MANAGEMENT OF RADIATA PINE FOR PROFITABLE EARLY THINNING

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SYNOPSIS

A brief description of current tending schedules for radiata pine is given together with the reasons for following what are claimed to be conservative practices. The use of wider initial espacements together with four-year old green pruning is put forward as an alternative to denser planting, delayed pruning and thinning to waste. The more efficient use of manpower together with the expectation of early profits from an expanding market are given as reasons for employing more intensive cultural practices.

INTRODUCTION

Normally accepted management practice for growing radiata pine in New Zealand has aimed at high initial stockings in excess of 1,000 trees per acre and low pruning of dead or moribund branches on selected trees, followed by a thinning to waste of the remainder of the crop. The over-riding object of management is the production of a sawlog crop of optimum form containing as small a knotty core as the foregoing schedule will permit. Although attempts have been made to improve techniques (Cruttwell, 1960, et alia) the capitalised cost of the final crop has apparently not been a limiting factor and it is hoped that overall rising stumpages together with improved log quality will more than offset the expenditure. Justification for such conservative practice is based on:

1. The frequency of heavy branching and early malformation in young growing stock, necessitating the establishment of an 80 percent “safety stocking” over and above the number expected to be profitably utilised.
2. A reluctance to remove by pruning more than one third of the green crown at an early age; due to the possibility of death through mechanical damage (Brown, 1961), and reduction of vigour of selected pruned trees compared with unpruned neighbours.
3. The apparent waste of manpower and money when 100 percent pruning is practised (Perham, 1960).
4. Whip damage to soft growing leaders through reliance on saws for early pruning.
5. Scarcity of markets for other than large sawlogs, and acceptance of the premise that the marketing picture will not alter.
Changes in past attitudes may well be forced on us by the necessity to improve the economics of silvicultural practice (Anon., 1961) if we wish to continue to obtain funds for treatments whose main return will not be apparent for many years; by a developing shortage of wood material, and consequent pressure for reduction in rotation lengths; by lack of trained marking and supervisory staff, together with the need to improve job conditions for a restricted and more discerning labour force. It is the intention of this paper to indicate that it is physically possible to employ more radical schedules in the expectation of greatly improved economics, as a result of markets for wood products other than high grade sawlogs either developing or being created by enterprise. If foresters wish to continue to practise tending schedules, requiring an outlay in excess of £50 per acre by age 12 years, it is probable that pressure will be brought to bear by the providers of such finance for both improved techniques and some attempt at growing produce in a form suitable for early sales.

CULTURAL CHARACTERISTICS

Radiata Pine as a Cultivated Crop. Although exceptionally rapid growth makes radiata pine an economically attractive species it should be appreciated that compared with many other species being grown in New Zealand it has peculiarly difficult cultural characteristics when being handled as a productive crop. Among them are:

1. The excessive variability in growth rates within an average New Zealand crop, which results in a large range of heights, crown development and general vigour.

2. A tendency in many parts of New Zealand, especially those where there is a late summer/autumn flush, for the species to suffer from the effects of retarded growth of the leader and the subsequent development of heavy laterals.

3. The development, on uninodal trees, of heavy whorls, resulting in weakened and malformed stems with sudden reductions in stem diameter.

4. The very characteristic of rapid growth reducing to a few months the length of the optimum period during which any particular cultural operation can be implemented (Fenton, 1961).

These characteristics, and particularly the last, make it imperative that pruning and thinning be carried out at the correct time; otherwise increased growing-costs and decreased productive yields will result. Wider initial spacings followed by the early removal of green branches and the mechanical correction of incipient multiple leaders and other malformations are possible means of overcoming some of these inherent growth disadvantages.
Initial Stocking. Variations from 1,210 to 500 trees per acre for
initial planting are currently practised in New Zealand and the future
sacrifice of up to 80 percent of this original growing stock is accepted
as permissible in order to keep branch size to a minimum and to
induce optimum tree form. Canopy closure commences in about the
fifth or sixth year in stands carrying more than 900 per acre, after
which time there is a steady loss of numbers through competition.
The value of close early espacement lies more in the reduced branch
size and greater selection rather than improved form, and if we
accept the fact that something less than 900 trees is sufficient from
which to select a usable crop of 150, alternative techniques to over­
come the development of heavy lower branches should allow wider
spacing. Provided that close attention is given to blanking up gaps
and that early green pruning together with the correction of malfor­
mations is practised, there appears to be no reason why initial
stocking of 770 trees per acre or less cannot be used, with a conse­
quently reduction in tree stock, planting- and release-cutting costs.

