Summary

- New Zealand’s total planted forest area was 1.83 million hectares as at April 2003. Of this 1.63 million hectares (89 percent) is radiata pine.

- Currently 1.09 million hectares (67 percent) of the radiata pine estate is, or is expected to be, pruned.

- The area of pruned radiata approaching harvestable age is increasing.

- Based on the age profile of the pruned estate the national volume of pruned radiata logs harvested is expected to increase over the next 3 to 5 years or so. The volume and timing of this increase will be based on market conditions and harvesting strategies of forest owners.

- From a national perspective once this increase has occurred pruned log volumes are likely to remain more static for up to 10 years.

- Thirty-eight percent (112,000 hectares) of the pruned area aged between 20 and 35 years is located in the Central North Island. Northland and the North Island East Coast have significant areas of pruned forest that will come on stream as production from the forests in these regions come on stream.

- To better understand the harvesting intentions of forest owners MAF and a number of forestry consultancy firms have undertaken regional harvesting intentions studies. The results of the studies undertaken by MAF are available on: [www.maf.govt.nz/statistics/primaryindustries/forestry/forest-resources](http://www.maf.govt.nz/statistics/primaryindustries/forestry/forest-resources).

- It is however important to note that forest companies regularly revise harvesting plans based on changing market conditions and changes in strategy. In addition there have been a number of changes in forest ownership over the last 2 years.
OVERVIEW OF NEW ZEALAND’S FOREST ESTATE

New Zealand’s planted production forests covered an estimated 1.83 million hectares as at 1 April 2003. Of this, 70% of the area is in the North Island and 30% is in the South Island. Some 32% of the entire planted forest estate is in the Central North Island wood supply region. Furthermore the Central North Island produced 50% of New Zealand's harvest in the year ended March 2003.

Over 60% of the planted forest estate is owned by 22 major organizations (with considerable offshore investment), each owning more than 10,000 hectares. There is continuing rationalization of forest ownership. Some integrated companies are divesting their forest assets, which show a poorer return on capital than their processing operations. Fund managers (particularly from the Northern Hemisphere) have recently purchased significant areas of forest. The remaining forests are owned by small companies, local government, partnerships, joint ventures and thousands of small-scale forest owners.

1.1 Silviculture

Radiata pine is the dominant species, making up 89% of the planted area. Douglas-fir makes up approximately 6%, and the remaining 5% is made up of numerous softwood and hardwood species.

About 67 percent (1.09 million hectares) of the radiata pine forest estate is, or is expected to be, pruned to a height of at least four metres. Twenty percent of the radiata pine area is currently, or is expected to be, production thinned.

Figure 1: Radiata Pine Silviculture as at 1 April 2003

1.2 Age Structure of New Zealand Pruned Forests

There is currently no authoritative source of forecast pruned log volumes in New Zealand. The age structure of the pruned radiata forest estate has therefore been used in this section of the paper as an indicator of future pruned log availability.

Pruned Pine 2004
The area of pruned radiata pine approaching harvestable age is increasing. Approximately 9% (94,000 hectares) of pruned radiata pine is older than 25 years, while 16% (174,000 hectares) of pruned radiata pine is between 21 and 25 years old. Seventy-five percent (824,000 hectares) of the pruned radiata pine estate is younger than 21 years.

The area by age information comes from the National Exotic Forest Description (NEFD) Database. The forest areas in the NEFD database are considered reliable for the older age classes. The majority of this forest is owned by large forestry enterprises. These enterprises generally have formalised information systems and employ professionally trained forestry staff and consultants. Each year these forestry enterprises provide a summary of their forest resource data to the NEFD database.

Figure 2 shows the age structure of New Zealand’s pruned radiata forest estate as at April 2003. If an average harvest age of 28 to 30 years is assumed for pruned stands the pruned log volume will increase over the next 3 to 5 years or so. However, once this increase has occurred the national harvest of pruned logs is likely to remain relatively static for up to 10 years. This is because the pruned area at each age between 16 to 25 years is relatively constant. As can be seen in Figure 2 there is between 30,000 and 40,000 hectares in each age class between 16 to 25 years old. Clearly forest owners are able to influence pruned log volumes by varying the age at which they harvest pruned stands. But they are unable to change the area of pruned forest within 15 to 20 years of harvest.

Comparing the age structure of the pruned radiata area in 2003 with the same information five years earlier reveals that more pruned area is approaching harvesting age than was the case in 1998. This indicates that nationally the volume of pruned logs will increase compared to pruned log volumes over the past five years.
The regional distribution of pruned areas aged between 20 and 35 years is shown in Figure 4. The Central North Island with its large forest resource base has 38% of the national pruned area. Both Northland and the North Island East Coast have significant areas of pruned forest that will come on stream as production from forests in these regions increases.

