A SYSTEM FOR THE PRODUCTION OF PULP-WOOD AND SAWLOGS FROM PINUS RADIATA FORESTS*

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SUMMARY

The system prescribes a twenty year cutting cycle for pulpwood with 25 trees per acre left each cycle to provide 40 year old sawlogs. The aim is to produce both pulpwood and sawtimber from the one area and to maintain a sufficiently dense canopy to control the ground vegetation.

The *Pinus radiata* forests of the Tokoroa district are destined to supply both pulpwood and sawlogs to the industries that have been established there. The silviculture of these forests presents a number of problems, the most important being a silvicultural system which will supply the industries with the type of raw material best suited to their requirements, and which is workable with the type of labour and limited skilled staff likely to be available. The silvicultural system must be economical to operate and, most important of all, must work with and not against nature.

A study covering the growth of these forests over the last thirty years shows that a rapid decrease in the number of green trees per acre and a fall in basal area per acre, took place between the ages of 20 and 25 years. This mortality caused openings in the forest canopy which allowed an increased amount of light and warmth to reach the forest floor. This was sufficient to enable native shrubs and ferns to establish themselves and to eventually become the major obstacle to the regeneration of the forests after they had been harvested. This undergrowth can only be controlled by keeping the forest canopy dense enough to keep the entry of light and warmth to the forest floor to a level below which they can thrive. If the stands are left unthinned mortality opens the canopy beyond the critical point. Similarly, if orthodox thinnings are carried out the invasion of the forest floor by these shrubs and ferns is encouraged, the presence of which will cause trouble when eventually regeneration is required. There is no way of preventing this growth under stands of over 20 years except to fight the natural trends that are taking place so that a basic 20 year cutting cycle is necessary to control the undergrowth.

The cutting of the stands at age twenty will give the greatest return in quantity of usable material but the majority of the material obtained would be suitable only for pulping and not for sawing. It is therefore

necessary to modify the cutting plan to provide for the production of sawlogs.

A system to provide pulpwood on a 20 year rotation and sawlogs on a 40 year rotation, both to be produced from the same area at the same time is prescribed to fulfil the above requirements. The scheme is to fell a stand at age 20 years and to leave twenty-five marked trees per acre standing. The next crop is then regenerated in the cutover and around the standing trees. Twenty years later, when the marked trees are 40 years old and the regenerated trees 20 years, the area is again cut over and all the 40 year old trees plus all except 25 of the 20 year old trees are harvested to give sawlogs and pulpwood respectively. This procedure is then repeated every twenty years. In this way the stands are cut before heavy mortality opens up the canopy, and both sawlogs and pulpwood are harvested from the area at the same time. In this way the canopy is kept sufficiently dense to prevent the growth of weed species under the stand before felling takes place so that no well developed root stocks of these species are present to coppice later. The regeneration which comes up profusely after felling has only seedlings of these shrubs and annual weeds to compete with it and has a much better chance of becoming successfully established over the areas.

A study of sample plot data shows that at age 20 the stands contain 313 trees per acre with an average diameter at breast height of 12.2 inches and an average height of all trees of 91 feet. Using the N.Z. Forest Service 1953 Volume Table for *P. radiata* and allowing no deductions for malformation this gives a volume of 7,250 cubic feet inside bark to a 6 inch top and 7,800 cubic feet to a 4 inch top. Allowing the twenty-five trees as being above average in size their volume would be 750 and 800 cubic feet respectively, leaving 6,500 cubic feet and 7,000 cubic feet per acre of available pulpwood in each case.

The marked trees each with full growing space would increase rapidly in diameter and from their average of 14 inches D.B.H. at age 20 would average 30 inches D.B.H. at age 40. They would contain about 200 cubic feet per tree and it could be expected that at least 20 trees would survive to that age. Observations indicate that the crowns of these trees would not greatly increase in diameter but that the denseness of their crowns would increase tremendously.

In many places young trees can be seen growing around larger trees without any apparent detrimental effect to either. It seems safe, therefore, to assume that there will be little or no reduction in the quantity of pulpwood obtained from the regenerated crop at age twenty, so from the second cutting when both age classes would be available 6,500 cubic feet of pulpwood plus 4,000 cubic feet of sawlogs would be available each twenty year period, giving a mean annual return of 525 cubic feet per acre.

There are six main points in favour of this system:
(1) It is comparatively simple and less skill is required than in orthodox thinning operations as there would be at least 43 feet between marked trees giving ample working room.
(2) A single utilization felling is all that is necessary to obtain this yield whereas three would be necessary under an orthodox system.
(3) The logging operations are more confined and would use only half the length of roads necessary each year for an orthodox system.
(4) This would give a satisfactory control of weeds in the area and regeneration would have every opportunity to establish itself whereas orthodox systems would encourage a prolific weed population.
(5) With only twenty-five trees per acre required for timber, pruning could be restricted to about thirty trees per acre.
(6) Stand improvement work such as grafting or the planting of special stock would only need to be at a rate of about thirty trees per acre allowing much wider use to be made of the limited amount of material that is likely to be available.

The disadvantages are:
(1) A large quantity of small size material has to be handled.
(2) Large and small logs would need to be handled in the same operation.
(3) Orthodox thinning would give a greater percentage of clear timber.

It is not claimed that this system will give any greater yield than would an orthodox thinning system but that it will give the maximum yield at the least cost. The production of a large percentage of pulpwood is an essential feature of the plan and it keeps the forest in a condition suited to the change over to any other system should that in the future be desirable.