

### III. CORRELATION OF SOIL-FERTILITY WITH PASTURE-RESPONSE TO MANURIAL TREATMENT.

In previous reports detailed accounts have been given of the experiments which have been conducted concerning influence of fertilizer and season on the yield and composition of a typical dairying-pasture at Richmond, Nelson. The data recorded in Bulletin 26 of the Department of Scientific and Industrial Research show that on this pasture superphosphate and lime treatment have given little increase in pasture-yield. On the other hand, comparatively large increases in yield have resulted from the use of ammonium sulphate either alone or in combination with superphosphate or superphosphate and potash. The best yield, however, was obtained with a complete manure consisting of 1 cwt. of ammonium sulphate, 2 cwt. of superphosphate, and 1 cwt. of sulphate of potash per acre. In order to ascertain whether there was any correlation of soil-fertility with pasture-production, a number of soil-samples was taken from the different plots in the winter of 1928.

The examinations have shown that the soil is well supplied with available phosphate, but is somewhat low in available potash. The amount of replaceable lime, particularly in the top 0-3 in. of soil, is comparatively high, although the soil has a marked acid reaction and a fairly high lime-requirement figure. The amount of replaceable lime in the topsoil no doubt accounts for the failure of lime treatment to effect any very marked improvement in either flora or pasture yield. It must be remarked, however, that the composition of pasture from the limed plots was better than that from the unlimed plots with similar manurial treatment. The soil determinations are in agreement with the yield data published in Bulletin 26, and explain why superphosphate has had so little effect in promoting pasture-yield, and why the use of sulphate of potash has been attended with such good results. One interesting feature of the soil data is their failure to show any accumulation of phosphate on those plots which have received a regular application of 2 cwt. of superphosphate per acre. In comparison with the untreated plots the percentage of phosphoric acid frequently is lower in those plots that have received superphosphate treatment, suggesting that leaching of superphosphate has occurred on this open-textured soil.

### IV. USE OF NITROGENOUS MANURES.

Much field-work has been directed to intensive studies concerning the effect of season and fertilizers on the yield and chemical composition of different pastures. In particular, very detailed studies have been made of the effect of nitrogenous manures on pasture-yield and on its botanical and chemical composition.

In this investigation three applications of calnitro, nitrochalk, ammonium sulphate, and ammonium sulphate plus calcium carbonate have been made during the season at the rate of 1 cwt. per acre on each occasion. So far as the experiment has gone, the yield data are definitely in favour of ammonium sulphate with calnitro in second position. Nitrochalk has fallen considerably behind either ammonium sulphate or calnitro in promoting increase in pasture. Owing to the lower percentage of nitrogen in nitrochalk (approximately 15 per cent.) in comparison with the nitrogen content of ammonium sulphate and calnitro (approximately 20 per cent.), it might have been expected that a smaller increase in yield of dry matter would result from its use. The increase, however, has been much less than might have been expected from the difference in percentage of nitrogen in the manures.

The use of calcium carbonate in conjunction with ammonium sulphate has not resulted in any increase in yield over the full period. It remains to be seen, however, whether the chemical composition of the pasture under the combined lime and ammonium sulphate treatment will show to advantage over pasture treated solely with ammonium sulphate. For a period of 139 days, covering two applications of ammonium sulphate at the rate of 1 cwt. per acre on each occasion, an increase of 312 lb. of dry matter per acre has been obtained over the non-nitrogen treated plots; 1 cwt. of ammonium sulphate, therefore, has given an average increase in yield of 156 lb. of dry matter per acre.

### V. INFLUENCE OF REPEATED APPLICATIONS OF AMMONIUM SULPHATE ON THE YIELD, BOTANICAL AND CHEMICAL COMPOSITION OF A TYPICAL DAIRYING PASTURE.

A great deal of time has been devoted to a detailed study of the effect of ammonium sulphate on the yield, chemical and botanical composition of pasture, which in the past has received different manurial treatment. For the purpose of this investigation the Richmond pasture-plots which were the subject of investigation during the previous season have been used. The number of plots was increased so that different aspects of manuring with ammonium sulphate could be studied. The more important features of this detailed investigation are reported below under the following headings: (a) Effect of Ammonium Sulphate on Pasture-yield; (b) Effect of Ammonium Sulphate on Botanical Composition; (c) Effect of Ammonium Sulphate on Chemical Composition of Pasture.

(a) *Effect of Ammonium Sulphate on Pasture-yield.*—The yield data show that the value of ammonium sulphate for increasing pasture-production is dependent on a number of factors, as follows:—

- (1) The manurial history of the pasture:
- (2) Rate and frequency of application of ammonium sulphate:
- (3) Time of application:
- (4) Climatic conditions.

By far the best return from the use of ammonium sulphate has been obtained on those plots where an application of nitrogenous manure at the rate of 1 cwt. per acre has been made each spring during the last six years. The following figures concerning yield of pasture under particular manurial treatment show the very large increase which has been obtained by the regular use of 1 cwt. of nitrogenous manure per acre.