**Figure 4: Regional Distribution Pruned Radiata (age 20 to 35 years) - 2003**

Source: A National Exotic Forest Description as at 1 April 2003
1.3 Harvesting Intention Studies

To better understand harvesting intentions of forest owners MAF and a number of forestry consultancy firms have undertaken regional harvesting intention surveys over the last 3 to 4 years. The regions where these surveys have been undertaken by MAF are:

- Nelson and Marlborough - 2000;
- Otago and Southland - 2002;
- Southern North Island – 2003; and
- Central North Island – 2003 (currently being revised based on intentions collected in May 2004).

The results of these surveys are available on MAF's web site at: www.maf.govt.nz/statistics/primaryindustries/forestry/forest-resources.

1.4 Regional Information

The following regional commentary is based on information derived from the harvest intentions studies described above, combined with industry comment on the studies when they were presented. In the studies, the major companies provided future harvest volumes based on their current harvesting plans. Volumes for small growers are based on modelling their area figures and using the 1995 NEFD Yield Tables.

It is important to note that companies regularly change harvesting plans based on changing market conditions and changes in company strategy. In addition to this there have been a number of changes in forest ownership, particularly in the Central North Island region over the last 2 years.

1.4.1 Central North Island

The total harvest (all species) for 2004 is estimated to be just over 9 million cubic metres, declining to an average of 8.5 million cubic metres until 2008, and then increasing again to 10.1 cubic metres by 2010.

According to the recent harvest intentions study carried out by MAF, the volume of pruned logs from Central North Island forests is expected to increase gradually from about 1.1 million cubic metres per year in 2004 to about 1.4 million cubic metres by 2010.

Key messages:

- The two largest forest owners are seeking to increase the age at which they harvest. While this reduces the regional harvest volumes between 2004 and
2008 it has the longer term benefits of improving log quality and increasing log size;

- There is increasing sophistication in pruned log purchase by the key processors in this region, with particular reference to wood density, resin pockets, internal checking and clear wood sheath;

- The supply situation is tight, and logs are brought in from other wood supply regions for processing;

- The small grower sector has a minor role in log production in this region.

Figure 5 below shows the age structure of pruned radiata area for the Central North Island in 2003 compared to 1998.

Figure 5: CNI Pruned Radiata Areas Reported in 1998 and 2003

1.4.2 Nelson/Marlborough

Estimates of total log production from this region are about 2.2 million cubic metres for 2004, rising to about 2.4 million cubic metres by 2010.

A MAF harvesting intentions study in 2000 estimated that pruned logs from the large growers in the region was likely to remain relatively constant between 2003 to 2005 with a harvest of between 158,000 and 167,000 cubic metres per year.

In 2003 the total pruned harvest in Nelson/Marlborough was about 200,000 cubic metres of which 40,000 cubic metres came from the smaller grower sector. The pruned log volumes are currently about 9% of the total log volume harvested for the region.

By 2010 the pruned log volume from the large forest growers is expected be of the order of 180,000 cubic metres. The potential harvest from the smaller growing
sector is difficult to estimate due to the large numbers of growers. Best estimate suggests that between 60,000 to 80,000 cubic metres of pruned logs may be harvested from this segment of forest growers by 2010.

The key messages are:

- The small grower sector currently form a relatively small proportion of the pruned harvest in this region;
- There is no key determinant to estimate the level of cut from the small grower sector;
- The small growers decision about the timing of harvest is sensitive to log price;
- Forest owners currently restrict pruning to the better soils and future expansion of the pruned resource is unlikely; and
- The large growers have been aiming for a clear felling age of 30 years or greater.

Figure 6 below shows the age structure of pruned radiata area in Nelson and Marlborough in 2003 compared to 1998.

**Figure 6:** Nelson & Marlborough Pruned Radiata Areas Reported in 1998 & 2003

![Graph showing age structure of pruned radiata area in Nelson and Marlborough in 1998 and 2003.]

Source: NEFD as at 1 April 1998 and NEFD as at 1 April 2003

1.4.3 **Otago/Southland**

Estimates of log production (all species) from this region were about 1.5 million cubic metres for the year ended March 2003 (NEFD), increasing slightly to around 1.7 million cubic metres between 2007-2012 (MAF Otago and Southland Harvest Intentions Study).

The 2002 MAF harvesting intentions study showed that pruned log supply in the region could decline from a volume of 355,000 cubic metres per year in 2003 to about 270,000 cubic metres between 2007-2012. The estimates are that most of this reduction will be from the small grower sector. The corporate sector reported
that their reduction in pruned log production is likely to be about 15% over the same period.

The key messages are:

- The average per hectare yields from the small grower sector are higher than from the corporate resource;
- Forest owners are seeking to increase the clear felling age.

Figure 7 below shows the age structure of pruned radiata area in Otago and Southland in 2003 compared to 1998.

Figure 7: Otago & Southland Pruned Radiata Areas Reported in 1998 & 2003

Figure 8 below shows the age structure of pruned radiata area in the Hawke’s Bay in 2003 compared to 1998.

1.4.4 Hawke’s Bay

An independently produced, harvest intentions study in 2000 predicted a decline in regional harvest totals from about 2.2 million cubic metres per year in 2004 to about 1.8 million cubic metres by 2010. The proportion of pruned logs in that mix was not available.

