

in 1921, also, *Pinus radiata* is easily the most promising species. The exclusion of stock from the reclamation area for a brief period has had the effect of promoting remarkably abundant natural regeneration of marram-grass and sedges. During the year the sand-dune advisory committee, formed of several local residents, paid a visit of inspection to the station, and to one of these gentlemen the Service is specially indebted for seeds and cuttings provided.

ECONOMY IN AFFORESTATION.

Planting-methods.

As a result of experiments conducted in 1920 and 1921 to ascertain the relative advantages of notching and of pre-pitting, all planting in the North Island State plantations was last year done by the notching method, with excellent results. Notching has not proved so successful in the Otago plantations, but 'successful results are anticipated in North Canterbury, where soil and climatic conditions are suitable. Investigations into the necessity in certain districts for clearing scrub prior to planting show that cutting lines may prove the best system.

Direct Sowing.

Following up the experiments made at Kaingaroa Plantations in 1920 and 1921 with a grain-drill with two disc coulters, a sowing was made in the autumn of 1922 to ascertain the respective possibilities of spring and autumn sowings. The result of this sowing, which was made with *Pinus radiata*, was very poor, and may be definitely taken as indicating that satisfactory results can be secured from spring sowing only. The trees produced from the previous year's spring sowing were counted, and show 356 and 252 trees to the acre of *Pinus radiata* and *Pinus ponderosa* respectively. The plants are healthy and vigorous, and the experiments compel enthusiasm and confidence in entirely satisfactory results when the weaknesses of the present method are eliminated. In order to improve the spacing results—at present not very good—it is proposed to increase the amount of seed per acre and to design a machine with a better arrangement for regulating the discharge of the seed.

A spot-seeding experiment was made during the spring with a number of species. In each case this has been a failure, due probably to the drying-out of surface soil which was disturbed when the sowing was made. It is evident that spot-seeding will be successful only when weather conditions are especially favourable, and that it is too risky for general use.

Nursery Practice.

Experimental work was carried out in the South Island nurseries, and it was found that sowing in open drills, both single-line and spade drills, was successful. Costs were thus considerably reduced, especially in the saving of much time in the elaborate preparation of seed-beds necessary under the roller system formerly used. The various systems will be carried out again this year on a larger scale, and it is anticipated that it will ultimately be possible entirely to discard the use of scrim covering and frames, and possibly, to a very large extent, the expensive lining-out of seedlings.

Seed-collection.

During the year collection of forest-tree seed under supervision was carried out by the Service on an extended scale. Experience over a number of years with purchased seeds of eucalypts showed that it was only a chance if these were true to name, and so serious did the position become that it has been customary for many years past to collect under supervision all the species it was possible to grow in New Zealand. *Pinus radiata* seed purchased from New Zealand collectors has often proved unsatisfactory, both as regards germinative capacity and the virility of the seedlings, being often harvested from diseased or misshapen trees which are almost invariably abnormally fecund. Collection of seed from races of normal, well-shaped, healthy mother trees is essential if seeds of high viability are desired. During the past twenty-four years there has been very considerable loss in the State nurseries and plantations—not to mention the loss to settlers and farmers—through the unavoidable use of seeds of poor quality. Purchased seeds are often overheated during extraction from the cones, thus destroying their germinative power. While it will be still necessary to import several species for some years to come, seed-collecting in New Zealand by the Service is being further extended during the coming season, and a seed-extraction plant is being erected at Rotorua Nursery. It is apparent that neither State, local body, nor private planter can afford to lose one or two seasons in the successful establishment of plantations, through having to incur loss of capital and interest on the original outlay, cost of fresh plants, labour for planting, and delay in harvesting the final timber crop.

Spacing-distances.

The spacing of trees when forming a plantation has always been a controversial question, depending upon so many various factors, including primarily the object of planting. The close planting which has been in vogue in the past necessitates early thinnings, which in New Zealand, however, are prohibitively costly, except in the few districts such as in city environs where there is a ready local market for firewood. The spacing-distance has therefore, as the result of observations made in plantations during the past few years, been increased to 8 ft. commencing with the coming planting season.