

troublesome secondary growth defies the ordinary methods of control. Firing is not entirely effective owing to the green edge that will not burn unless the area has reverted to one entire sward of this fern. Crushing with cattle and hard grazing with sheep increases rather than decreases the amount of hard fern. Man's hands, wielding the slash-hook or grubber, are impotent against the spread. During the past three years spraying tests with arsenical compounds, mainly arsenic pentoxide (AS_2O_5), have been thoroughly tried out, and it is very gratifying to report a marked degree of success. In 1926 approximately $\frac{1}{4}$ acre was sprayed; in 1927-28 approximately 26 acres were successfully dealt with, and in 1928-29 over 100 acres have been treated. Experiments are now afoot to clean up some 200 acres in all, and to find out over a period of years the amount of spraying and cost to keep this area entirely free of hard-fern. Control of hard-fern will put quite a different complexion on the control of other secondary growths throughout the back Taranaki country at least. Crushing is absolutely essential to control bracken-fern and the menace of hard-fern induced as a result of hard crushing has been a big influence towards lighter stocking, and consequently has prolonged enormously the struggle against bracken. Hard-fern control assured will inspire more confidence in the regrassing of the country, and effective bracken-control methods may be vigorously applied.

PLANT-BREEDING.

Routine Work: Herbarium.—The old herbarium was gone through and put into order, much having to be discarded owing to the ravages of insects. Some two thousand additional specimens have been collected. Contributions have been made by Mr. H. Carse, of Auckland, and by other workers, while a number of species received for identification were incorporated. The whole have been prepared, mounted, and classified. The herbarium of introduced and indigenous species now contains some five thousand mounted sheets. By purchase from Mr. T. W. Kirk 407 sheets, mounted under glass, have also been added. A considerable amount of duplicate material is held for exchange purposes.

Contributions of exotic material, mainly selected for its bearing on New Zealand problems, have been received from the Herbarium of the Royal Botanic Gardens, Kew; the Herbarium of the Botanic Gardens, Sydney; the National Herbarium of Victoria, South Yarra; the Gray Herbarium, Harvard University; the Herbarium of the Bureau of Plant Industry, Washington; the Herbarium of the Botanic Gardens, Berlin; the Herbarium of the University of Palermo; the Herbarium of the University of Messina; the Herbarium of the University of Modena; the Herbarium of the University of Tomsk; the Herbarium of the University of Kiev. The collection of exotic specimens now numbers over two thousand sheets. Exchange parcels of specimens have been despatched.

The following localities have been visited for herbarium material and general botanic purposes: Neighbourhood of Dunedin, Central Otago, neighbourhood of Ashburton, the Wairarapa, Castle Point, New Plymouth, Mokau, Rotorua and volcanic plateau, the neighbourhood of Napier, Wairoa, Nuhaka, neighbourhood of Gisborne, Tolaga Bay, neighbourhood of Blenheim, Kainui, neighbourhood of Christchurch, Oamaru, Tapanui, Roxburgh, neighbourhood of Nelson, Mount Egmont, Mount Tongariro. Much local collection has also been done.

Some four hundred packets of seeds have been received from Europe and grown for comparison of European forms of species occurring as introduced plants in New Zealand. These mainly came by way of exchange with the Agricultural College of Voronezh.

Identification of Specimens.—Some six hundred specimens of plants have been received and reported on, with advice as to treatment where necessary. Several new records of introduced plants have resulted, some being of importance from the economic point of view.

Library.—The library has been gradually extended. Three instalments of the works given to the station by Dr. Cockayne, C.M.G., F.R.S. ("The Leonard Cockayne Collection") have been received and classified. The pamphlet section fills thirty-six boxes. Progress has been made with the indexing of these and of the plant-collections.

Investigational Work.—Special: The species of *Phalaris* occurring in New Zealand have been studied. The progress of this work awaits report on certain points submitted to Kew.

The weed "*Antholyza aethiopica*" has been shown to be a species of *Watsonia*, and its importance is under study.

The genus *Juncus* has been studied taxonomically, with full collecting, and a preliminary to economical work.

Gorse has been studied, especially in connection with its phenology, with the help of monthly reports from various officers and independent workers. Progress reports have been forwarded to the field entomologist, Cawthron Institute, to assist the work of control by *Apion* attack.

The distribution and taxonomy of *Hypericum perforatum* in New Zealand have been studied in connection with insect-control proposals, and herbarium and living material collected. Specimens of plants and seeds have been forwarded to Kew for report.

Special attention has been paid to the taxonomy of *Festuca*, *Danthonia*, and *Acaena*, both with herbarium and living material collected from various sources.

A seed-collection has been prepared to assist in identification work.

A number of miscellaneous taxonomic questions have received attention, especially with Gramineae.

Assistance has been given to other officers of the station when required.

Progress has been made in the study of the taxonomy and ecology of the introduced plants. The objective is the publication of a handbook of the introduced flora.

Collections of living plants have been made, with a view both to systematic study and the adornment of the station-grounds.