The key messages from that area are:

- The corporate estate forms the dominant proportion of the total forest estate in this region;
- The corporate estate has been shown to be more productive than the small grower estate;
- Reasonable volumes of pruned logs are exported outside the region for processing.

Figure 8 below shows the age structure of pruned radiata area in the Hawke’s Bay in 2003 compared to 1998.
1.4.5 Southern North Island

The total production (all species) for 2003 is estimated to be about 1.0 million cubic metres, with the potential to increase to between 1.6 and 2.0 million cubic metres by 2010.

A recent MAF harvesting intentions study showed that volumes of pruned logs from the major forest owners in the region are likely to increase gradually from about 145,000 cubic metres per year in 2004 to about 225,000 cubic metres in 2010.

Key messages:

- The small grower sector forms a large proportion of the resource in this region;
- There is considerable uncertainty about the harvest volumes for the small grower sector, but there is potentially up to 200,000 cubic metres of pruned logs available per year from this source;
- Generally, log quality from small growers tends to be poorer than that of larger growers;
- Small growers have proved to be very price-sensitive in the past with regard to harvest age;
- The major purchaser of pruned logs is seeking older, larger logs;
- Log quality is variable, given a large range of different site factors.

Figure 9 below shows the age structure of pruned radiata area in Southern North Island in 2003 compared to 1998.
Figure 9: Southern North Island Pruned Radiata Areas Reported in 1998 & 2003

Source: NEFD as at 1 April 1998 and NEFD as at 1 April 2003

1.5 References

Ministry of Agriculture and Forestry, 1999: “A National Exotic Forest Description as at 1 April 1998”.

Ministry of Agriculture and Forestry, 2004: “A National Exotic Forest Description as at 1 April 2003”. 
STEVE CROSKERY

Summary

- Internal rates of return for a generalised pruned and unpruned forestry investment are shown for a range of log prices.

- In each case the pruned regime has a slight edge over the unpruned regime in terms of IRR, and generates higher stumpage revenues per hectare.

- The margin in price between pruned and top grade unpruned logs has changed very little over the period 1992 to 2004, averaging about $70/m³.

- This margin could fall to about $50/m³ before the IRR of the pruned regime investment fell below that of the unpruned regime.

- About 65% of the radiata of tending age in New Zealand is being pruned. The owners of large forests are pruning around 41% of their areas (range 10% to 90%), and smaller forests around 83%. Perceptions of the future, site and location, all impact on the decision of whether or not to prune.

- Average stocking rates and clearfell ages of pruned stands are likely to increase.

- Owners of most of New Zealand’s radiata pine, periodically review the economics of silvicultural investment.

- Most forest owners are of the view that there will be a rationalisation of land use over the next decade. This will see some land moving out of forestry where it has a better and higher use (e.g. dairying) or is uneconomic (some might walk away), as well as some areas of new land planting where forestry is economically competitive.

- A reasonable expectation of forestry returns is suggested in the range 4.5 to 7.5%, real and after tax.

- In comparison with historic and forecast future returns from equities, forest investment in New Zealand appears quite competitive, and perhaps less risky.

- Current margins between pruned and unpruned log prices support pruning, and there is some latitude in this margin before pruning becomes uneconomic. Even if the margin was to disappear, while stumpages and rates of return from a pruned forestry investment would suffer, the investor would likely still enjoy a positive return, and not lose money.
2 THE EVER SHIFTING PRUNED LOG RESOURCE (OR IS IT?)

Paul has provided some of the statistics on the radiata pine plantation estate area that is pruned and some indication of the potential future harvest of pruned logs.

What I will present is:

- Some basic forest economic analysis comparing results of a very generalised pruned regime and an unpruned regime
- Results and comments from a survey of twenty major New Zealand forest growers as to current silviculture (pruning or not rather than regime specifics) and their thinking / rationale
- Some thoughts on forest investment, including pruning.

2.1 Economic Analysis

The following tables describe the assumptions underlying the analysis in terms of yields, log prices, harvest related costs, forest investment costs, and the results.

2.1.1 Yields

Table 1: Assumed Yields

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Pruned Regime</th>
<th>Unpruned Regime</th>
</tr>
</thead>
</table>
s/ha @ harvest| 325| 400|
TRV @ harvest (m³/ha)| 650| 720|
|% TRV| Pruned logs| 25%| 163| 0%| 0|
| | Top Grade Unpr S/L| 20%| 130| 45%| 324|
| | Med Grade Unpr S/L| 25%| 163| 25%| 180|
| | Low Grade Unpr S/L| 15%| 98| 15%| 108|
| | Pulplogs| 15%| 98| 15%| 108|
| | Total| 100%| 650| 100%| 720|

s/ha = stems per hectare, TRV = total recoverable volume, S/L = sawlog

2.1.2 Log Prices

In the economic analysis I have considered three price scenarios, which I have called “recovery”, “current” and “possible”. These are outlined below, along with two other sets of prices for comparison.

