

success of the disposal of thinnings or conversion of same into by-products, the question arises, Is it possible to slightly increase our planting-distance without defeating our primary object—viz., the production of straight, comparatively branchless boles? In the case where fuel only is required the presence of a few stout laterals is even beneficial.

Every chance of studying this phase was availed of during the tour, and examples seen have enabled me to arrive at the following conclusions:—

- (1.) That generally the faster the development of any variety of tree the greater may be the spacing-distance allocated.
- (2.) That in sheltered valleys, where humidity is more intense and usually the surface of greater fertility, there is no occasion to plant so densely as on hillsides, and the more exposed the conditions generally the greater the necessity for closer planting prevails.

Thus, in operating over partially exposed, hilly country intersected with ravines, and where perhaps surface soils and substrata differ entirely, no absolute uniformity in spacing between trees should be recognized. For instance, *Pinus radiata*, one of the fastest-growing pines, need not in my opinion be planted any closer even on the exposed sites than 6 ft. apart, whilst in a position where the humidity and other congenial conditions cause unusually strong vertical development it would be perfectly safe to plant 7 ft. or even 8 ft. apart. *Pinus Laricio*, however, a much slower grower than the previous species, requires greater density of planting, and in this case on the more elevated situations the present distance, 4 ft. apart, meets requirements; but with the gradual descent to the lower and more sheltered positions the spacing-distance might reasonably be increased until the maximum 5 ft. 6 in. (in exceptional situations) spacing is reached.

On level or light undulating country of medium altitude, where rainfall and warmth are conducive to rapid tree-growth, I see no reason why the Corsican pine cannot be most successfully grown at 4 ft. 6 in. apart. This trivial increase of distance of 6 in. between the trees lessens the number required to plant an acre by 571 trees, or in reality reduces the initial expenditure by approximately £1 15s. per acre. In Otago Central, however, where extremes of temperature are experienced and rainfall somewhat scanty, trees have a tendency to produce protective laterals at the expense of their "leaders," and thus the increasing of spacing-distance in that locality would inevitably result in accelerating the present trouble, and, of course, cannot be recommended.

Closely associated with this subject is that of thinning, referred to on page 42, but the elimination of probable waste in raising and planting of trees only is aimed at in the remarks written under this heading. The following table shows the greatly decreasing number of trees required to plant an acre of ground by gradually increasing the spacing-distance:—

*Trees required to plant an Acre.*

Distance apart.		Number per Acre.	Remarks.
Ft.	Ft.		
4	by 4	2,722	Present uniform planting-distance of larch and pines (excepting <i>Pinus radiata</i> ).
4½	by 4½	2,151	Spacing-distance recommended in most localities.
5	by 5	1,742	Spacing-distance recommended in very humid situations.
6	by 6	1,201	Spacing-distance for <i>Pinus radiata</i> on exposed sites.
7	by 7	889	Spacing-distance for <i>Pinus radiata</i> in sheltered positions.
8	by 8	680	Spacing-distance for <i>Pinus radiata</i> in very humid situations.

Dr. Nisbet, in referring to one plantation inspected, remarked, "From the overcrowding appearance it represents, the deduction may safely be drawn that 4 ft. by 4 ft. is unnecessarily close planting for Douglas fir, and that from 5 ft. by 5 ft. up to even 6 ft. by 6 ft. is quite close enough, unless an exceptionally good market for small poles be likely to make early thinnings profitable."

#### TREE-PLANTING METHODS.

Several demonstrations of pitting and tree-planting were witnessed, and, in addition to the ordinary spade pitting, a specially constructed half-circular spade was seen in operation in Scotland, and received favourable comments from the delegates present. A man is able to prepare about 600 circular holes (9 in. in diameter and 9 in. deep) per day, and is usually followed by another workman, who places the tree in the prepared hole and, using a large trowel, completes the planting operation simultaneously with the preparation of another pit. Narrow spades are also used most successfully, particularly where ground of an argillaceous nature is met with. Grubber pitting is resorted to on stony surfaces, but preference is given to the previously mentioned methods. In Canada a very serviceable wooden-handled dibbler, with foot-press attachment, was seen in operation, and this tool is a decided improvement on the heavy pipe arrow-pointed spear at times used for notching on New Zealand plantations. The combined operation (pitting and planting) in the British Isles can be estimated at from 10s. to 14s. per thousand on easily worked areas. This figure is, however, proportionately increased as the surface becomes more difficult to operate upon. Tree-planting after the land has been cultivated is very popular in certain parts of America, but this idea is not worthy of extension in New Zealand. On comparing New Zealand general methods with those seen elsewhere I am satisfied we are adopting quite up-to-date measures.