





NEW ZEALAND FOREST RESEARCH INSTITUTE LIMITED

New Zealand Forest Site Management Co-op Report No. 79

Mechanical Site Preparation Survey

Conducted and summarised by Peter Hall, Researcher New Zealand Logging Industry Research Organisation

INTRODUCTION

This survey was conducted to provide information from and to members of the New Zealand Forest Industry on what mechanical site preparation treatments were being used, at what cost and most importantly why they were being used and what the benefits were. The emphasis was on gathering information on soil cultivation treatments in relation to soil type.

The targets of the survey were the major forestry companies as the small forest owners were considered to be difficult to identify and contact and the area they represent is still modest albeit expanding. No attempt was made to cover the small forest growers such as investment trusts and farmers.

In all 32 questionaries were mailed out, targeting the major forestry companies. Twenty-five replies were received, a 78% response.

The response from the companies was good. If the area of plantation pine forest in New Zealand is assumed to be 1,400,000 hectares then the area covered by the replies received (994,908 hectares) represents 71 % of the forest area in New Zealand.

Given that it is estimated that 20% of the forest area is owned by small forest owners, which were not targeted, then the response rate and coverage by area was very good (89% of that targeted).

A spread sheet summary of the replies is attached to this report as appendix 1. The company names have been removed for reasons of confidentiality.

A copy of the questionnaire is also attached as appendix 2.

Note:

QUESTION 5

There appears to have been a problem with the way question 5 was worded, which lead to it being answered in a number of different ways. The information from this question is of little use in its current form and more information would need to sought from the respondents if this information was required for completing some data analysis. The answers to question 5 have been summarised in the spread sheet,

however care should be taken in trying to interpret anything from the figures presented for this question. For question 5 some respondents gave an answer relating to their entire forest estate and some gave an answer relating only to the land being reestablished or newly established. Some answers were given as a percentage, and some as an area figure. Where a percentage is given there was no indication as to wether the percentage figures relate to the whole estate or only to the new land.

SUMMARY OF REPLIES

Question 1.

Area of forest - Total of 994,908 hectares covered in 25 replies, estimated to be 70% of New Zealands plantation estate.

Question 2.

Area logged per annum (NZ total).

1995

1996

1997

21,726 ha

21,108 ha

21,825 ha

Question 3.

Area re-established per annum (NZ total).

1995

1996

1997

23,085 ha

20,718 ha

21,773 ha

106%

98%

99%

Figures as percent of area logged in Q2

The replies to questions 2 & 3 shows that virtually all of the land being clear felled by the major forestry companies is expected to go back into plantation forest. There are some minor discrepancies, which can be explained by the difficulty in re-establishing blocks that are being harvested during the planting season. These may have to be carried over to the next years planting this gives some variation around 100% replanting for each years harvested area.

Ouestion 4.

Area of new establishment.

1995

1996

1997

12,141 ha

19,910 ha

19,600 ha

There are various estimates of the amount of new area being planted in trees, these range from 60,000 to 90,000 ha per annum. The NZ Forest Owners Association and Ministry of Forestry figures for 1995 are 85,000 ha.

Based on the questionnaire replies the major forestry corporates (70% to 80% of existing forests) are accounting for around 15% of the total new planting. It is also worth noting that two companies dominate the new land figures.

One company is anticipating planting 6,000 ha per annum for the next two years (96/97), in two different regions. This is 30% of the total in the survey.

The other company planning large scale new land planting reported that it will be planting 8000 to 9000 hectares per annum of new land for the next two years, or 45% of the new land planting reported in the survey.

Together the two companies account for 75% of the new land to be planted by major forestry companies.

Question 5.

Area of establishment by soil type.

Very little can be interpreted from the answers received.

Question 6.

Types of mechanical site preparation use by soil type.

	Clay	Loam	Pumice	Scoria	Sand	Gravel	Granite	Schist	Other
Windrow, exc	10	3	3	1	3	4	2	1	-
Rip-mound	4	1	1	1	1	4		-	_
Rip	3	2	_	-	-	_	-	-	-
Spot mound	2	2	3	2	1	1	2	-	-
Roller crush	3	1	5	1	1	1	-	-	-
Line rake	2	-	-	_	-	-	-	_	_
Mulch	1	-	-	-	-	-	-	-	-
V-blade	_	_	1	1	-	-	-	-	3

The main feature here is that a great deal of the mechanical site preparation is focussed not on the cultivation of soils but on the treatment of slash. 60% of operations noted are for slash treatment.

