Digestibility and General Pasture Production Trials.

In conjunction with the Grasslands Division several trials to determine the digestibility of pasture herbage at different stages of growth have been carried out. Trials of herbage from very short to mature hay stages have not shown any considerable variation in digestibility. The sheep used consumed over 3 lb. of dry matter per day on all the types. The digestibilities of all the main constituents were all high, ranging between 70 per cent. to 75 per cent.

A trial to determine the total yield of nutrients from pastures shut up at different times and cut at different stages of growth for silage or hay was carried out, but the analytical data is not yet complete.

A trial to determine the effect of animal droppings on pasture is in the course of study. Marked differences in terms of total dry matter have been measured, and chemical analyses of the pasture samples is under way. The trial is showing a progressive increase in yield and composition due to the effect of the animal droppings.

Phytohormones.

Chemical studies on the effect of naphthalene acetic acid on the composition of cuttings were carried out and the results submitted for publication. The hormone treatment had a considerable effect on the soluble nitrogen content of the lower ends of the cuttings.

The relationship of "accessory substances" such as auxins, vitamins, &c., to soil fertility was given some attention. Estimations of the content of auxin, of vitamin B1, and of ascorbic acid in sheep's urine were made. Pot trials, using a sand-bentonite mixture, in which urine was compared with synthetic mixtures containing the same amount of nitrogen in the form of urea, together with additions of heteroauxin, vitamin B1, and ascorbic acid in the amounts found in urine, showed that with the complete synthetic mixture the growth of rye-grass was as good as that obtained with urine. The addition of heteroauxin to straight urea solution had little effect, while the presence of vitamin B1 in the urea-heteroauxin solution produced quite a marked increase in yield. Further addition of ascorbic acid produced no visible response. Further work on this subject is contemplated.

Facial-eczema Investigations.

The work on the rest-nitrogen fraction of rye-grass mentioned in the last annual report has resulted in the isolation of several components exhibiting basic properties. These substances show all of the properties of alkaloids, but none of them correspond to any previously recorded alkaloids.

One of these alkaloids has been prepared in a pure state, and work on the production of a quantity of this alkaloid is being continued. The alkaloid is rather unique in giving coloured salts. The base exhibits marked fluorescence in various organic solvents. The chemical properties of this alkaloid have been studied closely, and a method of estimation in grass has been developed. This alkaloid has been found only in perennial rye-grass or hybrids of this and in very small quantities in timothy. The common weeds of pasture were negative, as were clovers and other grass species.

Five other alkaloids have been isolated, four of which have been crystallized. Owing to the small quantities obtained it has not been possible to attempt repeated recrystallization. One of these five alkaloids resembles closely in optical properties the above described alkaloid. The work on these is being continued.

Close collaboration is being maintained in this project between this Laboratory, the Grasslands Division, and the Animal Research Division of the Department of Agriculture.

Publications.

The following papers have been published, or are about to be published, in the *New Zealand Journal of Science and Technology* :—

"Cyanogenesis in White Clover"—
- Part 2: "Isolation of the Glucosidal Constituents," by J. Melville and B. W. Doak.
- Part 3: "A Study of Linamarase, the Enzyme which Hydrolyses Lotaustralin," by I. E. Coop.
- Part 4: "Methods of Determination and General Consideration,," by J. Melville, I. E. Coop, B. W. Doak, and I. Reifer.

"Movement and Loss of Lime from a Soil under Pasture," by B. W. Doak.

"Effect of Fineness of Grinding and Hardness of Limestone on its Efficacy as a Pasture Top-dressing": Part 1, by B. W. Doak.

"The Micro-estimation of Betaine and Choline," by I. Reifer.

"The Effect of Naphthalene Acetic Acid on the Chemical Composition of Cuttings": Parts 1 and 2 by B. W. Doak.

"Silage Studies—Part 1: The Quality of Stack Silage in the 1939-40 Season," by I. E. Coop (Plant Chemistry Laboratory), P. D. Sears, W. G. Thurston, and F. B. Sill (Grasslands Division).

ANIMAL RESEARCH.

Reports on researches relating to animal problems are included in the sections of this report referring to the work in progress at the agricultural colleges and Cawthron Institute.