Table 2: Log Prices Sets

<table>
<thead>
<tr>
<th>Price Set / Scenario Grade</th>
<th>Average Mar ’92-Mar ’04</th>
<th>Average Dec ’96 – Dec ’02 “recovery”</th>
<th>Average Last 12 Qtrs “current”</th>
<th>Average Last 6 Qtrs Decreased at 0.5%/yr for 28 yrs</th>
<th>Average Last 12 Qtrs “possible”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Pruned</td>
<td>195</td>
<td>174</td>
<td>161</td>
<td>154</td>
<td>140</td>
</tr>
<tr>
<td>Average Top Gde Unpr</td>
<td>122</td>
<td>104</td>
<td>89</td>
<td>83</td>
<td>77</td>
</tr>
<tr>
<td>Average Med Gde Unpr</td>
<td>100</td>
<td>87</td>
<td>78</td>
<td>73</td>
<td>68</td>
</tr>
<tr>
<td>Average Low Gde Unpr</td>
<td>84</td>
<td>72</td>
<td>66</td>
<td>62</td>
<td>58</td>
</tr>
<tr>
<td>Pulp</td>
<td>44</td>
<td>43</td>
<td>41</td>
<td>37</td>
<td>36</td>
</tr>
</tbody>
</table>

Pruned Pine 2004
Table 3: Basis of Log Prices

<table>
<thead>
<tr>
<th>Grade</th>
<th>Basis of Price calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pruned logs</td>
<td>([(85% \text{Dom} \text{P}1 + 15% \text{Exp} \text{Prn}) \times 0.8 + \text{Dom} \text{P}2 \times 0.2])</td>
</tr>
<tr>
<td>Top Grade Unpr S/L</td>
<td>Mean of A Gde Exp &amp; Dom S1</td>
</tr>
<tr>
<td>Med Grade Unpr S/L</td>
<td>Mean of J Gde Exp &amp; Dom S2</td>
</tr>
<tr>
<td>Low Grade Unpr S/L</td>
<td>Mean of K Gde Exp, Dom L1L2 &amp; Dom S3L3</td>
</tr>
<tr>
<td>Pulplogs</td>
<td>Mean of Exp Pulp &amp; Dom Pulp</td>
</tr>
</tbody>
</table>

MAF = Ministry of Agriculture and Forestry, AMG = at mill gate, AWG = at wharf gate, Dom = domestic, Exp = export

2.1.3 Harvest Related Costs

Table 4: Harvest Costs

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>($/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>3</td>
</tr>
<tr>
<td>Log and Load</td>
<td>20</td>
</tr>
<tr>
<td>Cartage</td>
<td>11</td>
</tr>
<tr>
<td>Management, Marketing</td>
<td>4 (unpruned) – 6 (pruned)</td>
</tr>
<tr>
<td>Total</td>
<td>38 - 40</td>
</tr>
</tbody>
</table>

2.1.4 Forest Investment Costs

Table 5: Forest Investment Costs

<table>
<thead>
<tr>
<th>Operation / Cost</th>
<th>Pruned Regime ($/ha)</th>
<th>Unpruned Regime ($/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land In</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Land Preparation &amp; Estab. (incl release)</td>
<td>1300</td>
<td>1430</td>
</tr>
<tr>
<td>Prune 1 (age 4)</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>Prune 2 (age 6)</td>
<td>490</td>
<td></td>
</tr>
<tr>
<td>Prune 3 (age 8)</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Thin to waste (age 10)</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Thin to waste (age 12)</td>
<td></td>
<td>550</td>
</tr>
<tr>
<td>Annual Costs</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Land Out¹</td>
<td>7170</td>
<td>7170</td>
</tr>
</tbody>
</table>

¹ The difference between ‘land in’ and ‘land out’ is the ‘land in’ value increased at 3.7% per annum, the average annual real rate of value increase that applied to grazing farmland in New Zealand between Dec 1980 and Dec 2002.
2.1.5 Results

Table 6: Results

<table>
<thead>
<tr>
<th>Price Scenario</th>
<th>Dec '96 – Dec '02 “recovery”</th>
<th>Last 12 Qtrs “current”</th>
<th>Last 12 Qtr Decreased at 0.5%/yr for 28 yrs “possible”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pruned Regime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Price ($/m$^3$)</td>
<td>103</td>
<td>94</td>
<td>81</td>
</tr>
<tr>
<td>Stumpage ($/ha)</td>
<td>41,000</td>
<td>35,000</td>
<td>27,000</td>
</tr>
<tr>
<td>IRR (after tax @ 33%)</td>
<td>7.2%</td>
<td>6.7%</td>
<td>5.9%</td>
</tr>
<tr>
<td>IRR (after tax at 33% but land out at cost)</td>
<td>6.7%</td>
<td>6.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Unpruned Regime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Price ($/m$^3$)</td>
<td>86</td>
<td>76</td>
<td>66</td>
</tr>
<tr>
<td>Stumpage ($/ha)</td>
<td>34,000</td>
<td>27,000</td>
<td>20,000</td>
</tr>
<tr>
<td>IRR (after tax at 33%)</td>
<td>7.1%</td>
<td>6.4%</td>
<td>5.5%</td>
</tr>
<tr>
<td>IRR (after tax at 33% but land out at cost)</td>
<td>6.5%</td>
<td>5.6%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

IRR = internal rate of return

In each case or price scenario, the pruned regime seems to have a slight edge over the unpruned regime in terms of IRR.

