LIME DEFICIENCY IN THE KING-COUNTRY.

The following is a brief account of the Mairoa research, giving some account of the practical work undertaken in the field by Mr. Sutherland and others who are charged with the duty of demonstrating in a practical manner, and to the farmers' satisfaction, the need of lime in this once fertile district :—

It should be premised that in the Mairoa district the prevailing type is that characteristic of deep volcanic mud or dust showers, and which may be called the Mairoa type.

(1) The natural plant covering of Mairoa consists largely of rimu, tawhero, and hinau. In addition to this, there occur in the Mairoa district, to such a small extent as to be almost negligible, the following types, which, however, are well developed in other areas outside the Mairoa district.

(2) Mangapohoe, which naturally grows tawhero, rewa, and tree manuka : This type is more unhealthy for sheep than is the first. In addition to the above unhealthy types of country there are three healthy types, namely—

(3) Kihikihi, which grows rata, rimu, matai, tawa, and mangaeo.

(4) Waitangururu, which grows rata, pukatea, matai, totara, rimu, konini, and mahoe.

(5) Mangaotaki, which grows forests similar to No. 4.

Both healthy and unhealthy types may have very dense undergrowth. The first two—(1) and (2)—consist of volcanic dust or mud showers, and the last three—(3), (4), and (5)—of soil are derived from sedimentary deposits. Types one and two were very productive for a number of years. The pastures on them are from eighteen to twenty-seven years old, and are now reverting to danthonia, brown-top, fog, weeds, moss, and fern, and it is to be noted that, in addition, on the No. 2 Mangapohoe type, manuka is coming in. In both, clovers are absent.

The following changes are in evidence on the healthy types :—

(3) On Kihikihi the pastures are reverting to danthonia and brown-top. They still contain a fair amount of cocksfoot and a little rye-grass and clover, but moss, fog, fern, and weeds also take up a good deal of these pastures.

(4) Waitangururu pastures have deteriorated, but still contain a good portion of the original grasses shown. Clovers are holding better than any other types, and fern does not come in nearly so quickly. The above gives a bird's-eye view of the types of subsoil in the large area to the west of Te Kuiti, but it should be said that in the Mangapohoe there is evidence of a deficiency of phosphate as well as calcium in the soil.

Before the present experiments were instituted top-dressing of pastures was spasmodic and confined to small areas, the dressings being largely phosphatic, and composed chiefly of basic super, basic slag, and superphosphate. This treatment produced better pastures, but did not cure dopiness in sheep. Before the war the Mairoa district was producing heavily and was considered one of the good districts of the King-country. It is important to remember this, as it affords a distinguishing difference between bush-sick country and dopiness country. The Mairoa is a good example of deteriorated land, but, on the contrary, bush-sick land always gets better with age and stocking. This matter was discussed in an article " Lime Deficiency in the King-country Soils, and the Effect on Plants and Animals " (Transactions of the New Zealand Institute, Vol. 59, 1928, p. 406). There the history of the country is given. The publication of this and the *Journal* article drew attention to the need for lime, and preliminary experiments with lime carbonate alone and with gypsum alone, and with lime and superphosphate mixed was successful in keeping sheep free from dopiness. (See 1929 report, H.–34, Scientific and Industrial Research Department, pp. 24, 25, and *New Zealand Journal of Agriculture*, July, 1930, Vol. 41, p. 14.) Since then the experiments have been mainly in the direction of practical tests on farmers' lands in which no controls were used, but the test being whether the previous well-authenticated mortality, which always occurred, could be stopped.

As a result of this work showing lime deficiency affecting malnutrition, an arrangement was come to whereby the settlers of the district were given facilities enabling them to obtain ground limestone, a boon which has been much appreciated. The result of this application of lime and superphosphate (5 cwt. lime, 2 cwt. super) to several farms where previously it was impossible to profitably farm sheep has been to enable this to be done much to the farmers' satisfaction. It is hoped that details shortly will be published in full.

The conclusion arrived at with regard to the year's experience with lime and super top-dressing treatment is that, to obtain the best results, these two ingredients must be mixed rather than separately applied to the pasture. In several instances where the lime and super had been separately sown the results were not so good as anticipated. It is thought that after four applications of the 5–2 mixture, with proper management, the carrying-capacity of the Mairoa country should be improved to about two and a half sheep per acre. The Government supply of lime to the farmer has been a great assistance, but the maximum improvement cannot be obtained without the use of superphosphate. The mixture of 5 cwt of lime and 2 cwt. of super per acre applied to land has proved that it is possible to successfully breed and fatten lambs on country where formerly it was impossible to do so.

Some reorganization of the work in the Mairoa and Kopaki areas has been effected as a result of the experience already gained. Carefully controlled sheep experiments have been initiated at Mairoa to compare the effect of various top-dressings on the health of sheep. A large series of replicated enclosed plots with various top-dressings have been established at Kopaki and Mairoa. A series of samples of uncontaminated pasture from these plots is being obtained, whereby it is hoped to secure exact data concerning the variation in mineral content and composition of the pasture with soil-type and manurial treatment.