

(1) COBALT SURVEY OF SOILS AND PASTURES.

Cobalt surveys have been continued, and a considerable amount of data is now available for both soils and pastures in the South Island. In the Westhaven-Collingwood district of Nelson Province, analyses of soils and pastures have given cobalt figures which correlate well with stock history, and suggest that cobalt supplements will prove beneficial to stock over extensive areas of country. A very detailed survey of cobalt in both soils and pastures of the Sherry-Wangapeka district of Nelson has shown a rather widespread correlation of low cobalt figures with the granite soils of this district. Low cobalt status of the soil was almost invariably associated with a low cobalt content of the pasture. One interesting feature of the pasture analyses was the fact that in a number of cases low cobalt figures in the pasture were associated with relatively high figures for cobalt in the soil.

A more extensive survey of the cobalt status of pastures and soils in the Grey-Reefton Valley has been made. The analyses have not yet been completed, but the determinations which are available confirm those made in the previous year showing that the recent alluvial soils are moderately well supplied with cobalt, but a great area of terrace land, particularly where underlaid by gravels, has a low cobalt content. Analyses of pasture samples in the Ashburton County have been completed. With one or two exceptions the cobalt figures for the pastures are quite satisfactory. As far as can be ascertained, cobalt deficiency is not connected with sheep ailment in this county.

Further samples of pastures and soils have been obtained from the Wairau and Awatere Valleys of Marlborough, while further analyses have been made of pastures from North Canterbury. Full data for Marlborough and North Canterbury are not yet available, but the cobalt contents appear quite satisfactory. One or two somewhat low figures from North Canterbury are not associated, as far as can be learnt, with cobalt deficiency in stock.

Further sampling of pastures has been continued in Southland on farms representative of both healthy and unhealthy country. The analyses definitely show a low cobalt content of the reputedly unhealthy country, but several cases of abnormal figures have been noted both in the unhealthy and in the healthy groups. Soil contamination of Southland pastures is undoubtedly one factor which has contributed to abnormality of results. The differences in cobalt content between the reputedly healthy and unhealthy pastures, however, are not as great as those shown for corresponding pastures in the Nelson District.

(2) VALUE OF COBALT IN SOUTHLAND LIMESTONES.

One of the outstanding features of the experiments in the Southland District has been the discovery that certain types of ground limestone have an appreciable cobalt content, and that the cobalt content of the pasture is definitely increased by the use of these ground limestones at ordinary farm rates of application. The results of the investigation have shown that certain Southland ground limestones have a cobalt content of approximately five parts per million. When applied at the rate of 3 tons of limestone per acre, the increase in the cobalt content of the pasture compared favourable with that obtained by the application of 4 oz. of cobalt sulphate per acre.

Table I shows the effect on the cobalt content of the pasture when 3 tons of a selected ground limestone, $\frac{1}{4}$ lb. cobalt sulphate, and $\frac{1}{2}$ lb. cobalt sulphate, respectively, were used for top-dressing.

Table I.—Cobalt Content of Pasture.
(Parts per million on dry basis.)

Date of Sampling.	Control.	Quarter Pound Cobalt Sulphate per Acre.	Half Pound Cobalt Sulphate per Acre.	Three Tons ground Limestone per Acre.
Before top-dressing, 10th November, 1938	0.04	0.06	0.06	0.05
20th December, 1938	0.11	0.21	0.35	0.21
2nd February, 1939	0.04	0.17	0.19	0.13
4th March, 1939	0.06	0.09	0.11	0.06
20th May, 1939	0.06	0.06	0.07	0.06

The results presented above show that 3 tons of the selected ground limestone gave results somewhat similar to those obtained with $\frac{1}{4}$ lb. cobalt sulphate.

The cobalt content of livers of lambs grazing on pasture treated with these limestones showed an increase comparable to that obtained from the use of soluble cobalt salts. The results confirm the general belief of farmers that Southland lime has a special value to the stock industry on many Southland soils. Not only is Southland lime of value in reducing soil acidity and conserving phosphates, but its cobalt content has an appreciable effect—although probably of short duration—in improving the cobalt status of the pastures. An examination of the residual soils overlying the limestone showed that there was a concentration of cobalt in the residual soil, suggesting that a proportion of the cobalt minerals occurring in the limestone was less soluble to weathering than was calcium carbonate.