Several pasture-analyses of the Wairarapa pastures have demonstrated that during the light rainfall period of late summer the phosphoric-acid content of the herbage fell to a very low level. This was associated with a rise in the lime content and a depression in the protein content, a state of affairs resulting in a deficiency disease (Waihi disease) caused by the bad balance of minerals in the diet of the stock.

The work of the Cawthron Institute dealing with Nelson soils and pastures has now enabled a complete picture to be made of the changes in pasture composition throughout the year, and the influence exerted on the composition by rainfall, manurial applications, and soil types. One of the most marked seasonal influences is that produced by periods of drought, which depress the soluble ash contents of the herbage. In March and April such depressions occur, and these are associated also with low percentages of nitrogen, potash, and phosphoric acid. Pastures, normally, are particularly rich in their content of these minerals in the spring months, subsequent to their being top-dressed. In all cases where sulphate of ammonia top-dressing was used the lime content of the herbage was reduced. The changes in the mineral composition of these pastures are now being associated with variations in stock health and thriftiness throughout the year.

PHORMIUM TENAX.

The botanical and cultural work on *Phormium tenax*, carried out mainly at the Massey Agricultural College, has suffered from the fall in the research levy on exports; nevertheless, thanks mainly to the capacity and energy of the Director, Dr. J. S. Yeates, very satisfactory progress has been made, and much more definite information now is available regarding improved varieties and the conditions under which *Phormium* may be profitably grown. It is unfortunate that this information was not available for the many flax-planting companies that have been inaugurated during the past few years, for in many cases the absence of such knowledge may have seriously jeopardized the chances of success of such ventures.

It is now probable that good varieties of leaf can be grown at an over-all cost of £2 10s. per ton, fibre content, uncut; and it is obvious that increased attention to the cutting, carting, stripping, &c., is necessary, so that the final baled-fibre costs may be sufficiently attractive to stimulate utilization and production. In this regard the following extract from a lecture by Mr. A. Wigglesworth, Chairman of the Vegetable Fibres Committee of the Imperial Institute (Jour. Royal Soc. of Arts, March, 1931) is significant: "Little or no attempt has, until recently, been made in the way of improving the plant [*i.e.*, *Phormium*] by breeding pedigree types, and no improvement has been effected in the process of scutching, with the result that the high wages now payable have raised the cost out of proportion to that of other fibres produced under more favourable conditions. But the Government is now alive to the necessity of research, so as to secure better-grade plants with a higher yield of fibre, and an improved method of preparing them, without which it is unlikely that the industry will be able to hold its own in competition with sisal."

While in England, the Secretary attended a meeting of the Vegetable Fibres Committee of the Imperial Institute, and, in addition, witnessed tests of strength of ropes made from *Phormium*, which tests were being carried out there; also trials of several decorticators under development. Arrangements have been made for field trials of one of these machines in New Zealand.

In addition to the work at Massey Agricultural College, and elsewhere, on improved strains of *Phormium*, there have been completed during the year an investigation of methods of bleaching the fibre, by Dr. J. S. Maclaurin, and tests of papermaking qualities of flax, the latter being carried out and published by the Bureau of Standards in the United States. For co-operation in the last-named investigation my Council wishes to express its gratitude.

Taking a general view of the situation, it would appear that with a continuance of effort on the part of all concerned and an intelligent application of the results there are good reasons for hope of a revival of the flax industry and for extended uses of the fibre for new manufacturing purposes.

FUEL RESEARCH.

The Fuel Research Station attached to the Dominion Laboratory has continued its work on the physical and chemical characteristics of New Zealand coals and the products of distillation at temperatures usual in low-temperature carbonization. Considerable work also has been carried out on briquetting, with a view to determining the amounts of pitch or other binder required to make good briquettes with various coals and chars of various degrees of fineness.

While in England, opportunity was taken by the Secretary to discuss the question of production of fuel oils by hydrogenation of coal, with representatives of the Fuel Research Station (Department of Scientific and Industrial Research), Dr. Bergius, representatives of I.C.I., and Standard Oil Co. He reached the definite conclusion that, given free, unfettered competition, oil from coal can compete with flow oil. Hydrogenation of certain black and brown coals for the production of petrol certainly is, technically, proved possible in both England and Germany; but the Secretary did not consider it worth while spending any money on such trials, for the next five years, at any rate, even if the industry had a tariff protection equivalent to the present duty on petrol.

Hydrogenation of crude oil to produce petrol, however, is a more practical proposition, although a plant to produce New Zealand's requirements would cost about one million pounds in New Zealand. If a plant with such an output would still involve heavy distribution costs, a better proposition would be a plant of about one-quarter the output required for the whole of New Zealand, situated at one of the main ports. A unit plant of such a size, it is understood, is not yet available; but one might well be developed; and it then might be a question of comparison with the costs—capital, running,