

have been investigated, including the following: Timber-mill ashes. New Zealand bracken-fern, flax (*Phormium*) refuse, ashes of various shrubs, peat ashes, kelp and seaweed ashes, waste-paper ash. Of these the first three would seem to be the most hopeful sources. New Zealand seaweed samples sent in proved to be somewhat disappointing in potash-content, but possibly these were not representative samples. Further details may be found in an article by the writer published in the Department's *Journal* for June, 1917 ("Potash in Agriculture, Part 3"). The effect of potash fertilizers on typical New Zealand soils requires to be more carefully studied, using potash-demanding crops and such substitutes for the Stassfurt potash salts as are to be locally procured. In view of the success which the United States of America Department of Agriculture claims for roasted alunite (a double sulphate of potassium and aluminium, which before roasting contains 11·34 per cent. of potash) it may be worth while endeavouring to locate and ascertain the extent of the deposits of this mineral, which is said to occur in New Zealand. Considering that healthy tone and resistance to disease is one of the effects conferred on all plants by appropriate potash manuring, one of the first signs of a deficiency of potash in the food-supply to plants may be the failure of the crop through disease or even insect pests.

LIME AND LIMESTONE.

A large number (197) of limes and limestones have been analysed during the year, either for the Fields Division to assist in locating the best sites for kilns or quarries, or to ascertain the quality of the lime or ground limestone on the market for sale to farmers, or for the public who send in specimens for analysis. I have before pointed out that there are many localities where farmers might obtain crude limestone rubble or coarse dust for the mere cartage and labour expended in transporting it from the quarry to the land, leaving to natural agencies the task of further disintegration and solution of the coarse particles. Such soft limestone has been located in Nuhaka, Waipawa, and Hastings, Hawke's Bay (90 per cent.); Gladstone, Wairarapa (94 per cent.); Waiau, Amuri (73 per cent.); Ward, Marlborough (70 per cent.); Murchison (76·7 per cent.); Taihape (56 per cent.—very soft); Greymouth (91·8 per cent.); Cave, South Canterbury (80·1 per cent.); Pembroke, Lake Wanaka (94·6 per cent.—very fine); Gisborne (80·6 per cent.); Cook Islands (95·1 per cent.). A series of samples from the Chatham Islands showed that there is a good supply of high-grade hard limestone available there.

The few samples collected on the market proved to contain varying quantities of carbonate of lime and to vary greatly in fineness, but the question of legislation regarding the composition of limes and limestones sold is a somewhat difficult one on which there will be great differences of opinion. It is significant that in most other countries the sale of lime is not regulated by Act of Parliament. It is very questionable whether such a low-priced product as limestone or lime is (or should be) worth legislating about, and legislative restrictions may have the effect of raising the price to the consumer.

A development in carbonate-of-lime production which is worth recording is the attempt to utilize the huge deposits of Recent shells abounding on the littoral areas of the far north (Awanui) and on the Hauraki Plains. Some of these samples show a purity of 93 per cent., and 91 per cent. of the ground shells passed through a $\frac{1}{16}$ in. mesh sieve. This product is, it is stated, now sold at £1 2s. 6d. per ton, but it is hoped to reduce the price considerably.

Nineteen calcareous rocks from the Middle Clarence River district, containing proportions of magnesian carbonate varying from less than 1 to 15 per cent., associated with calcic carbonate and silica, have been analysed for the Director of the Dominion Museum.

PHOSPHATES.

The decrease in the net amount of phosphatic fertilizers imported during the year by about 38,000 tons is a warning that should not be neglected, in view of the possibility of a much greater shortage in the coming season. The Egyptian deposits, the value of which to New Zealand was pointed out by the writer some years ago, have furnished quite a substantial proportion (8,000 tons) of the total imported phosphates, and are capable of much larger development. Mixed with superphosphate this Egyptian phosphate makes a more useful compound on some soils in the same way that basic slag may be improved by mixing with superphosphate. Further details may be found in an article on the importation of fertilizers in the *Journal* for May, 1917.

Attention should be called to the waste of phosphates in New Zealand. Modern sewage disposal is responsible for a great waste of phosphate, but a waste seemingly inseparable from our western ideas of civilization. A waste which might well be stopped at once is that attendant on the disposal of fish-refuse. This is a valuable artificial fertilizer. After the 23 per cent. of oil had been expressed a sample contained 16 per cent. phosphoric anhydride and 9·8 per cent. nitrogen, worth according to present prices about £8 10s. per ton. The bones which accumulate round every farm and station-house are a valuable manure when broken up. This is somewhat difficult if no bone-reducing machinery be available, but they may be reduced to a fine state either by fermenting in a compost heap or by burning, when they may be easily reduced to a powder.

Two explorers subsidized by a Government research grant are busy in Canterbury endeavouring to find a phosphatic limestone. A sample received from Hawke's Bay contained 73 per cent. carbonate and 0·65 per cent. phosphate of calcium. The process of making Palmer phosphate is suitable for treating low-grade siliceous phosphates uncontaminated with carbonates, and is suitable for some New Zealand phosphates, especially when cheap hydrochloric acid could be made by electrolytic processes.

Much discussion has arisen concerning the merits of the various methods of conducting the citric-acid test for available phosphate in basic fertilizers, but a recent research in Britain tends to throw discredit on the citric method altogether.

Specimens of phosphate rock as examples of what to look for have been supplied to the public as before.