Between 500–700 live stems per acre can be carried through to
age 8 on suitable radiata sites in New Zealand, at which time many
are large enough to produce some items of saleable produce (Blithe,
1959) provided that they have had room for growth and have
received early pruning attention.

Green Pruning. When considering the effect on the tree of remov­
ing a percentage of the green crown we should not forget, in the
case of radiata, that by age 4 this species is already putting on 5
feet of height growth per annum. Thus, although pruning to 7 ft at
the beginning of the fifth growing season may be equivalent to remov­
ing two-thirds of the crown height, this factor is reduced to one half
before the end of the growing season. If suitable tools are available
for carrying out green pruning without causing death to the tree
or serious increment loss, the result is the prevention of the develop­
ment of large green branches, an effect previously induced by closer
spacing.

Field application has already indicated that providing secateurs
are employed and not saws, which tend to whip leaders and tear
cambium, and that the operation is not conducted in the most rapid
growing season (from December to February) the removal of up
to two-thirds of the green crown on all stems can be practised. Few
deaths occur; height increment is not reduced to any marked extent;
occlusion is rapid on all branch-wounds, and epicormic needles and
branches develop only on the trees from which more than two-thirds
of the crown has been removed. Although diameter increment may
be depressed it is considered that this is not a disadvantage and
actually improves form, while any loss in volume increment at this
stage must be small in comparison with the loss of stand increment as a result of thinning (Brown, 1961).

It is axiomatic that early green pruning must be applied to 100 percent of the crop to avoid the probability of unpruned stems gaining in vigour over their neighbours as a result of the pruning shock. The reduction in total number of trees planted, the elimination of the necessity to select for pruning, and the reduced cost of pruning younger branches all minimise the difference in cost between selective and 100 percent pruning; and on some sites total capitalised expenditure is less with the latter technique. However the most important advantage so far resulting from the application of early secateur pruning has been the ready acceptance and approval by forest labour of the use of secateurs, providing they are light enough. The difficulty of using a single implement where branch size is variable (particularly in regenerated stands) has been overcome by the provision of alternative tools, for use on a small percentage of the trees as required. It is considered that due to labour preference, together with the fact that neither the men nor trained staff need spend time on selecting at this stage, 100 percent pruning is justified even without the added advantage of its acceptance on economic grounds. In addition, any possible postponement of the age at which tree selection is done, must be advantageous: from both the viewpoint of improved access and visibility and the progressive stratification of the stand.

EARLY PRODUCTIVE THINNING

It is reasonable to state that by far the most important operation facing foresters handling fast-growing crops on an even-aged basis is the correct timing of early thinnings. All the planning of original spacing and later pruning depend for their success on the completion of this operation and any procedure which may ease the inherent difficulties is worth investigating. These difficulties are mainly the provision of money to eliminate trees established at some cost a few years before – a procedure acceptable to form-conscious foresters, but not always to accountants; and the availability of suitable willing labour to complete the operation. If a thinning to waste can be converted to a harvesting of saleable produce both the accountants and the labour are far more tractable.

It is conceded that for any such thinning to be productive a market must be available, and this has not always been the case in New Zealand. However provided that the cost of preparing the crop for a potential sale is not too high when compared with alternatives it would appear that the future marketing outlook is such that forest owners would be well advised to accept the risk and take the optimistic view that sales will be available. To be faced with a sellers
market and not to be in a position to satisfy it due to lack of early tending could be the alternative. The rapidity with which early pruning scars occlude and stem irregularities become outgrown between the fifth to eighth years, before severe competition develops within the stand, is not generally realised.

Markets exist to varying degrees in different parts of the country for the following products which would be yielded from early thinnings:

- **Roundwood** — posts, mineprops, strainers, piles and poles.
- **Pulpwood** — groundwood and chemical.
- **Sawlogs** — studlength logs, battens and posts.

In addition, the future wood supply position appears to indicate that pressure will be brought to bear on forest owners to produce additional products from small sized material if it is of reasonable quality. Admittedly, too much reliance should not be placed on markets such as that provided in past years by the large fencing programme, especially with an unstable farming outlook. However foresters have for too long accepted the fact that utilisation plants are doing them a favour by taking their thinning produce, while the same plants are losing sales to alternatives by either artificial price-pegging or over-capitalised plant costs; thus restricting the amount of material being utilised. Those forest owners who are able to control the retailing of their products should be able to ensure that their early thinnings have a market by reducing the ultimate sale price to compete favourably with alternatives (and here the fencing-material market is a fertile field) and also to ensure that preference is given to the utilisation of the produce from those stands most likely to benefit from timely thinning, if there is any likelihood of the markets being unable to absorb all the produce offering.

