

## SMALLWOOD HARVESTING : WHAT FUTURE?

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### Introduction

I have been asked to speak on the future smallwood scene from the resource side. For this purpose smallwood has been defined as wood unsuitable for saw timber or veneer, i.e., early commercial thinnings, clearfellings of slow growing species, and small logs recovered in clearfelling predominantly sawlog sized crops. In view of the tight wood supply we now face the timing of the seminar on this subject is very appropriate. Since the Second World War we have been steadily increasing our production of roundwood mainly by expanding the use of softwood forests planted in the late 1920s and early 1930s. The build up in exotic roundwood production has been rapid as the following table shows:

<u>Exotic Roundwood Production</u>	
(000 000 m <sup>3</sup> annual average)	
1950-54	1.3
1955-59	2.0
1960-64	3.4
1965-69	5.0
1970-74	7.2
1975-79	8.1

Up until the early 1970s a growth in production has exceeded 5 percent per annum average and as you may be aware from media coverage this week forest products exports are at a record level of earnings of close to \$400 million.

The potential for exotic roundwood production has been calculated as:

<u>Exotic Roundwood Production Potential</u>	
(based on then current management intentions - 1977 National Forestry Planning Model)	
(000 000 m <sup>3</sup> annual average)	
1981-85	8.9
1986-90	9.2
1991-95	12.4
1996-2000	17.5

Putting these two tables together it will be obvious that we appear to have, nationally, reached a temporary plateau in our ability to produce. The 1950s and 1960s was a period of rapid expansion of forest industries based on the maturing pre-war plantations. As a country we had to learn how to use exotic timbers in place of the traditional native woods; we had to introduce new technologies for more sophisticated pulp, paper and panel products and we had to develop export outlets as well as changing our own pattern of wood use. While these developments were going on we were not using our exotic forests to their full growth potential. The speed of expansion was not therefore governed by the forest resources but by ability to develop new markets and build the associated plants. In the 1970s we began for the first time to run up against the limitations of the forest area. The absence of any major planting effort from the mid 1930s until the early 1960s began to be felt. Now we must wait a few years until the greatly expanded plantings of the 1960s and 1970s, which doubled the forest area, allow us to once more assume rapid growth in forest production and forest industries. We are faced with the dilemma of wanting to develop new export markets in anticipation of the large resource that lies ahead but having limited room to do so as a result of the tight supply situation. The only way that supplies can be increased is by greater production of smallwood. Hence the appropriateness of the topic. In summary the factor that will influence a greater use of smallwood in the 1980s is simply that there is no-where else to turn for significant increases in production.

#### Some Limitations on Smallwood Production to Date

Why has the extraction of smallwood assumed greater importance than in the past? The answer to this question is complex but there have been four main factors:

- the forest resource, as already stated, has not until recently been used to its full potential.
- smallwood is the most expensive component of the crop to produce taking into account direct costs and, in some circumstances, "hidden" cost,
- the risk from wind and disease of holding large areas of untended forest has placed the emphasis on clearfelling the "old crop",
- with the exception of the post market many regions have had no demand for smallwood, i.e., pulpmill, panelboard or chip export outlets have not been developed until recently.

The first three are obviously linked - while there has been cheap large wood available and a strong desire to remove it, the incentive to use more expensive smallwood has been lacking, unless the small size was specifically needed - as for example for posts and stone groundwood. Despite this significant areas have been production thinned.

### Some Problems in Obtaining Smallwood From Thinnings

Historically the situation in thinning has been roughly as follows. Prior to World War II plantation timber was in little demand and although the urgency of thinning the earliest plantations was much discussed from the end of World War I, the absence of markets was a disincentive to do anything. Between 1928 and 1937 large areas of State forest were thinned to waste by relief labour but the massive plantings of the 1926/36 period missed out on this treatment because of the war.

From the early 1950s the establishment of pulp and paper industries in the Central North Island, and the boom in farming and related demand for fencing, coupled with advances in preservation technology created conditions for exotic smallwood use. Smallwood in radiata pine was obtained mainly as arising from clearfelling or thinning mature stands of sawlog size. In Corsican and ponderosa pines in State forests it was obtained from thinnings of dense 30-50 year old stands.

