

Selection of Suitable Planting Species.

To ascertain the type of seed of various North American species best suited to New Zealand conditions crops have been raised from seed of *Pinus ponderosa*, *P. monticola*, *Pseudotsuga Douglasii*, *Thuja plicata*, *Tsuga heterophylla*, and *Picea Englemanni* collected from different localities in North America, varying from the western coastal slopes to the inland dry-belt areas in western Canada, and from altitudes varying from 1,100 ft. to 8,000 ft. above sea-level. Final results are naturally not yet available, as comparative studies have to be made over a complete rotation.

Growth of Pinus Sylvestris in Mycorrhiza-infected Soil.

In co-operation with the research branch of the British Forestry Commission, plants of *Pinus sylvestris* have been raised in New Zealand nurseries in soil treated with mycorrhiza, which is favourable to the growth of this pine. This was done by treating the nursery beds with soil from old Scots pine forests, with soil from mycorrhiza-carrying nurseries, with soil containing infected rootlets, and with soil containing spores of *Scleroderma vulgare*. The results to date are not yet conclusive.

Fumigation of Tree-seed.

After a two-years trial it has been found that, with the exception of formalin solution, the fumigation of tree-seed by chemicals has no appreciable harmful effect on subsequent germination, but in some cases appears to increase it. Formalin solution was found to be universally injurious to the germination of all five species which were treated. Carbon bisulphide increased the germination in four out of six species dealt with; this chemical is easy to apply and is also an effective insecticide.

Gas fumigation with a mixture of potassium permanganate and formaldehyde, and also treatments with solutions of mercuric chloride and of sulphurous acid, showed no appreciable harmful effects either on the germination or on the subsequent growth of the seedlings.

As a result of this study and of correlated studies carried out by the Forest Entomologist, all seed imported by the Service is at once subjected to fumigation with bisulphide of carbon as a matter of ordinary routine. Risk of importation of seed-feeding insects is thus entirely eliminated, without detriment to seed-viability.

6. FOREST ECONOMY.

Forest-products Investigations.

New Zealand has in her native and exotic forests three distinct types of trees, on and in connection with which extensive research has yet to be carried out if their maximum utilization is to be secured. These include the much-utilized indigenous softwoods; the little-used indigenous hardwoods; and the introduced species, which are in general not yet sufficiently mature for commercial utilization. The main activities in research are directed towards the utilization of waste material in the former type and the maximum utilization of the other types.

Although hardwoods are estimated to total 40 per cent. of the existing volume of commercial indigenous forests, they account for less than 3 per cent. of the annual forest cut. This is due not so much to faults in our own system as to two basic and external causes—firstly, the restriction of the important coniferous forests to the Northern Hemisphere, from which practically all advances in modern civilization have sprung; and, secondly, the evaluation throughout the ages of the position of softwoods solely upon the most primitive conception of wood-use, workability and durability, with resulting economy of labour.

Again, until the present century, sawing and hewing have been the most universal manner of converting the forest into usable products. During the past decade, however, revolutionary advances have been made in forest-products research, and it now appears feasible that in the future timber logs may be produced for utilization in the manufacture of, firstly, fabricated and built-up products, and, secondly, shaped and moulded products, rather than converted into the sawn and hewn material of to-day. This possible future method of wood-utilization, which may be conveniently referred to as the "disintegrating method," and, as such, considered to include all processes involving the breaking-up of wood, whether by mechanical or chemical means, into small bundles of fibres or into the individual fibres themselves, and their recombination into desired shapes and forms, is, indeed, in use to-day. For example, disintegrated wood is being produced, moulded, and made into paper, fibre containers, wall-boards, box-boards, reinforced wooden beams, sedan tops for motor-cars, milk-bottles, and innumerable other moulded and shaped products. The pulp and paper industry exemplifies the place of hardwoods in disintegrating schemes. Two years ago the thought of utilizing any other hardwood but aspen in the industry was considered impossible—and this hardwood only produced a bulky and opaque pulp suitable for book-paper. During the last year, however, the Service, in co-operation with the Madison Forest Products Laboratory, succeeded, by the development of a refined rod-mill beating treatment of the raw pulp, in manufacturing a newsprint sheet containing 85 per cent. of hardwood (tawa) pulp, the resulting sheet being superior to standard softwood paper in practically every respect. Failure to appreciate the possibilities in the processing of hardwood pulps had hitherto been the reason for their neglected use. As an illustration of the possibilities involved and the basic economic facts supporting the argument, consider sedan tops for motor-cars. Hitherto these have been constructed of many pieces of wood laboriously bent, shaped, and put together, with several coverings of cloth and artificial leather, &c., all being subject to fairly rapid wear and deterioration. Now they are being moulded from disintegrated wood, with only a fraction of the labour formerly employed, and at the same time made more serviceable.