

The major importance of this future method of wood-use lies in the increased utilization of hardwoods which will occur; in the far greater yields which will be secured from all types of forest-trees; and in the method of management of exotic stands, which will conceivably be worked to produce high increments and poor quality—that is, knotty logs—for which the psychology of sawing will be one of quantity rather than quality. The basic use for the sawn material will be not only for casing and boxing purposes, but as core stock for the mounting of clear veneers cut from the hardwood forests. Here again some of the processes have already become economic: doors of built-up softwood cores with hardwood veneer faces being in common use to-day.

To develop the species and industries involved in wood-utilization schemes it is essential that detailed information be secured. With reference to species themselves, information is needed on strengths, structures, weights, and any other physical or mechanical property appropriate to the use to which the species is to be put. In respect to an industry it is imperative, on the other hand, that accurate information be readily available on supplies of raw material needed, costs, freights, &c. To cover the lack of knowledge in the subjects mentioned above, forest-products research studies are being carried out in New Zealand.

The range of forest-products research in New Zealand can be gauged by the following typical results of work carried out during the year under review:—

A uniform classification and grading scheme has, by co-operation with other Departments and interests, been devised for local timbers, in which, with more efficient seasoning practices, lower grades and qualities of native timbers will be permissible under the building by-laws. This will serve to secure increased utilization of native timber, and by allowing a more balanced use of the product of the log will directly benefit the sawmilling industry. The utilization of the little-used species has been promoted throughout the wood-using industries, some motor-body builders now using tawa and miro for their motor-bodies, and many brewers tawa and silver beech for barrels and casks.

In the field of kiln drying, the Service co-operated with the purchaser of a modern scientifically equipped kiln in developing successful and efficient schedules for a number of different species. Air-seasoning practices have been improved throughout the Dominion, and studies commenced and model piles erected at Mamaku, Manunui, Ohakune, and Wellington. A study on the shrinkage of timber in commercial sizes was completed on five species, giving valuable data on excess required in sawing green timber of the species in order that they may season to a specified size.

Strength tests carried out on green or air-dry material of seven species of native and exotic woods, including maire, rata, mangeo, Douglas fir, Corsican and ponderosa pine, have advanced the testing programme of the Forest Service to a point where international standardized tests have been made on twenty-four species of native and exotic woods. The completion of tests on structural-sized specimens of insignis pine and rimu has allowed a commencement to be made on the preparation of grading rules and working-stresses for structural timbers. A study into the nail-holding power of local timbers was carried out on three species, and the completion of the tests will enable species to be grouped for their suitability and interchangeability in the manufacture of boxes. Strength tests were carried out on *P. ponderosa* mine-props from a fire-killed plantation at Hanmer. Routine examination of box-bindings in connection with standard specifications were continued.

Preliminary experiments and an economic survey were commenced regarding the preservation of various forms and species of timbers with water-soluble preservatives.

Considerable progress was made in the study of the pulping and papermaking properties of local timbers, the work being carried out in co-operation with the Madison Forest Products Laboratory, Madison, Wisconsin; the Great Western Paper Mills, Ladysmith, Wisconsin; and the Consolidated Water Power and Paper Co., Wisconsin Rapids, Wisconsin, U.S.A. The tests proved that a commercial grade of newsprint can be produced from insignis pine alone or from a combination of insignis pine and tawa, and of kraft papers (*i.e.*, wrappings, &c.) from rimu, insignis pine, Corsican pine, Austrian pine, and European larch. Coming from one of the foremost pulp and paper research institutes in the world, these results may be accepted as conclusive, particularly so as they include both laboratory and actual commercial pulp and paper-mill trials. The results, too, in one respect have a far-reaching significance in commercially demonstrating the wide range of papers and other products which can be manufactured from hardwood pulps suitably produced and processed and intelligently combined with varying proportions of softwood pulps.

Microscopic studies into the zoning of rimu and miro have proved that the cells of the middle zone or coloration appearing in the cross-section of logs of these species, and commonly referred to in the trade as outer heart or inner sap, contain a considerable quantity of heartwood products, the latter deposit, however, decreasing as the true sapwood is approached. Under these circumstances timber adjacent to true heartwood of the species can be expected to be more durable, and, as the presence of heartwood products denotes a corresponding absence of starches and sugars, &c., can also be expected to be more resistant to insects, as the latter live on these foods. This fact has been allowed for in the uniform grading and classification rules recently devised for local timbers, and in which a medium quality is defined to be used in place of all heart, but which requires to average only 50 per cent. of the latter in any board, provided any cross-section of the board contains at least 25 per cent. heart.

Experiments carried out in co-operation with the American Paint and Varnish Research Institute indicate that bled kauri-gum is inferior to fossil gum in the manufacture of varnishes and lacquers.

Sap-stain and moulds developing on freshly manufactured veneer were studied under commercial conditions, and recommendations made for their control.

Customs regulations, which it is hoped will be gazetted shortly, were drawn up to prevent the introduction of insects in poles, piles, and general forest-produce.