

PREDICTION OF MACHINE REQUIREMENTS

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INTRODUCTION

It is important to put into perspective the machine requirements for the future, early on in this seminar. Although it may appear to some to be crystal-ball gazing, reasonably accurate predictions can be made as the resource to be handled and its location is already determined.

Improved technology will continue in the logging industry as in all industries, and this should result in improved efficiency. However, it is not foreseen that there will be significant changes in the general techniques of logging as we know them today. Logs will still be extracted either downhill by tractor or skidder or alternatively up or downhill by cable methods. A general statement as this however is of no use to equipment people, planners or logging managers on which to base decisions on future trends. To be more specific we must look a little more closely at the resource we will be dealing with, its characteristics and location. This paper attempts to draw together known information based on the volumes that will be available by time and predict machine numbers required to harvest this resource.

FUTURE RESOURCE CHARACTERISTICS

There are several key factors which will influence the development of logging over the next two decades. Some of these are:

- (a) A high percentage of new planting is on ground too steep or otherwise unsuitable for agriculture. Much of this steep country is unstable and major problems exist in developing both cost effective and environmentally acceptable logging methods.
- (b) The quantity of wood available to be logged remains almost static over the next eight years but by 1996-2000 will be double current production and increase by more than 300%, 30 years from now.

TABLE 1 AVAILABLE WOOD SUPPLIES			
			000 m3/yr
REGION	Now Vo./yr	1996-2000 Av. over period	2011-2015 Av. over period
Northland	313	1 977	3 081
Auckland	519	930	2 322
Rotorua	5 786	7 196	9 283
Taranaki	44	94	150
Wellington	406	1 071	1 527
Gisborne	0	259	3 940
Hawkes Bay	132	1 119	1 652
Nelson/Marlborough	515	1 928	2 190
Westland	11	223	655
Canterbury	428	855	1 346
Otago/Southland	466	1 577	3 360

- (c) Overall tree size for clearfelling will decrease and there will be a greater need to protect the pruned butt-log investment. Wood shortages in the immediate future will increase pressure for shorter rotations and necessitate increased utilization of small-wood by way of thinnings, pulpwood and cutover recovery which are both high cost and low value parts of the resource.

Year	Total Volume	Logs 35 cm %	Logs 15-35 cm %	Small Logs %
1981-85	8 628	3 597 (42)	3 092 (36)	1 939 (22)
86-90	8 899	3 406 (38)	3 463 (39)	2 030 (23)
91-95	11 128	3 632 (33)	4 947 (44)	2 549 (23)
96-2000	17 679	6 007 (34)	7 998 (45)	3 674 (21)
2001-05	24 067	9 051 (37)	10 242 (43)	4 773 (20)
2006-10	27 852	11 601 (42)	10 958 (39)	5 293 (19)
2011-2015	31 105	13 421 (43)	11 780 (38)	5 907 (19)
		BIG	MEDIUM	SMALL

- (d) The proportion by area logged by cable methods is currently around 18-20% and this will increase to 38% by the time the trees planted over the last 5 years are available for harvesting at age 30 years.

Age Class (@ 31.3.81)	Total Stocked Exotic Forest	Hauler Area	Percentage
1-5	264	99	38
6-10	239	83	35
11-15	125	44	35
16-20	64	19	30
21-25	35	10	29
26-30	23	6	26
31-35 )	17	3	18
36-40 )	6	2	32
41-45 ) Current	10	3	30
46-50 ) 1981-86	20	3	15
51-55 ) Logging.	28	2	7
56-60 )	10	-	0
61 + )	7	1	14

The overall volume increase throughout New Zealand is massive. In the next 20 years every region in New Zealand with the exception of Rotorua will more than double their present production with major increases coming in Northland, 923% increase;

Southland, 494% increase; and Nelson/Marlborough, 326% increase.

A reduction in tree size is predicted provided future development of the industry follows current management intentions indicated by silvicultural regimes now being applied. What is difficult to predict however, is the speed in which industries will develop in regions not currently logging on a large scale particularly where a high proportion of their resource is on steep environmentally sensitive terrain. The combination of small tree size and difficult terrain leads me to believe that in fact trees will be left longer than 30 years before clearfelling to ensure peice size is sufficient to keep logging costs down as low as possible. The size of hauler required may not change as significantly as first thought although improved techniques could result in machines capable of more efficient cable systems than currently used.

