

trials show that these are unequalled by any other strain from any other part of the world. In short, it would appear that our inimitable grassland climate has evolved types in relation to its inherent high-producing capabilities both in the nature of total yield, persistency, and seasonal spread of their growth. Such are the more favourable permanent grassland areas of both Islands.

Where New Zealand fails in herbage seeds suited for permanent pastures is within the arable and short-rotation areas, particularly in the South Island. Our own trials and reports from trials of New Zealand herbage seeds at the Welsh Plant Breeding Station at Aberystwyth, Wales, makes it very clear that while the permanently grassed high-production areas have evolved splendid types, yet the arable areas have produced types, particularly rye-grass, poorer than anything yet tested at Aberystwyth. This position must be righted, and thanks again to the certification system inaugurated by the Department this is becoming rapidly effected. With the strains we possess and with the organization certification provides, virtually the whole rye-grass position at least should be righted in a few years. The possibilities of this have been demonstrated very clearly during the past year in our trials of the maiden seed crops produced from certified mother seed in arable areas of the South. This seed produced, say, in South Canterbury, when sown at Palmerston North alongside the original mother seed that was produced in Hawke's Bay, makes a sward for twelve months at least indistinguishable from that produced from the mother seed itself. The same lines put out as single plants confirm the impression that the once growing of certified permanent strains in arable areas under certification leads to no marked deterioration in type.

This opens up a wonderful opportunity to New Zealand, and makes possible the exploitation of our good strains that have become localized in permanent high-production habitats. Were it possible to reproduce those strains only in the habitat where they are found to exist, then it would be years before we had more than a mere handful of pedigree seeds and the price would always be so high as to be out of the reach of the average farmer. The position as I see it is to earmark those high-production habitats as mother-seed areas and to reproduce that seed not necessarily within those areas, but in any arable area where the soil and climate are suitable for seed-production.

Elite Pedigree Strains.—Every line of seed yet tested contains many types of plants and even the best lines contain little more than 50 per cent. of what one would call super-valuable strains. For practicable purposes a mixture of strains may be preferable to pure lines, however good these may be, in much the same way as a mixture of species in the seed mixture sown is generally advisable, but just as the farmer should be able to say what proportion of species he wants in a seed mixture so in the ultimate seed mixture it should be possible for him to stipulate what amount of any one strain of any one species he requires in the seed mixture. For the immediate future, however, the isolation of separate strains and the general improvement of the existing certified lines by culling and selection is being carried out.

PERENNIAL RYEGRASS.

(a) *Certification Trials.*—Approximately 1,000 lines of these were sown in the autumn and a further 400 lines in the spring.

(b) *Single-plant Study.*—Two thousand two hundred single plants put out last year were culled by approximately 90 per cent. The remaining 10 per cent. were lifted and replanted for further observational work prior to subjecting the most promising to critical mowing and grazing trials.

Sixty-four plants were selected from our first selections now two years old and which have been under a dual mowing and intercultivation treatment for the whole of this period. These sixty-four plants were split up into fifteen-tiller clones, five of which are being kept under close grazing, five under intermediate grazing, and five under intercultivation treatment. Owing to the extremely dry spring and summer experienced and the non-retentive-moisture nature of the soil, there has been a heavy death-rate in the tillers set out. A number of the plants are growing and producing well. The advantage of the fifteen-tillered clone as against the single plant is well manifest in this trial as a check against soil variation and injury by grub or root attack.

Four thousand single plants, representing eighteen "mother" seed lines and twenty-two "first harvest" seed lines from the eighteen mother seed lines were planted out for the dual purpose (1) of determining deterioration, if any, that takes place in once-grown mother seed from a permanent pasture area in a strictly arable district, and (2) for the purpose of securing additional material for selection work towards improved lines. In the first case careful notes on the single plants confirm the general results of the broadcast plot. There is no marked deterioration occurring under the Department's system of certification and field inspection. The 4,000 single plants as a whole amply demonstrate the possibilities of greater improvement by selection.

Growth-form Experiments.—Tests under mowing with intermittent grazing have confirmed results in former years—namely, that the light-coloured, lax, few-tillered type of plant is most undesirable from either the hay or grazing point of view. For grazing conditions the ideal plant appears to be dark-coloured, dense, stiff-leaf type. This type recovers rapidly, makes a good-sized plant, and produces well at all times.

Performance of Certified Rye-grass.—As a result of strain trials during the past three years throughout New Zealand and overseas it can be confidently asserted that the type of rye-grass being certified to is giving eminent satisfaction wherever it is being grown, and stands out markedly superior to the poorer types of rye-grass that dominated the markets before strain work, followed by certification, was initiated in New Zealand. Reports from Australia and Great Britain are particularly encouraging.

Non-germination of true Perennial Rye-grass.—For the past two seasons the germination of "first harvest" seed grown in high rainfall districts, especially Southland and South Otago, has been very low. Experiments have been laid down at Palmerston North and in Southland with the following objectives:—

- (1) To determine susceptibility of rye-grass type to injury, and whether district of origin of the same type of seed when sown in Southland has any relation to degree of susceptibility. This will determine whether the trouble is a rye-grass type susceptibility rather than an acclimatization factor:
- (2) To determine susceptibility of selected strains and single plants to see whether individual plants or strains vary in themselves as to degree of susceptibility or otherwise:
- (3) To determine, by treating with hot-water treatment, whether the endophytic fungus held to be responsible is a major factor, and whether susceptibility is decreased by treatment.

In addition to seeding down with special types from different districts tillers of susceptible and non-susceptible plants growing at Palmerston North will be transferred to Gore for verification.

Elite-strain Work.—A selection put out at Flock House, Bulls, has been harvested, and the seed from this is now being field tested alongside ordinary certified lines and against once-grown British indigenous.