Based on the “current” average prices of the last 12 Quarters, the IRR of the pruning investment on its own, that is the IRR of the difference in the cash flow (Pruned – Unpruned regime), is nearly 9%. This return on investment has been obtained at a log price margin for pruned logs of $72/m$^3$.

This margin in price, between pruned logs and top grade unpruned logs has changed very little over the period of the MAF log price series (see Figs 10 & 11, below).

Figure 10: Pruned & Top Grade Unpruned Sawlog - MAF Price ($/m$^3$ AMG / AWG – real Mar 2004)

Pruned Pine 2004
My analysis indicates that the pruned log price margin could fall to around $50/m³ before the IRR of the pruned regime fell below that of the unpruned regime.

Site (growth and quality impacts) and location (proximity to suitable processing plants or points of sale), along with the interest or focus of particular growers and any financial objectives and constraints, will all come to play in the silvicultural decision of whether or not to prune.

So, what are the major growers doing, and why?

2.2 Silvicultural Strategy and Rationale of Twenty Major New Zealand Growers

I spoke with twenty growers representing the majority of owners, (in terms of area) of plantation forest in New Zealand.

I asked them four simple questions. These questions and a summary of answers are as follows:

2.2.1 What percentage of your area in the tending age classes do you currently prune and intend to prune in the future?

<table>
<thead>
<tr>
<th></th>
<th>Number of Entities</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Area Wted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest area &gt; 50,000 ha</td>
<td>7</td>
<td>10%</td>
<td>90%</td>
<td>41%</td>
</tr>
<tr>
<td>Forest area &lt; 50,000 ha</td>
<td>13</td>
<td>33%</td>
<td>100%</td>
<td>83%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>10%</td>
<td>100%</td>
<td>65%</td>
</tr>
</tbody>
</table>
Comments about silviculture and rationale:

A. Forest Areas > 50,000 hectares

- Want a mix of pruned and unpruned areas that can be harvested in any period. Target 70% of area to be pruned. If pruned log prices are down, can focus harvest on unpruned stands for a time.

- Increasing stocking rates (pruned) to 400s/ha, and rotation length to 31 yrs for wood quality and economic reasons.

- Likely to move away from pruning because of proximity to structural processing plant and high cartage costs to pruned mill. (On truck margin).

- Pruning about 50% age class area and focus on fertile sites where resin pockets not a major problem.

- Target pruned height is 8.5m. Company focus on clearwood and believe that more pruned volume per hectare is better than more hectares.

- Prefer to invest in good purchases of existing forests.

- Some focus on recovering short length clears from otherwise export sawlogs – believe better return.

In the group of large forest owners there is a diverse range of opinion as to whether pruning is worthwhile, either due to general economic and price perceptions (i.e. the general question as to whether pruning is a good investment) or whether it was the best option for their particular circumstances, i.e. forest site and location or particular objectives. Overall, in this group of large forest owners, about 41% of the young crop is being pruned.

B. Forest Areas < 50,000 hectares

- Most forest areas controlled by entity are very well suited to pruning producing large cylindrical good form butts with central pith and few resin pockets. Some forests with low BA growth, fertility constrained, small branches, high density - here > focus on structural S/L's and posts/poles. (Pruning around 90%).

- Main constraint is labour (prune about 90%). Prune because adds value and economics suggest worthwhile. Fewer options for the unpruned log in the region.

- Want a mix of pruned and unpruned areas that can be harvested in any period.

- Prune 100% because consider it a good investment and like the diversification in terms of markets.

- Focus of parent company is on appearance grade, high value lumber. Only areas not pruned are very high harsh sites (prune about 98%)
- Advantage is in appearance grade lumber and very good markets for pruned logs - several competing mills. Regional growth characteristics well suited to pruning.

- Investments floated on basis of pruning. Though can change silviculture, internal reviews and external advice supports continuation of this. Investors generally happy to proceed as planned.

- Currently pruning investment is cash flow constrained (described as short-term accountant mentality, i.e. current earnings versus investment, forest value and future earnings perception).

- Only one-third of young crop being pruned due to cash constraints - focus on better sites and areas of better genetics. Current company interest is in older mature and semi-mature forests.

This group of forest owners, the medium and small size forests (includes farm forests and other small growers), are generally more enthusiastic about pruning than their larger counterparts. Of the larger growers in this group, most of their forest is in the CNIs, Hawke’s Bay / East Coast, and Otago / Southland regions, where basal area growth is good and wood density in the low to average range. Several companies have a particular focus on appearance grade lumber and in the South Island regions there are competing mills for the pruned log.