On flatter terrain the tree size reduction from the average 3.5 m3 now to about 2.5 m3, by 1990 will decrease daily gang production by up to 16% all other factors being equal.

#### EQUIPMENT REQUIREMENTS

The type and size of machines will undergo change although the process will be slow. The users should be the ones specifying what is required after careful planning of the job in hand. To often equipment suppliers have brought in equipment without adequate market research and that equipment becomes an orphan.

Machine Type	1982-85	1986-90	1991-95	1996-2000
Chainsaw	1 835	1 850	2 297	3 683
Fell/limbing machines	10	19	27	36
Tractors/skidlers	Small 214 Large 184	171 196	170 232	50 416
Forwarders	5	5	7	10
Haulers	Small 14 Large 45	25 55	50 87	80 140
Front end & Crane Loaders	252	260	325	518
Log trucks	823	852	1 062	1 693

#### CHAINSAWS

The assessment of number is for professional saws in exotic forests. There has been a trend to smaller sized saws and this should continue with the reduction in tree size. Changes in delimiting techniques should improve the efficiency and safe use of chainsaws and there will be no decrease in their importance especially on steep country.

#### FELLING AND DELIMITING MACHINES

Because of cost and economics of scale, multi-functional machines will probably

develop ahead of single functional machines but the numbers will not be high. Machines of this nature will be limited to relatively small trees and flat to moderate terrain.

#### TRACTORS AND SKIDDERS

The number of small machines (under 60 kw) will remain fairly constant through this decade because the overall volume increase in smallwood is not significant. An exception in the immediate future could be the use of small crawler tractors on steep country thinning or clearfelling in an effort to combat high cable logging costs in smallwood.

The number of larger machines will increase rapidly in the 1990's. There will be a drift away from crawler tractors to skidders which are more efficient (both in production and fuel usage) with flexible track skidders operating on steeper terrain.

#### FORWARDERS

These machines will be used for cutover recovery and some thinnings where short log lengths are prepared. The overall number of forwarders will not be high.

#### HAULERS

The numbers of both large and small haulers will increase gradually. In some regions older ex indigenous type haulers will be used in the first instance because of the low rate volumes are coming on stream and lack of expertise. The trend will be towards haulers with integral spars (to reduce landing size), and either self-propelled or trailer mounted for added mobility. To achieve flexibility over a range of sites and terrain machines with spars of 27 m (90 ft) will be needed although there will be a place for haulers with a high degree of mobility and spars under 16.8m (55 ft). The small truck mounted hauler currently used in thinnings with a design capacity of about one tonne will continue at about the same level. Improvements in utilization of haulers and more efficient systems such as running skylines, gravity return and slack-pulling carriages will develop in New Zealand.

#### LOADERS

The near future will continue to see the extensive use of rubber-tyres front-end loaders. On steeper country where landing area is restricted rubber mounted crane loader will increase. Hydraulic knuckle-boom cranes are likely to increase in numbers also provided the unit cost for loading is acceptable with this type of machine.

#### TRUCKS

The trend in log trucks will not change significantly from the situation today. Most rigs will operate on-highway with axle configurations aiming towards the best economics depending on weight restrictions. Self loading trucks will increase in popularity to uplift logs from scattered operations.

#### OTHER POTENTIAL EQUIPMENT DEVELOPMENTS

Small combined skidding/loading machines or prebunching/loading machines for the woodlot logging operation or to improve efficiency in handling smallwood will develop. The challenge of improved harvesting of smallwood is one

needing close attention in New Zealand.

Aerial logging and transport will be used only on a very limited basis in this country because of economics of scale, however, it is an option that requires a close watch on developments overseas.

Water transportation by barging is likely to develop in Northland and Marlborough Sounds.

#### CONCLUSIONS

This paper has attempted to bring together known information on the exotic resource and its location to give an overall perspective of the numbers and type of logging machines needed over the next 20 years.

Significant gains can be made by improved efficiency in existing equipment without looking at new technology overseas. Operator training and improved servicing of equipment by specialists must keep pace with the expansion especially in the new resource areas. This seminar needs to identify these requirements so the machinery sector of the logging industry is well prepared.

#### REFERENCES

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