

weakly podsolized where there is a combination of rolling and steep country, very little leached on the steep slopes, and most fertile on the steeper slopes where slumping has taken place.

Thus natural differences in the value of the soils owing to various causes can be mapped out, and it remains to be seen to what extent farm-management surveys and fertilizer trials can make use of them to improve farming in Hawke's Bay. Observational top-dressing experiments should now be laid down on the various soil types in order to find out what fertilizers are required for each type.

ORCHARD SOILS ON THE HERETAUNGA PLAINS.

(By Dr. L. I. GRANGE.)

A detailed survey of the soils of Heretaunga Plains was undertaken with the object of assisting the orchard industry. The plan was to map the soil types and then to ascertain by an examination of orchards already existing which were the types suitable for the growing of apples, peaches, pears, and plums. When this information was obtained it would then be possible to advise where future plantings should be made. The soil map would be of value if it is desirable to grow more of the small fruits. For these local experience offers some guidance, and this, coupled with experience in other countries, should allow the orchardist to be of service when an extension is contemplated. The soil map will be a guide to all workers on orchard problems. Advice on manuring can be given intelligently when responses can be linked up with soil types. Workers on fruit diseases must have in advance all information on the soils in order to judge whether or not the soil is a factor in the problem.

As the holdings are small it was necessary in the first place to construct a good topographic map. Aerial photographs taken by Mr. P. van Asch along with the standard surveys of the Lands and Survey Department were used for compiling 10-chain maps showing every subdivision fence, creek, house, orchard, &c. On these, soil types have been delineated.

The parent material of the soils in the Twyford, Stortford Lodge, Longlands, Pukahu, and St. George Road districts—forming much the greater part of the area so far examined—is the sediments deposited by the Ngaruroro River while in its old course. The old channel was abandoned in 1867, and later sediments have been laid down in a fairly wide belt following the present course. The soils are thus very young, and in the case of the heavier-textured soils are of remarkably high natural fertility. The soils with a high water-table, although young, exhibit mottling.

Drainage is the major factor on which the soils are divided into series—this factor, of course, being all-important where orchard trees are concerned. The drainage of the soils is reflected in the soil profile. Three series are recognized:—

- (1) Very well drained soils occupying a little less than a third of the area:
- (2) Moderately well drained soils covering less than a third:
- (3) Badly drained soils occupying somewhat more than a third.

The very well drained soils occur in or close to old channels of the Ngaruroro. Included in these soils are stony sands and sands, shallow loams on sands, and silt loams. The stony sands and sands dry out badly in summer, and are unfit for orchard purposes. In the few areas where planted, the apple-trees are stunted. Comprising most of this series are the shallow sandy and silt loams lying on fine sands and the silt loams which have unbleached subsoils. These are eminently suitable for the growing of apples and peaches. The free, well-drained subsoil allows of good root development.

The moderately well drained soils lie chiefly on either side of the very well drained soils following the main road between Stortford Lodge and Twyford. The soils are chiefly clay loams and silt loams, and their subsoil is grey, mottled somewhat by iron-staining. On one of the types bordering the old Ngaruroro River the humus-coloured soils extend to a depth of 18 in. The ground-water level in the autumn is 3 ft. or more below the surface. These soils are favourable for the growing of fruit.

The badly drained soils are in low-lying localities and generally heavy in texture, most of them being clays. The subsoil is mottled—blue-grey and light-brown. In the autumn the water-table was only about 18 in. below the surface. Cold air drains into these low-lying areas, and killing frosts occasionally occur in the late spring. Such a soil type must be considered unfavourable for orchard purposes.

Preliminary investigations show that there is room for considerable expansion in orcharding on the Heretaunga Plains, if market conditions warrant it. Three areas examined were found to contain a total of 2,600 acres that could with advantage be utilized.

FIELD-WORK IN NORTH AUCKLAND.

(By N. H. TAYLOR AND C. F. SUTHERLAND.)

During the 1935-36 season a soil map has been prepared of approximately 1,000 square miles lying between Kaeo, Kaihu, and Kawakawa, and, in addition, a sketch-map has been prepared of about 200 square miles of land lying between the Kaihu and Wairoa Rivers on the east and the sea on the west. An account of this latter area is being published in a separate report.

Throughout the course of the work the Fields Division of the Department of Agriculture co-operated closely with the Soil Survey, and grateful acknowledgment is made of the ever-ready help of Mr. P. W. Smallfield and his field officers.

Much of the area mapped has been previously examined by the Geological Survey, whose maps have formed a very useful basis for the soil work.

Topography, Geology, and Climate.—The area lying between Kawakawa and Kaeo is largely rolling to steep country carved from Mesozoic sediments which are in part overlain by basalt-flows.

The basalt-flows belong roughly to two periods. The older basalts form remnants of a flat-topped upland, 700 ft. to 900 ft. above sea-level, extending from Okaihau northwards; the eastern part close west of Kerikeri Inlet has been down-faulted and stands at a lower level (200 ft. to 300 ft.). The down-cutting of the rivers has caused the ancient upland to be converted locally into rolling