The area-weighted average of 83% of the young crop being pruned in this group of owners depends on my assumption of 85% for the farm forester and small grower group of owners, as does the overall national average of 65%. This compares with about 66% from the NEFD as at April 2003.

2.2.2 Is silvicultural decision-making significantly influenced by ownership of mills or contracts to supply wood?

- Only one forest owner answered ‘yes’ to this question. Their interest is strongly in pruned and quality unpruned logs. They are processors and exporters of processed product and are of the view that without forest resource ownership they cannot influence the quality of the raw material.

- One major grower indicated that while in earlier years there had been a major focus on producing volume for processing, that emphasis had changed to a focus on quality sawlogs.

- Several growers own pruned log sawmills. The main purpose of this was to be able to extract maximum value from the forest, operating as an integrated grower-processor rather than just a log trader. One such company indicated that mill ownership was of significant value in achieving best prices from sales of surplus pruned logs, as they had a real understanding of the economics of the processing business.

- Mill ownership or supply arrangements are not an impediment to sensible silvicultural decision making.
Generally the answer to this question is that mill ownership and wood supply contracts do not impact on silviculture, largely because of the long period between silviculture and harvest (usually more than fifteen years).

2.2.3 **Do you periodically review the economics of silviculture, for example pruning versus not pruning?**

- Periodic review of economics (about every 2 years for strategic direction). In addition, each block considered for prune/non-prune at planting and prior to pruning/thinning time.

- Will review silviculture towards maximising returns with least risk - assess market and best silvicultural solution. Proximity to particular type mills (location) & natural wood quality factors of site are significant and early indications are that a structural regime focus will be best.

- Periodic analysis to give comfort that current strategy should continue, however technical analysis not a major contributor to business decisions.

- Yes about every 5 years considering what's changed (if anything) - analyses indicate a $50/m³ margin required from pruned logs to justify the investment. Company specific current differential is $72/m³. (Same as my analysis).

- Each year review economics of forest investment from a strategic perspective and what's best for each stand/site.

By far the majority of forest growers periodically (every one to five years) review silviculture as part of determining and refining strategy. In addition, many growers analyse and consider the options in a formal sort of way at a block if not stand level.

2.2.4 **What is your view about future forest investment and divestment?**

- Expect log prices to increase from current lows but still expect rationalisation of land with changes to dairying and not reinvesting in forestry in some areas. There are some areas where forestry does very well. Current feeling that sufficient external wood supply to meet processing needs. No new planting and no land bank.

- Here as a long-term player. With log prices trending downwards see rationalisation of the plantation forest area with some forests not being replanted due to distance from market, steepness and cost of harvesting, and some converted to higher and better alternate uses. A function of oversupply of wood relative to market.

- Always looking at opportunities to expand but current land prices are limiting.

- A hot topic with Board at the moment. Considering alternative species or walking away from some harvested areas.

Pruned Pine 2004
Replanting and consider returns in the range 5 to 8% after tax very good. Parent Co. US, conservative, has a strong forestry history and focus, and see the investment as a long-term one.

Own analyses indicate forestry returns in range 5 to 8% real after tax. Regard this as reasonable in comparison with other opportunities and electing to replant, though not bound to. Expect to see some contraction in the national plantation estate area with conversion and not replanting some forests.

Most owners who answered this question were of the view that there would be a rationalisation of land use over the next decade. This would see some land moving out of forestry use where it had a better and higher use (e.g. dairying) or was uneconomic (some might walk away), as well as some areas of new land planting where forestry was economically competitive.

2.3 Some Thoughts on Forest Investment and Pruning

2.3.1 Forest Investment

The success of both forest investment and investment in pruning will depend largely on future log prices. For new crop radiata management this means that the success of the investment depends on prices that will apply some twenty to thirty years in the future.

Prices may stay where they currently sit, say the average of the last 12 Quarters, they may recover to say the average during the period December 1996 – December 2002 (post spike and pre high FX and sea freight) or better, or they may continue to fall.

In terms of real prices, the trend over the period from December 1996 to December 2002 has been a negative one, averaging about 1.5% per year. Over a rotation of say twenty-eight years, if that trend continued, prices would fall by around 35%. Hopefully prices will not continue to fall, however, there are some sobering market issues to consider.

On the demand side there has been:

- Stagnant global consumption of solid wood in the form of sawn timber and declining consumption in Asia-Pacific over the past ten years.

- Little change in the global and Asia-Pacific consumption of solid wood in the form of plywood and veneer over the past ten years. (This is expected to start declining over the next decade).

- Increased global consumption of fibreboard and particleboard (replacing solid wood products).

- Increasing paper production coupled, however, with reduced percentages of wood pulp and increased percentages of recovered paper and non wood pulp (fibrous vegetables) used. In 1968 wood accounted for 81% of the fibre input.
for global paper production. In 1998, this had fallen to about 56%. While global paper production is increasing at around 3% per annum, wood pulp consumed in its production is increasing at only about 1%. These trends are expected to continue with increasing use of recycled paper and reduced amounts of wood fibre in the pulp mix of new paper.