Question 7. Why those site prep operations were used.

	Improved Access	Better growth	Compac- tion	Drainage	Frost	Tree stability	Retain Nutrients
Windrow	10	-	_	_	_	_	_
Crush	6	-	-	_	_	-	-
Rip mound	-	1	7	6	4	1	-
Spot mound	-	2	_	2	2	-	-
Mulch	_	-	_	-	-	-	1
V-blade	1	-	-	1	1	-	-

The number of responses where improved access to the site was given as the reason for mechanical site preparation (MSP) was 17, the total of all the other reasons given was 28.

The main reasons reported for ripping and mounding are to alleviate compaction and to improve drainage (13 of 19). Mounding to alleviate frost was also a common reason for ripping and mounding. Better growth was reported to be a justification for ripping and mounding in only one reply. However, if compaction, drainage and frost problems are alleviated some growth response would be expected.

Question 8. Cost of mechanical site preparation operations (\$ per hectare, average and range).

	Windrow	Windrow	Line	Rip	Spot	Towed	Gravity	V
	Bulldozer	Excavator	Rake	Mound	Mound	Roller	Roller	Blade
Average	255	360	245	315	480	270	430	230
Range	275 -	150 -	140 -	175 -	160 -	135 -	180 -	175 -
	350	700	400	500	800	320	700	325
No. of					**************************************			
companies	4	15	6	6	9	7	12	6

Despite their high cost's excavator windrowing and gravity rolling are being widely used, to clear or crush slash and improve planter access on steep sites with heavy slash loads.

Spot mounding had the highest cost and the widest range of costs. Spot mounding can do slash treatment at the same time as the mounding. With ripping-mounding slash treatment is often necessary prior to the ripping mounding.

Question 9.

What is the net economic gain from these operations?

Seven replies said that the net economic gain was not known, one of these added that it was believed to be there. Many of the replies gave answers such as improved growth or better survival, but no quantification of the figures.

Some replies said that without the mechanical site preparation there would be no crop so the economic gain was being able to plant at all.

Reduced silvicultural costs	11	(for subsequent operations, planting, releasing)
Increased growth	6	1 1 11 51 65 11 11 11
Increased survivals	9	
Greater plantable area	5	
Makes the land plantable	3	(related to both slash and cultivation)
More even growth	5	(including more even stocking)

It would appear that although the benefits of it have not been quantified, a lot of effort is going into improving the site for planting. Treating the slash to improve access and cultivating the soil to improve ease (and quality) of planting are major reasons for mechanical site preparation. This indicates recognition of the fact that good planting and releasing treatments are vital to getting a well-grown uniform crop.

Question 10.

What restrictions are imposed that limit choice or use of mechanical site preparation.

RMA 7
Cost 7
Company Policy 7
Regional Authority 4

Soil erosion 4 (slope limits on cultivation operations)

Waterways 3 (limits on proximity to streams for cultivation operations)

NZFOA/

Forest accord 4

From the above figures it would appear that the company polices and cost restrictions are having at least as big an impact as external restrictions from the RMA and Regional Authorities.

Question 11.

Comments.

At the end of the survey respondents were invited to offer general comments, the list below is a representative summary of those comments.

The aim of mechanical site preparation (MSP) is to improve soil conditions and reduce weed growth.

Cost effectiveness of MSP is not clear.

MSP for frost amelioration is a major factor.

Compaction or compact soils are a problem.

Optimum solutions to frost compaction issues are not clear.

Drainage and mounding on wet clay soil is essential.

Choice of MSP is based on slope, harvesting method and slash volume before soil type. Sometimes more expensive (short term) methods are chosen with a long term perspective. (If we do it carefully now we won't have the option removed by Regional Authorities).

Good management of MSP should ensure that Regional Authorities do not use the RMA to stop MSP operations.

A combination of cultivation, fertilisation and oversowing improves soil fertility and site productivity.

More research is needed on the effects of harvesting and compaction on tree growth and ameliorative techniques.

