

New South Wales, and has been produced in the United States of America, chiefly as a shelter-tree. Since it does not develop strong side branches, it will probably be possible to thin heavily at a comparatively early age, and introduce some of the more valuable but tender species of eucalyptus by underplanting.

The Future.

Future progress in afforestation will be along two lines—namely, extension, or the planting of new areas; and development, or the tending of the woods already planted till they attain maturity. The policy of the State with regard to the expansion of the work must depend largely upon the increased or decreased prosperity of the people, and the growth of public interest in the subject; but in view of the growing scarcity and rising prices of timber it seems tolerably certain that any change will be in the direction of increased activity.

The principal steps in the development of the plantations are pruning, thinning, and underplanting.

Pruning.—Owing to the great danger of rot arising from the germination of fungi in open wounds, pruning will be chiefly confined to the removal of dead branches from the trees. In some species the branches drop off naturally soon after they are killed by the exclusion of light; in others they remain on the stem for many years, and, if not removed artificially, will cause knots in the timber. Some authorities recommend pruning as a means of correcting defects in the development of the trees, but owing to the expense and the danger of disease it would seem preferable to dispense with such pruning, and remove malformed trees in thinning. In the case of mixed woods, when the growth of the species is uneven it is the practice in European forests to assist the slower species by pruning side branches of the quicker that threaten to interfere with its growth; but it is questionable whether such practice can be profitably adopted in New Zealand, on account of the higher wages to workmen, and it is therefore the more important that trees of an uneven height-growth shall not be planted in mixture.

Thinning.—This is probably the most important step in the development of the woods, since it governs the quality and quantity of the timber produced. In order to obtain the greatest height-growth, trees must be grown in crowded woods; and in the struggle to keep their crowns in the light they will produce straight cylindrical stems without side branches; but when they are too much crowded the stems will be deficient in thickness. On the other hand, the greatest diameter-growth is obtained when the crowns of the trees have space to spread; but if allowed too much space the timber will be of inferior quality, with very wide annual rings; knots will be formed, because the side branches obtaining light will not be killed off; and the fertility of the soil will be lessened by the action of air-currents and direct sunlight on the surface humus. In the struggle for existence in crowded woods certain trees will prove weaker than their neighbours and will be suppressed, or possibly killed outright; others, thriving better, yet outgrown by the strongest specimens, are known as “dominated” trees; and the best and strongest are termed “dominant.” It is the forester’s object, in thinning, to remove all the dead trees, as being breeding-grounds for insects and disease, and as many of the suppressed and dominated as may be necessary to give the dominant trees the space they require for their best development. Experiment will be necessary to determine just what this space is for each species, but it would seem probable that in our plantations it would be good policy to thin as little as possible at the earlier stages of growth, because of the difficulty of utilizing the small timber to advantage, and the fact that, whilst underthinning may mean a loss of increment, overthinning must mean the production of inferior timber. Trees grown in crowded woods provide mutual protection from wind, and do not develop such strong root-systems as when grown in more exposed situations; by heavy thinnings they are therefore in special danger of being overthrown if suddenly subjected to the pressure of high winds. Hence it will be desirable, when the development of the woods demands heavy thinning, to execute the work by repeated light thinnings, allowing sufficient time between each for the trees to root themselves more firmly. This will have the further effect of preventing the marked increase in the width of the annual rings of new wood, and consequent deterioration in the quality of the timber that ensues when the crowns of trees suddenly gain a greatly increased growing-space.

Underplanting.—Some trees will only thrive when they can keep their crowns directly in the light; others can bear a certain amount of shade. The various species differ in the degree of their light-requirement or shade-endurance, and are classified accordingly by foresters. It is characteristic of light-demanding species that they develop thin crowns, which open out, so that a pure wood of such species will fail to preserve the unbroken overhead canopy that is essential to maintain the fertility of the soil. The age at which this occurs varies with the degree of light-requirement: the most exacting species fail at an early age, and the more moderate later. Therefore, when light-demanding species are planted pure it becomes necessary to provide for the protection of the soil by underplanting. The time when this work should be undertaken is determined by the development of the trees. In larch it will probably occur at about twenty years of age; and here again experiment will be needed to show how best to thin the woods to allow sufficient light for the growth of the new species without damage to the first. This point is being kept in view in the experiments, already referred to, that are now being carried out to test the suitability of the various species for underplanting.

Utilization of Small Timber.—At present the cost of timber obtained from natural forests is the cost of felling, hauling, and milling; but when the timber comes from artificially formed forests the cost of growing the trees must be added. Therefore it would seem certain, if the plantations are to show a profit, either the price of timber must be very high or else nearly all the timber grown, whether large or small, must be used. The greater quantity of timber per acre in artificial forests will reduce the cost of felling and hauling, but the profitable utilization of the small timber will be a much more important factor. No doubt, as population increases, minor industries in which small timber can be