THE NATURE OF NEW CROP CLEARFELL TREES IN TASMAN FORESTRY LIMITED FORESTS

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Introduction

New Crop. What does the term mean? For the purposes of this paper "New Crop" refers to the post Depression plantings or those areas that will probably be logged over the next 10 or so years. To broadly clasify these plantings they could be called the transition-pre intensively managed stands.

Tasman Forestry has its own unique management philosophy and objectives which have contributed to the formation of the present and expected future forest estate. To dwell at length on the past silviculture variations would be of little value. This paper will look at generalities and make comparisons between the old and new crops where appropriate.

The Resource

One of the main differences between the CNI and the rest of New Zealand (as far as logging is concerned) is the average clearfell age. Many thousands of hectares were planted in the 1920's and 1930's in the Rotorua, Taupo, Tokoroa areas. Some of this was destroyed in the 1946 Taupo fire but subsequently regenerated naturally. It has been this resource that has sustained the forest industry in this region.

Because of the almost total lack of planting in the 1940's and 1950's, and the overcutting (or mining) of the resource over the recent past as a result of poor resource planning and short sighted marketing policies, coupled with periodic wind blows, the old crop resource is rapidly running out. The existing markets will have to be sustained from smaller areas of the younger plantings of the late 1950's and 1960's or the markets will contract. This means that as a general trend the average clearfell age will drop from the mid 50's to the low 30's high 20's within the next few years. There are local aberrations but in general this holds true.

Regimes

In broad terms most of the 1940-70 plantings are framing regimes. The influence of clearwood has increased from that date to be the predominant regime type today. Within those classifications however there is considerable variation in thinning time and stockings and in pruning intensities and height, with the subsequent effect on final tree size and quality.

Little of the "old crop" had any formal management. The value of periodic thinning was ably demonstrated by the wood wasp, "Sirex", which attacked and killed individuals in those highly stocked and stressed stands and in doing so

contributed to a "natural" thinning. Matea which escaped this attack is an example of how Kaingaroa, Tauhara etc., perhaps could have looked if the attack had not taken place. Since that time thinning has been carried out as money or markets for the thinnings allowed.

Just like most other companies, Tasman Forestry has stocking extremes i.e. 1300 to less than 200 spha. Fortunately these are only small areas. In the main the new crop areas scheduled for felling over the next 10 or so years will fall into two broad stocking levels 500 - 700 spha and 220 - 400 spha. This is due to the effect of terrain on thinning timing, accessibility and perceived end use.

Pruning has also occured to varying degrees. There was generally a low prune for access or fire protection. There are however some areas of the 50 and 60 plantings that have been high pruned. Generally however this pruning was late in today's terms resulting in a smaller clearwood sheath. Nevertheless it represents a potentially more valuable resource if it can be identified and cut. The amount of pruning increased slowly through the 60's with most being carried out since the mid 70's.

The tree breeding programming is having an increasing affect in terms of growth (size), straightness, branching characteristics etc. The first plantings of improved tree stock for TFL commenced in 1972 and since 1978 virtually all company plantings have been with improved stock. The only affect this will have in the next 10 year period is through production thinnings. A trial thinnings in Tarawera indicates an increase in tonnage extracted of about 19% and a decrease in cost of 8%.

COMPARISON NON-ORCHARD vs ORCHARD TREE STOCK AT AGE 9 YEARS

Description	Tree Stock Origin		Difference
	Non Orchard Per Ha	Seed Orchard Per Ha	%
Merchantable Lengths Extracted	325	358	+10.1
Wood Tonnage Extracted	51	61	+19.6
Extraction: Cost/Tonne	$ 12.87	$ 11.82	- 8.2

Supporting data comes from Omatoroa Forest with the same seed source planted in 1973 and thinned at 10 years. An assessment of thinning piece size showed a 15% increase in favour of seed-orchard stock (John Gleed pers comm).

In summary as far as the regimes are concerned, the new crop is quite similar to the old crop except for one major difference - age. This one factor is the cause of all other differences as all other things (site, stocking, regime etc.) being equal a 30 year old tree is not as big as a 50 year old one. This affects tree size, volume per hectare, branch retention, basic density, heartwood content etc. These all affect the harvesting and transport processes. Machinery that is optimal for one tree size is not necessarily the optimal for another, volume per hectare affects the unit roading rate etc., as well as affecting the gang shifting costs and so on, increased numbers of branches, increase trimming time and increase saw costs. Tree size can also affect log types and age can affect quality. Some of these factors will be discussed in more detail.

