

In the Takaka and Aorere Valleys of Golden Bay, pastures have shown, except in a few cases, satisfactory cobalt content. The exceptional samples containing 0.03 p.p.m. to 0.05 p.p.m. were generally on granite or pakihi soil types. Pastures on the lower part of the Takaka Valley were well supplied with cobalt, their contents being approximately 0.15 p.p.m. In the Upper Takaka Valley some low figures have been found.

(b) *Cobalt in Limestones.*

Further samples from South Island vendors have been analysed for cobalt content. Most of the samples contained about 1 p.p.m. of cobalt, but some were as low as 0.2 p.p.m. Samples from Centre Bush, Southland, and Waiiau, Canterbury, contained 5 p.p.m. and 12.5 p.p.m. of cobalt respectively. There does not appear to be any relation between the geological age and cobalt content, nor is there any indication that content of calcium carbonate is directly related to the cobalt content.

(c) *Cobaltized Superphosphate and other Cobalt-containing Fertilizers.*

Several samples of commercially prepared cobaltized superphosphate have been analysed and found in each case to be satisfactory in cobalt content. A sample of commercial cobaltized superphosphate was held for nearly two years and a half to examine the effect of ageing on the solubility of the cobalt. Over the stated period no change in water solubility occurred. It is unlikely that a supply of this fertilizer will ever be held by a buyer for such a long period, but should cobaltized superphosphate be held for a considerable period no loss in the effectiveness of its cobalt is to be expected.

Ground serpentine from the Auckland District was found to contain 83 p.p.m. of cobalt. Silico-superphosphate prepared commercially from the same serpentine contained 18.5 p.p.m. of cobalt, of which only 0.7 p.p.m. was soluble under the conditions of extraction.

(d) *Use of Cobaltized Superphosphate.*

The plots on which cobaltized superphosphate has been used to provide varying amounts of cobalt have been sampled regularly during the year. Relatively few of the samples have been analysed, however. The indications to date are that for applications given early in August, 1939, at rates of 2 oz. and 4 oz. of cobalt sulphate per acre, no benefit in cobalt content of the pasture was recognizable after the beginning of March, 1940. The cobalt content of the pasture treated with 2 oz. cobalt sulphate per acre was not markedly increased after the middle of December. After applications of 8 oz. and 16 oz. per acre, appreciable increases in cobalt content of the pastures were found until the end of March, 1940, when the treated pastures showed approximately three times the content of the control pastures (0.03 p.p.m.).

On a pasture in the same area, applications of a serpentine-derived soil carrying 350 p.p.m. of cobalt have been made at rates of 5 cwt. and 10 cwt. per acre. Very substantial increases in cobalt content of the pastures resulted from these applications, especially with the higher rate. In this latter case the dressing with soil has given, over a period of three months, results at least as good as an application of 8 oz. cobalt sulphate per acre.

(e) *Animal Experiments.*

(1) *Role of Cobalt in Animal Metabolism.*—In the autumn of 1939 a number of wether hoggets were sent to Glenhope for use in an experiment designed to give information on the cobalt content of organs of sheep under cobalt deficiency conditions, followed by a period of drenching with cobalt. A number of sheep went "bush sick" when the flush of grass growth came away in November and December. The average weight dropped to 49.4 lb. from the original weight of 72.9 lb. Drenching was commenced on 10th January, 1940, and was continued twice weekly. The animals responded rapidly, so that by the end of the month the average weight was 66.9 lb. Further increases in weight were obtained until the end of season, when the experiment terminated. Animals were killed periodically during the season to obtain samples of organs, &c., but as yet no results of analyses are available.

(2) *Field Experiments at Sherry River.*—At the Sherry River a trial, to run over two seasons, has been established to examine the effect of a high cobalt limestone on stock health under Nelson conditions. Groups of hoggets are being run on areas with no cobalt top-dressing, with applications of low cobalt limestone, or of a high cobalt limestone or of cobaltized superphosphate. Equivalent amounts of superphosphate were used on all plots. In the earlier part of the season, animals on the area top-dressed with a Southland limestone containing 5 p.p.m. of cobalt at the rate of 2 tons per acre grew as rapidly as those on the area top-dressed with 2 cwt. per acre of cobaltized superphosphate. Animals on the other two plots were definitely behind these two groups in weight increment; thus, on 27th October, 1940, the average live weights for the best groups were 75.6 lb. and 75.8 lb., and for the control and low cobalt limestone groups 71.4 lb. and 71.8 lb. respectively. However, after this date the animals on the high cobalt limestone plot did not do so well as those on the cobaltized superphosphate area; thus, on 28th January, 1941, the latter group averaged 20 lb. heavier than the former. By 21st March the average difference had increased to 30 lb. The control and low cobalt limestone groups had begun to go off seriously in condition owing to the development of "bush sickness." Several animals in each of these groups are affected. Some of the animals in the high cobalt limestone group are also now affected with bush sickness. To date, therefore, the indications are that some benefits have been obtained from the cobalt in the high cobalt limestone, but that the effect is of short duration.

Pasture samples have been obtained regularly from these areas for chemical analysis, in order to correlate cobalt content of pastures with condition of the animals.