

- (6) Lightness of the bones of dead animals. Although the bones are light, there are no cases where bone-lesions have been observed, such as occur in phosphate-deficient areas in cattle; neither do the bones break easily, as has been found in sheep in an osseous cachexia case (Reid and Aston, reported in *N.Z. Journal of Agriculture*, 15th November, 1910, page 422). The writer regards this absence of bone-lesions as confirmatory evidence of calcium deficiency, as Theiler was unable to produce bone-malnutrition by deficient calcium diet, only general emaciation.
- (7) Botanical composition of pastures showing moss, *Danthonia*, Yorkshire fog, and brown-top (*Agrostis*)—species that love sour soils.
- (8) Preference of sheep for limes over unlimed pasture.
- (9) The fact that the land after a forest-burn was highly productive, but after some years deteriorated rapidly, indicated that something was being leached out of the soil, assisted by the heavy rainfall of this upland locality, that had been contributed by the ashes of the bush-burn. The only element which could answer to this description was calcium. Phosphates are not leached out of the soil.

Work during the year has been largely concentrated in the field experiments. Mr. C. M. Wright, a farmer with chemical training, and an assistant, also a farmer, have been busily engaged in supervising extensive trials with various top-dressings on pasture on which sheep were used to determine the effect of the dressings in ameliorating the malnutrition. The results of the year's work have confirmed the first prediction, that calcium is the deficient element, or, to put it in Mr. Wright's words, "lime is the limiting factor" in farming these King-country volcanic loams, and it would seem that a mixture of 5 cwt. of ground limestone and 2 cwt. of superphosphate, which would supply 12 parts of calcium to 1 part of phosphorus, is likely to be a dressing which will enable the settlers to overcome their present difficulties. One may say that the farming community of the districts in which the experiments have been carried out seem to be convinced of the correctness of the conclusion that some form of calcium is necessary to bring the land back to its former productiveness.

The local officers of the Chemistry Section of the Department have had the whole-hearted support of the settlers. The two lime companies operating in the district—Wilsons' Lime Co. and the Hangatiki Lime Co.—have supplied a very large quantity of lime (50 tons each) at cost price, and the Challenge Phosphate Co., of Auckland, has donated a truck of superphosphate. The Australian companies have given or promised to give consignments of some tons of gypsum (sulphate of lime), and the Golden Bay Cement Co. and the Milburn Lime and Cement Co. have also enabled the Department to obtain gypsum from their stores.

That the rehabilitation of this fine type of country, now classed as "deteriorated," is now only a matter of time and the granting of reasonable financial facilities, is the opinion of the writer.

SUMMARY OF MAIROA EXPERIMENTS.

Area.	Treatment.	Grazing.	Pastures.	Results.
20	2 tons ground limestone, Jan., 1928	40 cull hoggets, Feb., 1928, and cattle	Originally tawa-rimu; grassed twenty years—run-out <i>Danthonia</i> and <i>Lotus major</i> ; now much healthier and clover showing	Sheep have done well.
5	4 cwt. gypsum, Oct., 1928	8 hoggets, 3 cows and calves, Nov., 1928	Improved in appearance	Sheep satisfactory; weight increased.
7	Control	10 hoggets, Nov., 1928	Sheep holding their own.
35	Field divided in two; No. 21 CaCO ₃ pellets used	38 ewes and 1 ram, Mar., 1929
10	1½ tons limestone, Jan., 1928	11 cull ewes	Ewes did well—7 lambs; also night paddock for cows.
20	5 cwt. limestone and 2 cwt. super., April, 1928	April, 1928, heavily stocked with cattle and sheep	Better soil than elsewhere; heavy fern crushed out by top-dressing in fern	No grazing records kept.
11	5 cwt. limestone and 2 cwt. super., May, 1928	11 sheep, mixed sexes ..	Originally fern-manuka and now greatly improved	Now possible rear young sheep. One strip limed only neglected by stock.
10	1 ton limestone, Jan, 1928; 2 cwt. basic super., Aug., 1928	No records kept; owner considers lime-phosphate dressing suitable	Originally fern-manuka, but grassed fifteen years; badly run out	No grazing on area where basic super. not used.
13	2 tons limestone, Mar., 1928; 2 cwt. super., spring, 1928	No records kept ..	Twelve-year-old pasture liberally phosphated without result; improved in appearance	Stock doing better after lime treatment.
<i>Waitangururu.</i>				
20	5-2 limestone-super, June, 1928	20 cows, 18 ewes, 16 lambs	Originally tawa-rimu bush, grassed eighteen years	Previous great trouble with sheep now averted; lambs ceased dying from malnutrition and now killed fat.
<i>Ngapaenga.</i>				
4 } 5 }	5-2 limestone-super, Aug., 1928	..	Seven-year-old run-out pasture; now improved	Now available to improve cull sheep.