Overall, global consumption of finished wood products has been increasing at around 2% per annum, while growth in the global consumption of roundwood used has been increasing at only around 1% per annum. The difference is due mainly to recycling and changes towards reconstituted panel products. There has also been evident improvement in the technology for wood processing, resulting in higher conversions of logs to finished product.

On the supply side there has been:

- Smaller than expected reductions in harvest from natural conifer forests, (spruce, fir and hemlock) of the Pacific Northwest of the US, Canada and Alaska.

- Increased supply of softwoods from Russia (larch and white pine) to New Zealand’s traditional log export destinations.

- Increased processing of coconut, oil palm and rubber trees at the end of their life as opposed to burning them.

- Increased harvest from plantations - New Zealand’s harvest alone has increased from around 12 million m$^3$ per year in the early 1990s to the current level of around 23 million m$^3$ and will increase still further.

- Increased yield from plantations as a result of intensified management and genetic improvement.

- An increasing area of plantation forest. The global area of fast growing plantations, currently around 20 million hectares, is expected to increase to around 30 million hectares by the year 2015. Accordingly, the harvest from plantations will continue to increase.

It would, however, be wrong to suggest that the view of the future is entirely pessimistic. There are some factors that would indicate that log prices in New Zealand may not continue their downward trend. These are:

- The reputation for quality and certainty of supply that New Zealand has developed in its traditional log export markets of Japan and Korea, and although volumes exported to these destinations may not grow significantly they will likely be maintained.

- The rapidly approaching significant fibre shortage in China. The China market, which is not very sophisticated in terms of quality, has been using radiata pine for some time. This is expected to facilitate increased export sales from New Zealand.

Pruned Pine 2004
Although harvesting and utilisation of tropical hardwoods has not declined at the rate expected in the early 1990s, in part due to illegal logging activities for instance in Indonesia, it is decreasing. At the same time, softwood solid wood products are replacing those from hardwoods. New Zealand expects to capitalise on that trend, as part of the Wood Processing Strategy, encouraging high value end uses for radiata such as in the American moulding and European furniture markets.

As Russia harvests more and more natural forest, it is moving into increasingly more distant and challenging locations. This will likely impact on infrastructure, transport and labour costs, reducing the cost competitiveness of that wood supply.

For these reasons, there is some expectation that log prices may remain fairly flat in real terms, even with increasing harvest and export volumes.

As outlined in Table 6, the rate of return from forestry at recent prices is in the range 5.6% to 7.2% real, and after tax. If prices fell on average by say 0.5% per annum in real terms, or around 13% over a 28-year rotation, then those returns would fall to around 4.5 to 5.9%. So, perhaps a reasonable expectation for forestry returns is in the broad range of 4.5 to 7.5% real, and after tax.

How successful would that be?

Perhaps a reasonable benchmark might be long run returns from equities. According to a recent paper by Dimson, March and Staunton, which looks at global equity returns between 1900 and 2002, the highest annualised 10-year return (real and after tax) in the U.S. was 16.8% (1919-1928). The lowest was –4% (1965-74) and the average over 103 years was around 6.3%. This average didn’t vary a lot for holding periods between 10 and 100 years. At the global level the long-run return from equities seems to be in the range 4 to 7% (real and after tax). The paper concludes by saying that three trends seem likely for the future:

- “Equity investment will remain risky. Business itself is risky and the years ahead may well bring new forms of disorder and volatility. The counterparts of international conflicts and the Cold War may be new wars on terror, drugs and the forces of nature. On the upside, business opportunities may arise that are barely reflected in today’s stock prices.

- Given that equities will remain risky, investors should continue to expect a reward for risk. That is, when investors look back a century from now, equities should prove to have been the best performing asset class in the 21st Century. Nevertheless, the real return on stocks will turn out to be lower than it was in the 20th Century. (The authors estimate around 5% real and after tax).

- Stocks do not and cannot offer a guaranteed superior performance over the investment horizon of most investors. To maximise the probability of favourable real returns, equities should be held within a diversified portfolio. Equity exposures should be diversified globally, so as to dampen domestic stock market volatility. By including multiple asset classes, risk can be
brought down still more. If investors fail to diversify efficiently and cost-effectively, they can expect to erode the reward for equity risk exposure.

Equities continue to have an important role in long-term portfolios. However, their prospective returns are lower than the performance that many investors project, while their risk is higher than many investors appreciate. Investors or corporations who assume that favourable equity returns can be relied upon in the long term or that stocks are safe so long as they are held for 20 years are optimists. Their optimism is irrational."

If a reasonable benchmark for forestry is equity investment and the long run return from that is say 4 to 7%, then 4.5 to 7.5% likely from forestry makes forestry seem a sensible and reasonable investment. Even if log prices fell in real terms at 1% per year, or 25% over a rotation, forestry returns would be around 3% for my unpruned regime and 4% for pruned (assuming no real increase in land value). I don’t think there is the same level of volatility or risk associated with forest investment and returns as compared with equities either. In my opinion, forestry investors are unlikely to lose money.