It was envisaged through the 1950s and early 1960s that the post war stands of radiata pine would have two or more extraction thinnings as well as an early thinning to waste to bring them down to final crop stocking. It was thus predicted that quite a high proportion of their production would be in smallwood and that this would become a much more important component of future wood supplies. It was not however until the 1960s that post-war stands were extensive enough to commence extraction thinning as a general practice and soon after it commenced the desirability of such thinning was called into question. Operationally the main problems were the fact that thinning was commonly the first operation to be suspended in any downturn in demand and scheduled programmes thus fell behind. As well there were difficulties in obtaining a final crop of pruned stems and of controlling a tendency to "over thinning". All of these difficulties were likely to reduce the value of the final crop.

The economics were studied in the late 1960s. It was reasoned that while production thinning was designed to increase yields, to obtain intermediate returns and to allow greater final crop selection, increased yields were unlikely, intermediate produce was of relatively low value and obtained at the expense of the final crop either by direct damage or by the need for longer rotations, and selection should be concerned with the first two logs and could be done as soon as these were formed, i.e., at about 12 metres height. The upshot of this reasoning was advocacy of an approach to radiata pine silviculture that avoided extraction thinning and deleted smallwood production entirely by pruning and early thinning to waste. In the 1970s this approach was widely adopted by the State and some private organisations - a situation which would have to be revised if large quantities of smallwood were to be available. This in turn means considering the reservations that lead to avoiding extraction thinning and considering how valid they are in the changed supply situation.

There will doubtless be detailed discussion of costs later in the seminar. It is generally appreciated that smallwood is dear wood. Unpublished work by Terlesk documents how daily production rises rapidly with piece size in thinning radiata pine (by ground extraction in long lengths). For each 1/10th metre increase in piece size the increase in production was estimated to be 10 cubic metres per day. Cost per cubic metre declined rapidly as piece size increased until it reached a little over 0.20 cubic metres, and then declined more gently. Costs of thinning radiata pine up to 14 years old have been calculated by NZ Forest Products as three and a half to six times that of clearfelling 48 year old stands. The high cost of smallwood production may be lessened to some extent by carefully matching the equipment and labour to the physical conditions and the mean piece size but as Terlesk states "In very small piece sizes there is an irreducible amount of capital and labour input required to harvest the produce and this is shown in the high cost of production trend...". Not only is smallwood more expensive to produce but it is intrinsically of lower value than larger wood except in the case of posts. Pulpwood stumpages in State forest are currently in the range \$1 to \$5.50 per cubic metre, domestic sawlog stumpages \$5 to \$20 per cubic metre and export sawlog stumpages up to \$52 per cubic metre. An early thinning of radiata pine for pulpwood may therefore yield less than \$100 per hectare in stumpage compared with a clearfelling value at age 25 of several thousand dollars per hectare for the same stand based on current domestic prices (i.e. without allowing for improved quality).

The aim in intensively tended State and private plantations is commonly to obtain a final crop of well formed trees with pruned butt logs capable of yielding a high proportion of clear sawn timber. It is desirable to obtain large size in the final crop trees as rapidly as possible and this may be done by thinning to the final crop stocking immediately the pruning of the butt log is completed at about age 10 to 12. If such thinnings were utilised by non damaging methods such as short pulp billet production either with the skidding of bundles or the use of chutes, the effect on the final crop would be little different from a thinning to waste. There could be no argument against recovering what would otherwise be wasted in these circumstances, provided the very high cost of the wood produce could be met by the user. However the piece size at the time of high pruning is very small and for reasons discussed above a delay of a couple of years or more after high pruning has generally been considered necessary both to increase the extractable volume and the average piece size. To increase the volume even further some of the earlier thinnings to waste may be foregone. The effect of thinning delay and of higher stockings is to reduce the diameter growth of final crop trees and therefore necessitate a somewhat longer rotation to achieve the same size. These conditions also place pruned trees at risk from competition with unpruned trees. If the delay is only about 2 - 3 years so that shortwood pulp systems can still be used, these are the only "hidden" costs of thinnings. If the delay is longer and tree length extraction is practised damage to butt logs can further reduce the value of a pruned final crop particularly for peelers.