Tree Size

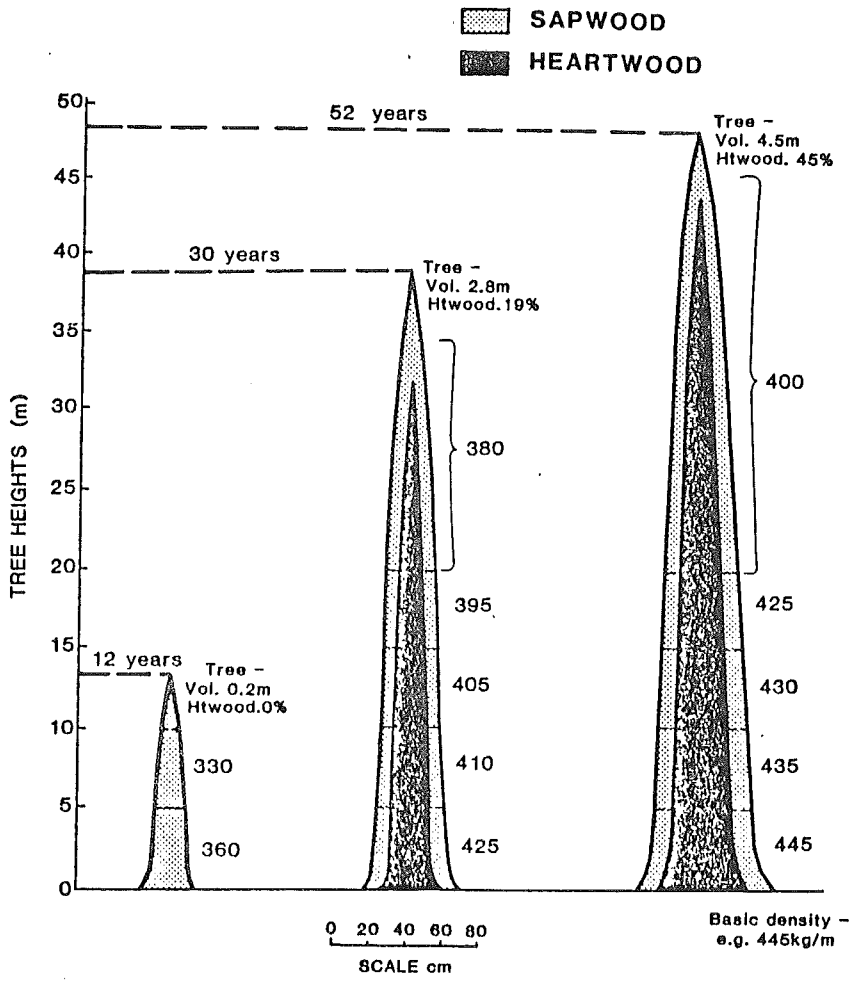
The following table is data representative of old crop areas in Tauhara and two framing regimes with different stockings, representative of the new crop in Taupo and Tarawera.

TREE SIZE VOLUME/HA & LOG TYPE COMPARISON

	New Crop		Old Crop
	Minimum Tending	Export/structural	
Age	30	30	52
spha	378	228	266
Total live vol./ha (m^3)	700	630	1198
Tree size (m^3)	1.8	2.8	4.5
Export %	15	60	75
Sawlog %	55	20	12
Pulp %	30	20	13

The reduced volume per hectare is quite dramatic. Couple this with a reduction in the more valuable log types per area and considerably more area needs to be felled to supply the market for these valuable log types. (As an aside, more area felled means more area to be replanted and subsequently tended, all affecting the cash flow). A reduction in piece size generally infers an increased harvesting cost further reducing the unit value/hectare to the grower. The tree size reduction is diagramatically shown below.

TREE SIZE COMPARISON



Branch Characteristics

Because the regimes of the new crop are similar to those of the old crop in terms of final stocking then the increased number of branches on the new crop is again a function of age, i.e. the 20-25 year difference in rotation length means less branches have died and rotted off the tree. The influence of tree improvement on branching will not be felt until closer to the year 2000 as far as clearfell is concerned.

FRI undertook some extensive measurements on a newcrop and an old crop stand to derive a measure of work effort due to branching (Terlesk pers comm). In a recent skidder trial at Tarawera a trim time figure was also measured.

THE EFFECT OF BRANCHING & AGE

F.R.I. & T.F.L. DATA

	Tarawera	Kaingaroa	
	New Crop	New Crop	Old Crop
Age	23	29	48
Piece size	1.18	2.20	4.13
Average merchantable lengths	27	29	32
Branches per merchantable length		187	139
Live branches		64	36
Time spent trimming % bush	73	43	0
skid	10	5	8

Although no branch numbers were collected in the Tarawera trial, the time taken of the total cycle indicates a high number to be removed.

If nothing else, the increased number of branches is going to change the work pattern and must affect costs if nothing more than in increased fuel usage and saw and chain maintenance.