The implied discount rate associated with some significant recent sales of forests in New Zealand may be significantly higher than these levels of internal rates of return. However, that doesn’t necessarily mean that we will not see ongoing reinvestment in forestry and possibly some new investment as well.

Perhaps we really need to adjust our expectations (paradigm shift) as to what is a reasonable rate of return, in what some commentators are referring to as a ‘new low return world’.

2.3.2 Pruning

The success of the pruning investment will depend on the margin between pruned log prices and prices for the top grade unpruned log (assuming that’s what the pruned butt would be in an unpruned stand). The following graph, similar to Fig 10, shows the MAF prices for pruned and top grade unpruned sawlogs between December 1996 and December 2002.
Over this six-year period, that I would suggest as relatively settled in terms of prices, real prices for each grade have trended downwards. The average annual price decrease for pruned has been 1.7% and for unpruned 2.4%. The margin between the two has remained almost constant at around $70/m³. The key question however is what will the margin be in the future?

There are numerous factors impacting on this:

- As the total volume of wood harvested in New Zealand increases, the contribution of pruned logs will increase quite significantly. For example, over the next 5 years or so, the national harvest volume could increase by about 6 million m³/year or 27%. The pruned log harvest could increase by about 1.4 million m³/year or 50%. Over the next 15 years or so, the national harvest volume could increase by about 9 million m³/year or 40%. The pruned log harvest could increase by about 2.5 million m³/year or 90%.

- Reduced availability of timber suited to machine stress grading in the future (related to shortage of structural logs?).

- Increased self-sufficiency of Australia in structural lumber.

- Increased volumes of engineered products such as LVL suitable for structural applications.

- Non-wood substitutes for structural timber.

- Increasing international demand for appearance grade lumber from plantation forests.

- Increasing international supply of appearance grade lumber from plantation forests.

- The gap between supply and demand for appearance grade plantation lumber.
Potential for New Zealand to supply long length and wide clear board lumber.

Just like future log prices in general, the price margin between pruned and top grade unpruned logs is difficult to predict. While the historic margin of $70/m³ could easily reduce with increases in the harvested volume of pruned logs, there is apparently a reasonable amount of latitude before the margin falls to a level that pruning is not (or was not) worthwhile (i.e. the $50/m³ margin).

The following table summarises average log price, stumpage revenue and IRR for my generalised pruned regime and unpruned regime, and the pruned regime assuming the same price for pruned logs as for top grade unpruned logs. The price scenarios are the average of the period Dec 1996 to Dec 2002 (“recovery”), the average of the last 12 Quarters (“current”) and the average of the last 12 Quarters reduced by 13% or 0.5%/year over 28 years (“possible”).

| Table 8: Returns by Generalised Regime & Log Price |
|---------------------------------|-----------------|----------------|-------------------|
| Log Price Scenario              | Dec ’96 – Dec ’02 “recovery” | Last 12 Qtrs “current” | Last 12 Qtr Decreased at 0.5%/yr for 28 yrs “possible” |
| Pruned Regime                   |                              |                     |                   |
| Average Price ($/m³)            | 103                          | 94                 | 81               |
| Stumpage ($/ha)                 | 41,000                       | 35,000             | 27,000           |
| IRR (after tax @ 33%)           | 7.2%                         | 6.7%               | 5.9%             |
| IRR (after tax at 33% but land out at cost) | 6.7%                         | 6.0%               | 5.0%             |
| Unpruned Regime                 |                              |                     |                   |
| Average Price ($/m³)            | 86                           | 76                 | 66               |
| Stumpage ($/ha)                 | 34,000                       | 27,000             | 20,000           |
| IRR (after tax at 33%)          | 7.1%                         | 6.4%               | 5.5%             |
| IRR (after tax at 33% but land out at cost) | 6.5%                         | 5.6%               | 4.5%             |
| Pruned Regime (with pruned logs selling at unpruned price – i.e. no margin) |                              |                     |                   |
| Average Price ($/m³)            | 86                           | 76                 | 66               |
| Stumpage ($/ha)                 | 30,000                       | 24,000             | 17,000           |
| IRR (after tax @ 33%)           | 6.2%                         | 5.5%               | 4.5%             |
| IRR (after tax at 33% but land out at cost) | 5.4%                         | 4.6%               | 3.3%             |

If current margins are maintained, then there appears to be opportunity to increase both stumpage returns per hectare and the rate of return of the forest investment by pruning. Even if the margin between pruned logs and unpruned logs disappeared, which is unlikely in my opinion, the investor will likely still enjoy a positive though reduced rate of return from the forest investment.

Unless there are good reasons such as site and location, that support a structural regime, then my inclination would be to prune.

We may get some clearer direction on the future for pruned clearwood as the conference progresses.
2.4 References