We therefore have a conflict - the earlier extraction thinning can be done particularly in an intensively tended stand the better from the viewpoint of value in the final crop but the later it can be left the cheaper the wood produced in thinning. Deciding where the compromise, if any, lies is a complicated business requiring precise information on growth etc. much of which is just coming to hand. The analysis must be done within the context of a whole forest. Such information is being assembled by the Radiata Pine Task Force to try and provide conclusive evidence of the relative advantages of different approaches to radiata pine silviculture.

The decision has already been made, for example by NZ Forest Products, that the smallwood available from thinnings is worth the costs, direct and indirect, of obtaining it. The likely reasons for this will be discussed later.

### Early Clearfelling

The cost of producing smallwood could be significantly reduced by clearfelling young stands (say 15 to 20 years in radiata pine) rather than thinning them. One company in Northland is planting radiata pine with a 15 year rotation in mind - for pulpwood, and the Fiji Pine Commission, using Caribbean pine has had a similar aim. This option would obviously be one way of advancing the use of New Zealand's plantings of the 1960s into the 1980s, rather than the following decade - a possibility suggested in the recent DFC report. It is not an option that appeals to most New Zealand foresters because it would remove tended stands at or before the height of their growth and thus sacrifice volume production, and it would forego the valuable sawlog crop available a few years later for the sake of relatively low value pulpwood. It has not been the policy of the State to grow forest on short rotations solely for pulpwood and this will generally continue to be the case. It would have to be demonstrated that the economic benefits to the nation of early clearfelling outweighed those of conventional rotations in a particular case if this policy were to be reversed. There is little indication that most private companies prefer this option to the alternative of obtaining smallwood from thinnings and better recovery of clearfellings.

### Better Cutover Clean-up

There are no silvicultural complications in increasing the volume of smallwood obtained from clearfellings by better clean-up of cutover and landing although the best methods may require some consideration. The only requirement is that the high marginal cost of hauling and loading smaller pieces is matched by their value. Where the user is also the forest owner the incentive to look to this additional source is strong particularly in a tight wood situation. Where clearfelling is part of a sale to another party it may require a continuing effort from the seller to achieve a high clean-up standard. This is because what makes broad economic sense may not be in the financial interest of the buyer.

### Scope for Increased Yields by Use of Smallwood

If by better cross cutting, harvesting of shattered tops and gathering of small pieces generally the volume from clearfelling could be increased by 5 percent it would mean close to half a million cubic metres a year additional wood in the 1980s. If all stands scheduled for thinning to waste at age 10 or thereabouts were thinned with recovery (of only 35 cubic metres per hectare) the additional yield would be a little over 1 million cubic metres a year. The total increase of 1½ million cubic metres per year would represent a 16 - 17 percent increase on the figures given earlier which represented management intentions in 1977. One of the major obstacles to realising the additional thinning volumes would be steep terrain. No precise figures can be given for the proportion of tractor to non-tractor country but from data gathered from Symposium No. 11 in 1969 by Chavasse it is probably not much more than one third of the former. Thus the techniques of getting small thinnings off hills, such as the chutes developed by NZ Forest Products, are basic to realising the potential.

If instead of attempting to recover the additional volume at the time of high pruning the thinning was delayed until age 15 and yielded 150 cubic metres per hectare a potential would exist for over 4 million cubic metres per year extra in the latter half of the 1980s. However this would be largely a hauler operation and the effect on the final crop from the delay in thinning and the physical damage of rope hauling is not likely to be generally acceptable where an investment has been put into pruning for quality logs. In general the more intensive the early silviculture the less likely that delayed extraction thinning would be acceptable.

It therefore seems to me that what are needed to realise a high proportion of the thinning production potential are non-damaging techniques for flat and hill country capable of dealing with the small piece sizes at ages 10 to 12 years, or a little older in slower growth areas, and of course a sufficient value for smallwood to make it worthwhile.

### The Value of Smallwood

The cost of smallwood cannot be measured solely by the direct cost of its production and the hidden costs of adverse effects on the final crop which may result from some types of thinning operation. If by recovering this wood it is possible to conserve bigger logs for higher value end uses this must also be taken into account. For this reason there are two distinct situations in looking at the role of smallwood.