It should also be accepted that any early thinning should be aimed primarily at reducing the growing stock as economically as possible, to allow better stems to develop, and not aimed at producing the maximum amount of produce per acre. Thus ideally the lower the volume produced per acre, within the economic requirements of a thinning operation, the more likelihood that the total thinning programme will be achieved if there is a limited market. In practice therefore, it would be preferable to aim at the cutting of only one post or other saleable unit per thinned tree and allow the remainder of the stem to rot on the forest floor. Early pruning to 7 ft takes this fact into account. Admittedly this outlook is dependent on the forest owner ultimately being the recipient of increased stumpages or improved product quality as a result of the thinning, rather than merely managing for maximum wood yield at basic stumpages which are unaltered by log size or quality.
COMPARATIVE ECONOMICS

The capitalised costs of pursuing the schedule quoted above as being the normal current New Zealand practice are approximately as follows:

Initial costs of establishing 1,100 trees per acre inclusive of tree stocks, planting and release-cutting £18 per acre

Age 6: Selective low pruning of 200-350 stems £6 per acre

Age 8: Poison thinning to waste £4 per acre

Total Cost £28 per acre

This, then, is the figure which must be improved on or at least approached if any alternatives are to be considered.

The capitalised costs of the proposed schedule which is aimed at early profitable thinnings have, in practice, been approximately as follows:

Initial costs of establishing 770 trees per acre, inclusive of tree stocks, planting and release-cutting £13 per acre

Age 4: Low pruning to 7 ft of all trees in excess of eight feet tall, and elimination of remainder £12 per acre

Age 8: If no markets for produce – poison thinning to waste £4 per acre

Total Cost £29 per acre

When it is realised that the crop is being held in a condition suitable for fulfilling any possible market for roundwood with the best possible material, without the expenditure of any significant increase in cash, such a departure from normal practice becomes attractive.

Extension of such economic arguments can be made to cover higher pruning of all those stems which may be carried through to an age where they are large enough to produce studlength logs, pruned bolts for pulpwood and veneer production, and other possible produce. However, sufficient evidence is available to indicate that the possible slight loss of increment due to severe early pruning and the possibility of some pruned stems being felled to waste if markets do not develop are outweighed by the many advantages accruing from the proposed management schedule. To the traditional arguments in favour of 100 percent low pruning – such as ease of access,
improved visibility for marking, and fire protection – we can now add:
(a) reduction of initial establishment costs;
(b) worker-approval of pruning tools;
(c) the opportunity to delay selection of stems for high pruning;
(d) the advantage of always being in the position to satisfy any market developments with well-tended stems;
(e) the possibility of turning the necessity to seek finance for thinning-to-waste-operations into a considerable early profit.

Finally it is considered that with the current and developing wood supply position in New Zealand and the probable continued demand for early thinnings, everything is to be gained by altering existing schedules; at the same time preparing for the shorter rotations which are likely to be forced upon us.

### TABLE: SUGGESTED ESTABLISHMENT AND TENDING SCHEDULES FOR RADIATA PINE TO PRODUCE PROFITABLE EARLY THINNING

<table>
<thead>
<tr>
<th>Age</th>
<th>New Plantings</th>
<th>Regeneration</th>
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<tbody>
<tr>
<td>Initial Establishment</td>
<td>Plant 700-800 acre Supplementary planting or seeding to ensure ample stocking.</td>
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<tr>
<td>2-3 years</td>
<td>-</td>
<td>Treatment to reduce stocking to 500-700 per acre.</td>
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<tr>
<td>4 years</td>
<td>Elimination of any trees less than 8 ft high; prune all remaining trees to a minimum of 7 ft but leave at least two whorls on smaller specimens.</td>
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<tr>
<td>5-8 years</td>
<td>Extension of pruning to 10, 12 and 20 ft to prepare trees to be thinned for probable markets, and final crop trees for later pruning.</td>
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<tr>
<td>8-12 years</td>
<td>Thin as market and tree development allows for roundwood, pulpwood and sawlogs. If no markets develop, thin to waste, reducing stocking to no more than 200 per acre by age 12.</td>
<td></td>
</tr>
</tbody>
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### REFERENCES


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