APPENDICES.

I. REPORT OF THE PLANT RESEARCH STATION, PALMERSTON NORTH.

THE activities of the Station have been well maintained during the year (1930-31), and a large amount of valuable work has been performed, as is indicated in the appended reports of the individual Sections.

The work has been carried out partly in co-operation with the Department of Scientific and Industrial Research.

A. H. COCKAYNE, Director.

AGRONOMY SECTION.

J. W. HADFIELD, AGRONOMIST.

1. SEED-PRODUCTION.

The raising of improved lines of seed of the various farm crops had to be carried out at the Ashburton Experimental Farm for another year, and conditions have been anything but satisfactory. The abandonment of the transfer to Lincoln, which was expected to be arranged in time to transfer work there, meant the hurried preparation of land for autumn sowing and the planting of potatoes on land unsuitable to the crop. A rather extensive programme of sowings had to be modified to meet a reduction in the amount of money available for the work. To offset this, some of the selection work in peas, linseed, and onions was transferred to Palmerston North. In addition, the season was unfavourable. The winter was unusually dry and cold. Fair rains were experienced in the spring, but these were followed by a dry summer, with a long spell of "nor'-westers" early in the new year. As a result, yields will be much lower than anticipated and the quality of the grain harvested will not be up to the usual standard.

WHEAT.

The aim of this work is to make available to growers pure and disease-free seed of high-yielding strains of the regularly-grown varieties, so that farmers can build up larger supplies for their own use and for entry into certification. Considerable progress should be made in this way towards controlling such seed-borne diseases as do not lend themselves to preventive treatment. Only varieties of recognized or of possible commercial importance are being dealt with. Breeding and production of new varieties are carried out by the Wheat Research Institute.

Two major problems are met with in this work: (*a*) The relatively large amount of natural crossing. (*b*) The distribution of spores of loose smut. Both these will be mentioned only briefly.

Last season (and also previous seasons) plants were noticed which appeared to be of crossbred origin—*e.g.*, Solid-straw Tuscan plants with Velvet Chaff, and Velvet plants with Red Chaff. Seed of these plants, when saved and planted out this season, segregated in a typical F 2 manner. An attempt was made to eliminate these plants by carefully hand-picking a few sheaves from each plot. In the case of the Red Chaff impurities success was attained, no such plants appearing this season, but Velvet ears were still to be found in the Tuscan.

With regard to the spread of loose smut, it appears that spores can be carried and cause infection from at least 21 chains distant on a south wind. This makes necessary more careful isolation of the seed area and the treatment by hot water of any seed suspected of having been produced anywhere near a smutted crop.

The method employed in this wheat-improvement work is to select a large number of single ears from various sources. These are grown in short adjacent rows, and only the best retained. The next and following seasons these remaining ears are tested in a yield trial. The poorest ones are eliminated year by year until the best remain. With each yield trial corresponding increase plots are grown, so that no seed need be retained from the trials.

The plots this season comprised: Ear to row, 435; first-year-yield trial, 42 lines; second- and third-year-yield trial, 28 lines; small-increase areas, 115 lines; large-increase areas, 28 lines.

The varieties Solid-straw Tuscan, Velvet, and Dreadnought have now been tested four seasons, and one outstanding line of each retained. These will be sown out next season on larger areas to provide seed for distribution. A high-yielding variant in Dreadnought has been isolated. This has outyielded the standard Dreadnought for three consecutive seasons, and promises to be worth testing on a larger scale. White-straw Tuscan and Pearl have been tried out for two seasons, and promising lines of each are on hand. As Solid-straw Velvet is of recent origin, no yield trials have been carried out, but a pure line of seed is being built up. A line of Hunter's is being maintained pending the results of field trials of Bell's Hunter's. Work is being carried out with Major. Great difficulty is being experienced with this variety, as it has a tendency to throw a large range of ear-types. Further selection is being carried out to obtain a fixed line of definite Major type. A pure line of Sensation is being raised for trial against other varieties on a field scale.

In addition to the above, ¼-acre plots of twelve varieties were grown to supply seed for next season's variety trials. Also 3½ acres of hot-water-treated College Tuscan were grown for Lincoln College to provide them with smut-free seed. Areas of pure line Velvet and Dreadnought were grown to provide seed for distribution.

POTATOES.

The objective here is the production of pure lines, as far as possible, free from virus disease. Virus in one form or another is responsible for the majority of poor run-out crops. Since the disease is carried over in the seed and there are no remedial measures the only hope lies in the use of virus-free seed.