of loess, or alluvial material, on the gravel, and the texture of soil and subsoil. The gravel having a coarse sand matrix, is very porous. Shallow soils on the gravels dry out more readily than do the deeper soils. The minimum depth of loess on the gravel is about 9 in. Depth to the gravel is, of course, more important in the low rainfall belt, where the moisture even under optimum soil conditions is low for crops other than grain. Texture plays an important part; for one thing the moisture-holding capacity largely depends on it.

The soils have been divided into fifty-five types. The alluvial soil types occupy about a quarter of the total area.

The finer-textured alluvial soils in the low rainfall belt are loams and clay loams, which, in places, have a total depth of as much as 6 ft. A profile at Wakanui is—

9 in. to 15 in. dark-grey clay loam;
12 in. creamy-yellow clay loam;
3 ft. (+) sandy loam.

At Eiffelton the clay loams are low lying, and were originally badly drained. The subsoil is lighter in colour, and there is, in places, iron-staining. A hard iron pan has formed in the clay loam to the east of Eiffelton. Small areas of peat and peaty loam ranging in depth up to 3 ft., occur at Willowby, Blackbridge, and Lowcliffe. Occupying a little less area than the loams are silts and stony silts, which are in general shallow. The stony silts to the south of Tinwald average about 13 in. thick. Silts near the coast southward of the Ashburton River are a little thicker than the Tinwald silts, but are bleached owing to the former presence of a high ground-water level. The sands which occur close to the rivers are mainly more than 3 ft. thick.