

Regular botanical analyses of the pasture were made throughout the year. During the dry weather the weed content, mainly pennyroyal, accounted for 85 per cent. to 90 per cent. of the growth on the unirrigated pasture. One of the plots receiving 1 in. of water contained 6 per cent. to 12 per cent. of weeds, and its duplicate had a weed content of only 1 per cent.; the latter plot at this time had 78 per cent. rye-grass and 18 per cent. white clover. The plots receiving $\frac{1}{2}$ in. of water at each irrigation were far more weedy, containing about 40 per cent. weeds in one and 11 per cent. to 20 per cent. in the other. If allowance be made for weeds, the increase of growth from irrigation would be much greater than the figures quoted.

Drain Gauge Trials.—Little or no information was available in New Zealand regarding the proportion of the rainfall which passes away into the subsoil as drainage water below the reach of the plant roots and is lost to the plant.

A portion of undisturbed grassland was separated from the surrounding land by sinking two concrete rings each 3 ft. deep to a depth of 6 ft. in the soil. The surface enclosed is about $\frac{1}{3000}$ of an acre. A perforated steel plate was inserted between the rings, leaving 3 ft. of undisturbed soil above. The soil below the plate was removed and a funnel for collecting drainage water inserted in its place.

By measuring the drainage water it was found that in August 41 per cent. of the rainfall passed away in the drains, in September 30 per cent. and in October 38 per cent. Analyses of the drainage water have shown the amounts of plant-food which are lost in the drainage. A feature of this work is the large amount of magnesium which is being lost from Hamilton clay soil.

Manurial Requirements of Soils

For estimating available phosphate of soils in the field, consideration of accumulated data from 1945 to 1947 led to a trial of Truog's method, and this has proved promising enough to warrant its provisional adoption for advisory work. A modification of the method will be used in the field officers' outfits. The extractant employed is a 0.002N sulphuric-acid solution buffered at pH 3. The sulphate ion does not displace absorbed phosphate, a form which appears unavailable for plant uptake. For potash tests the Purdue rapid test has been provisionally adopted and used for routine advisory work, and provision for its use will be made in field outfits to be issued to advisory officers.

The soil tests for phosphate and potash have been further checked by use in conjunction with tissue-test methods. Indications were in general agreement, but there were exceptions. Soil samples from all observational top-dressing trials have been examined by quick-test methods, and results await comparison with field pointings. Mitscherlich pot experiments were carried out in the past season on 13 soils from various parts of New Zealand.

In the field outfits at present on issue, lime requirement of soils is judged from a joint consideration of pH and exchangeable lime. To put recommendations on a sounder footing, a measure of base-exchange capacity is needed in addition. Efforts have been made to devise a simple test for this capable of use by field officers. The Truog test for lime requirement was examined critically. Soils in no need of liming could be distinguished, but the test proved untrustworthy for assessing the lime requirement of deficient soils.

A large number of pot experiments was carried out, including those into the use of minor elements and the use of compost with and without mineral fertilizers.

Testing of Limestones

Commercial limestones in New Zealand are for the most part much less finely ground than formerly. The necessity for fixing some standard of fineness has prompted a general study of the relative importance of such factors as fineness of grinding, reactivity, and purity. Some 100 commercial limestones have been tested for carbonate