

THIRD ANNUAL REPORT OF THE PAKIHI INVESTIGATIONS CONDUCTED AT THE  
CAWTHRON INSTITUTE.

PERIOD 1ST APRIL, 1930, TO 31ST MARCH, 1931.

During the period under review the experimental plots laid down in previous years have been continued. Several series of new plots have been laid out at Sergeant's Hill to test further points in connection with pasture-establishment on pakihi land, and several blocks of *Phormium tenax* have been planted. In addition, a commencement has been made with the testing of certain exotic trees to determine their suitability for shelter purposes on pakihi land.

PASTURE EXPERIMENTS.

The plots established three years ago are still making excellent growth in every case where top-dressing with superphosphate at the rate of 2 cwt. per acre has been given during the winter. A number of plots sown in the autumn of 1928 have been cut for hay each year, and despite the heavy drain on the plant-nutrients in the soil, by the entire removal of the hay crop, the yield of hay in the season which has just passed was at least 3 tons per acre. In those cases where a top-dressing of superphosphate has not been given a rapid decline in production of hay and in quality of the flora has taken place.

Where pasture has been established for three years a great change has taken place in the nature of the soil. Consolidation of the surface has taken place, and the soil in midsummer is comparatively dry and has lost that spongy feel which is so characteristic of untreated pakihi land.

*Use of Lime.*—In previous reports the great importance of lime in the treatment of pakihi land has been stressed. In early experiments slaked lime was used in the treatment of pakihi land, but more recently ground limestone was found to give very satisfactory results. In the past season observations have been continued on pasture plots on which different amounts of lime were used. The plots demonstrate that in the initial establishment of pasture 1 ton of ground limestone per acre is as effective as a 2-ton application. Certain plots on which only half a ton of ground limestone per acre was employed gave a very fair result, indicating the possibility of reducing the cost of initial treatment in the establishment of pasture.

*Use of Phosphates.*—All the pasture experiments continue to show the great importance of combined lime and phosphate treatment of the land in the establishment of pasture. Basic slag and superphosphate have given equally good results for sowing prior to seeding. Nauru rock phosphate, on the other hand, has given poor results during the first two years of pasture-establishment. It must be remarked, however, that during the past season the plots treated with Nauru rock phosphate have shown wonderful improvement. This is particularly marked where a dressing of 10 cwt. of Nauru per acre was used in the initial establishment of pasture.

*Seed-bed Preparation.*—In previous reports the great success which has accompanied the establishment of pasture on pakihi land which has been simply burnt over and scarified with harrows or disks has been commented on. Plots established two years ago, using this method of seed-bed preparation, still continue to give as good results as plots which were established on land ploughed, fallowed, and thoroughly worked with the disks. Although many additional plots have been laid down on similar lines, in no case has failure resulted in the establishment of pasture. It must be concluded that ploughing and fallowing of pakihi land is not necessary for the successful establishment of pasture. Further experiments which have been carried out during the past season indicate that even scarification of the surface is not essential to successful pasture-establishment. On several blocks ground limestone and superphosphate were distributed directly on the burn of pakihi vegetation. Seed was then distributed and one brush-harrowing was given. A remarkably good "take" of clovers and grasses was secured, and certain plots in the second year after establishment gave a yield of hay equal to 3 tons per acre. In other experiments, made with the object of still further simplifying procedure, superphosphate and grass-seed were distributed direct on to the unburnt pakihi vegetation, which was then run over with the back of ordinary tine harrows. A good take of grasses and clovers was thus secured amongst the pakihi vegetation. After mowing of the crop at the end of the first season an excellent cover of lotus, clover, and grass was obtained. At the end of the second season it was difficult to distinguish between plots sown in this way and those in which burning of the pakihi vegetation accompanied by scarification of the surface had taken place.

*Seed-mixture.*—Plots which have been established for two or more years show that lotus, clovers, crested dogstail, and fog are the dominant constituents in the sward. A little cocksfoot, rye and paspalum is also present, but conditions do not seem to be very favourable for rapid growth and development of these species. Subterranean clover has been tried, but in no case has a successful stand been obtained. Even on land very liberally limed and phosphated, subterranean clover, under the high rainfall conditions of the West Coast, does not seem to prosper. The experiments indicate that for the initial establishment of pasture on pakihi land too much stress should not be laid on the use of rye. No doubt, as consolidation and aeration of the soil improve, rye and cocksfoot will have more favourable conditions for growth; but in the initial stages of pasture-formation suitable amounts of lotus, white and red clovers, crested dogstail, and Yorkshire fog are required. Based on experiments over a great number of plots, the following mixture can be recommended: Perennial rye, 8 lb.; Italian rye, 6 lb.; cocksfoot, 4 lb.; brown-top, 2 lb.; crested dogstail, 2 lb.; timothy, 2 lb.; Yorkshire fog, 2 lb.; white clover, 4 lb.; red clover, 2 lb.; alsike, 1 lb.; *Lotus major*, 1½ lb.; *Lotus angustissimus*, ½ lb.: total, 35 lb. per acre.