Firstly, in areas such as the Bay of Plenty where there is considerable smallwood demand from existing industries increased use of smallwood may release an equivalent volume of sawlog and peeler sized material which can be exported at relatively high value, used to increase local mill throughput, or conserved to smooth the transition from pre-war to post-war crops ( which will

be very different in size and quality characteristics). These opportunities must be analysed on a forest wide basis over time and not for individual stands. In forests the younger age classes which have not been pruned the effect on the final crop of holding wood for extraction thinning may be simply to reduce tree size at the time of clearfelling or to add 2 or 3 years to the rotation to get trees of the same size. If the extraction thinning immediately releases mature timber in the forest for other purposes then in effect a transfer of such wood from the future to the present has been achieved and as you will be aware a dollar now is worth considerably more than a dollar 10 to 15 years hence. In stands which have been pruned and intensively tended the position is more complicated because the value of the future harvest that may be foregone or delayed by thinning is that much greater. Differences in the attitudes of forest owners are therefore to be expected and will reflect the investment they have made in pruning and early thinnings and the relative importance they attach to immediate versus longer term gains.

In summary the value of having the additional smallwood from thinning is not measured solely by increased pulp or panelboard production but must take account of redirection of bigger logs to a more valuable end use. NZ Forest Products Ltd currently has programmed about 18 percent of its Kinleith input in thinnings and plans to increase this proportion. It seems probable that this has advantages to the company not only in increased total production but in the greater flexibility in the use of the diminishing old crop in the manner described. The main contract for supply from Bay of Plenty State forests is being renegotiated and an important feature is the provision of incentives in pricing etc. to use non-sawlog material as pulpwood to the maximum possible extent. Greater efforts to utilise smallwood will be required if maximum production is to be achieved.

There is an opportunity to conserve older and larger logs by increased use of smallwood wherever there are existing pulp and/or panel board plants, i.e., Auckland metropolitan area, Central North Island, Hawkes Bay and Canterbury. It is likely that the whole of the North Island with the exception of the remoter parts of the East Coast and Northland, could be regarded as a timber "catchment" for this purpose.

The second situation exists in areas such as Nelson, Otago and Northland which have no reconstituted wood processing plants, limited areas of older plantations and large areas of young exotic forest. When the young forests are ready to harvest in the 1990s there will need to be an outlet for the residues from sawmilling and for smallwood. In the meantime more limited volumes of residues currently available must either be wasted, used for fuel or exported unprocessed as chips - a trade which has not been particularly profitable in the past. The advent of relatively small scale pulping using the thermomechanical process presents another option and one that is being examined by CSR-Baigents in Nelson and Odlins in Otago. Although the proposed plants are not large (300 and 200 t.p.d. respectively with requirement of 200 000 and 150 000 cubic metres per year)

the supply position is tight in the 1980s and increased use of roundwood would be needed to make them feasible. In the case of Nelson, Baigents propose to achieve this by lowering rotations to 21 years for pulpwood and 25 years for sawlogs and to use their own forests relatively heavily in the early years. In the case of Otago the use of thinnings to supplement sawmill residues has been mooted\*. In both cases it would be possible to build the proposed plant without lowering rotations or otherwise increasing the smallwood proportion of sacrificing the sawlog potential in any way simply by waiting a few more years. However both from the viewpoint of individual companies and from that of Government earnings generated now rather than later are important and may be sufficiently so to forego a portion of the overall potential earnings for the sake of early returns.

The job of foresters is to try and measure what may be foregone so that those making the necessary value judgment, be it Boards of Directors or Ministers, are well informed on all of the costs.

#### In Summary

- There is potential to increase production in the 1980s by greater use of smallwood and there are specific proposals to do so.
- There can be little argument about doing so by greater recovery in clearfellings or by using early thinnings that would otherwise be wasted.
- Despite the keen demand for more wood cheaper extraction methods for flat and hill country must be developed if early thinnings are to be used.
- The desirability of later thinnings is arguable and they are likely to be practised only where the resultant loss of final crop values is offset by immediate release of mature wood for other purposes and/or where the early investment in tending, particularly pruning, has been minimal.
- There is a challenge to loggers to develop lower cost, non damaging thinning methods if the full potential for smallwood is to be realised in the 1980s.

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\*Footnote: The proposal for a Northland pulpmill has not been taken to the point where the process is certain. The locally produced component of the high value finished paper could be T.M.P. or pressure groundwood. If the latter it would be unique in relying solely on smallwood, probably from thinnings.