Pruning

Some pruning has been done to varying degrees. Some of it is very good so pruned logs will be extracted. Data supplied at the recent Conversion Planning Seminar indicated that even trees that had only been low pruned had a potentially very valuable short log. If forest growers are going to achieve the premiums on the pruned logs they expect then the quality of these logs will have to be adequately protected by changes in logging, loading and transport systems. This is also likely to increase harvesting costs which the grower must be prepared to pay.

There is another fundamental problem in the older new crop pruned logs. This is the identification of where the pruned log finishes when the second log branches have been shed. Even to the trained eye this is extremely difficult. The likelihood of a mistake being made in a pressure production situation is very high. If this occurs too frequently then the price for pruned log parcels may reduce or there will be continual claims made by the purchaser against the grower.

High grade clearwood logs must reach the buyer completely undamaged. This means no spearing from loader forks and no felling damage or bark damage during production thinning.

Murphy and Gaskin investigated the affect of felling practise on butt damage (draw wood, splitting, stabbing) in steep country and found a significant reduction in damage with across slope directional felling, although there was an increase in stump height.

STUMP HEIGHT & BARK DAMAGE BY FELLING TYPE

	Downhill Crossed	Downhill Parallel	Across Slope	Uphill
Average Stump Height (cm)	15.7	10.2	18.4	16.3
Butt Damage (% of trees damaged)	63	34	11	55

Although this study was carried out on a 41 year old stand its silvicultural history means the mean stem size is similar to that expected from clearwood stands at around 32 years. The damage sustained using "correctional" felling techniques is unacceptable although this needs further qualification to identify the length and depth of the damage zone and the consequential value loss.

Conversion Factors

The younger the tree the higher the moisture content. The higher the moisture content the less wood fibre per tonne of log. This is reflected in the conversion factor. These are also affected by geographic location.

Taupo

Age (years)	15	20	25	30	50
Moisture Content %	185	166	151	139	109
Conversion m^3/tonne	0.89	0.93	0.95	0.96	1.01

This has important consequences for the forest grower if the harvesting is paid for in tonnes and the produce is sold in m^3.

e.g.	Age		30 Years	50 Years
	Delivered Cost	= $30/tonne	$31.25/$m^3$	$29.70/$m^3$

There is a 5% difference in return due to conversion factor alone.

Summary

A generalised case study has been prepared to highlight the factors discussed.

Age	30	50
Rec. volume/ha (tonnes)	530	950
Rec. piece size (tonnes)	2.3	3.6
Export %	60	75
Sawlog %	20	12
Pulp %	20	13
Roads & skids (@ $1000/ha)	1.89	1.05
Log/load, overheads $/tonne	13.00	11.00
Cartage domestic/export $/tonne	10.00/15.00	10.00/15.00
Delivered cost $/tonne	27.89	25.80
Conversion factor	0.96	1.01
Delivered cost $/$m^3$	29.05	25.54
Gross revenue $/$m^3$	70.00	77.40
Net revenue $/$m^3$	40.95	51.85
Net revenue $/ha	21 702	49 262

Gross revenue - export $90/$m^3$; sawlog $50/$m^3$; pulp $30/$m^3$

An extra man has been costed in because of additional trimming at age 30 and the same machines have been used for both ages.

On a per m^3 basis the difference between the two is very significant but the real difference and the one that will affect the grower is the return per hectare. A 56% reduction in revenue per hectare plus the additional costs in preparing, and the subsequent tending of the additional area felled to meet market commitments, means a change in cash flow and a reduction in profit. There will be enormous pressure applied to logging to ensure the correct systems are used and the logs are segregated and delivered properly to maximise profitability.

Conclusion

In general terms the central North Island radiata estate is mirrored by Tasman Forestry's forests in the same region although on a smaller scale. The old crop plantings are rapidly being logged out to be replaced by stands 20 to 25 years younger. Most of these stands have had some silvicultural history in the form of thinning and a few have been pruned more for protection and access reasons than for value. Therefore the stands to be logged over the next 10 or so years are similar to the old crop except for age. This age factor has big effects on tree size, volume per hectare and branch characteristics which in turn all affect the amount of log types produced. This will result in changes to old crop harvesting methods and costs.

Pruned logs and other special use crops will be segregated and the industry including growers must use this time as a training and proving ground to ensure handling systems have been evolved that will prevent damage to the potentially very valuable resource, coming on stream in the late 1990's.

References

G. Murphy, J. Gaskin 1982. Directionally Felling Second Crop P.radiata on Steep Country. LIRA Report Vol. 7 No. 1

D.J. Cowan et al 1984. Wood Properties of Radiata Pine in Some Forests in the Bay of Plenty/Taupo Region. FRI Bulletin No. 81.