

Oats.—Breeding in oats has been largely an attempt to combine disease resistance, mainly to leaf and stem rust, with the desirable agronomic features of varieties grown commercially in New Zealand. It is yet too early to predict results, but some of the advanced segregates now in F_6 show distinct promise.

Field Peas.—An attempt to improve the yield and quality of field peas appears to have met with distinct success. The main objectives have been, first, the production of an improved White Ivory type for the split-pea trade, and, secondly, a boiling-pea of better quality than Blue Prussian. The F_7 segregates now under trial show marked superiority in yield and, in some degree, in improvement in quality. These crosses are now sufficiently fixed to undergo field trials, and material is being increased with that end in view.

Potatoes.—Potato breeding has been confined to the utilization of South American species certain of which are frost-resistant and others resistant to late blight. The F_1 yield and quality of some crosses between *Solanum andigenum* and commercial varieties of *Solanum tuberosum* is very satisfactory. Great care has to be taken to prevent virus infection, but facilities are not as yet available to permit of selection for frost and disease resistance. This is a long-range project and it may be many years before any improvement is affected.

Brassicas.—Brassicas occupy a far greater area than any other crop in New Zealand and warrant special consideration in the direction of disease control. They are particularly susceptible to both insect pests and diseases, and, although resistance may be difficult and even impossible of attainment, attempts are being made with this end in view. As a result of several years' work, material improvement has been effected in the rape crop, and the demand for certified seed of improved strains is far in excess of supply. Marrow stem kale is becoming increasingly popular and steps are being taken to raise seeds of improved strains and eventually to place seed production under certification. Interspecific and intervarietal crosses between and within rape, swedes, and turnips are being studied, and certain crosses between rape and club-root resistant swedes, back-crossed on to rape, are showing promise. This method may afford a means of introducing into rape the resistance of the parent swede.

PURE-SEED PRODUCTION.

The demand by farmers and merchants for pure seed of standard varieties may be regarded as perennial. To meet this demand this Division raises nucleus lots of seed which are further multiplied by Canterbury Agricultural College or the Fields Division of the Department of Agriculture, and thereafter are distributed under certification. To this end pure-seed stocks of most varieties of cereals and peas are maintained. The farm attached to this Division consists of 52 acres worked under a strict rotation in which green manure and fallow appear every fourth season. The greater part of this area is devoted to pure-seed production, and every endeavour is made to distribute seed that is free from seed-borne diseases.

The greatest demand for pure seed is found in the case of wheat, garden peas, and rape. Wheat varieties become mixed during threshing and there is often a steady increase in the incidence of loose smut. Garden peas are grown largely for export, and a very high standard of purity has to be maintained. Not only do varieties of garden peas become mixed during threshing and harvesting, but variants appear in many varieties, necessitating roguing. The production of pure seed is an activity of this Division that is greatly appreciated by merchants.

Under the system adopted it generally takes three years to raise nucleus seed. Commencing with a number of single plant selections, the seed from each is sown in a plot. Each plot is observed carefully and those that are pure are increased individually for a second season. The seed harvested from those that remain pure for two seasons is then bulked and an acre, more or less, is sown for distribution. Any lines showing deviation from the normal are discarded. Since this is a continuous process, it happens that in many cases a line distributed is wholly the progeny of a single plant, and in this manner a high degree of uniformity is attained.

In some varieties, as, for example, Dun oats and Hunter's wheat, this method of studying single plant progenies has brought to light wide variations. In such cases the variants have to be tested for yield and quality, and four to six years may be spent in deciding which is the best before seed is liberated.

BOTANY SECTION.

(Botanist: DR. H. H. ALLAN.)

ROUTINE.

Routine work has proceeded on the lines indicated in previous reports. Numerous additions have been made to the herbarium—especially of weeds—by all members of the staff, and important accessions have been received from abroad. The usual botanical assistance has been rendered to the various Divisions of the Bureau, the Department of Agriculture, State Forest Service, and other Government Departments. Over 1,500 specimens have been received and reported on. Some twenty hitherto unrecorded weeds have been noted, but none have been of major economic importance. Samples of charlock received from Invercargill indicate the need for examination of seed samples of crucifers on a purity basis. Samples of seed for trial in the experimental area at Pisa Flats have been received from the Soil Conservation Service, United States: the Plant Introduction Officer, Canberra; and the Pasture Research Station, Pretoria. Other material is being sought. Samples of New Zealand grasses are being sent in exchange.