Bulldozers are not suitable for low impact site preparation operations. Excavator based operations produce a better quality of operation.

SUMMARY

There seems to be very little in the way of hard data to justify many site preparation operations, except for the Northland clays where figures for growth benefits from cultivation and fertilisation are well known.

There are some cases where ripping is required to be able to plant at all (gravels).

There is a lot of doubt on some of the pumice plateau sites about what the best treatment is and what the benefits are

The treatment of slash and its effect on the establishment and growth of the crop is at least as big an issue as cultivation.

Excavator based operations have proved very popular in recent years, even though they are often more expensive than bulldozer based equivalents. They are considered to produce a better quality job with less impact on the site in terms of disturbance.

There are a number of instances where Regional Authorities are having a significant effect on re-establishment operations, one reply stated that "Resource consent conditions to harvest do not allow site prep; eg cultivation, burning or blanket spraying."

Although the replies did not contain much information in terms of hard data on the benefits of mechanical site preparation it has provided a good base of information on the treatments being used, why they are being used and the scale of operations.

The least information gained was on the subject of soil type as it relates to cultivation. However, the comment was made that other factors (slope, slash, harvesting method) are more important than the soil type in making site preparation decisions.

Appendix 1

Response No. 1 2 2 3 4 4 5 6 7 7 11 12 12 13 14 15 16 17 18 19 20 21	FOREST AREA(ha) 4000 188000 33000 30000 5300 11500 31000 25030 54000 111115 30000 30000 18000 118000 118000 1139000 116384 30000 25100 40000		\$6000000000000000000000000000000000000	1997 129 5000 700 1200 150 250 600 0 0 200 300 240 400 400 442 500 0 0	RE-ES 1995 0 6000 6000 6000 280 280 820 885 200 360 120 775 1085 250 600 4000 425 300 0	AFEA RE-ESTABLISHED 1995 1996 119 0 0 1 6000 5000 50 6000 600 8 700 1000 1 280 130 1 400 400 2 885 0 2 200 200 2 360 325 3 120 180 2 775 775 775 7 1085 720 9 250 300 4 400 400 400 4 425 431 4 300 400 5 11200 1100 11 11200 1100 11	ED 1997 129 5000 800 1100 150 600 600 600 220 2240 2240 2240 2240 2400 240	NEW ESTABLISMENT	5 8 3 3 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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5	5300	130	150	150	280	130	150	0	60
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7	31000	600	500	600	820	500	600	100	1000
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14	18000	250	300	400	250	300	400	0	250
15	33000	650	700	700	600	650	700	0	0
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21	11000	35	35	35	35	35	35	450	550
22	16000	150	0	0	150	0	0	1000	1000
23	67000	2000	2000	2000	2000	2000	2000	0	0
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Appendix 2



Mechanical Site Preparation Survey

For the Site Management Co-operative

Introduction: This survey is intended to provide information from Zealand forest industry on the range of mechanical site and the reasons for using them. The emphasis is on soi costs and benefits of the treatments specific to different	preparation operations available l cultivation treatments and the
Company Name:	
Region:	
Respondent:Contact Number:Date:	
Note: All data provided will be summarised and prese confidentiality of individual companies. Please return replies to;	ented in way that preserves the
Peter Hall, LIRO P. O. Box 147 Phone Fax Rotorua (07) 348 7168 (07) 346 2886	
Questions 1. What is your company's area of fores ha.	t (net) in your region?
2. What area of forest is logged per annum?	1995ha 1996 ha

	1997	ha
3. What area of cutover is re-established per annum?	1995	ha
	1996	ha
	1997	ha
4. What is the area of new establishment per annum?	1995	ha
por minum.	1996	ha
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	1,7,7,	114
5. What is the total area of establishment by soil type?		
Clayha		
Loam ha		
Pumiceha		
Scoriaha		
Sand ha		
Gravelha		
Otherha (please state soil type)		
6. What mechanical site preparation operations are cur soil types). That is: windrow, rip-mound, spot mound, etc. Clay Loam Pumice Scoria Sand	rently used	d? (for different
Gravel		
Other(please state soil type)		
7. Why are these operations used, (by soil type)? That these site preparation operations in each soil type?		
Clay		
Loam		
Pumice		

Scoria	
Sand	
Gravel	
Other (please	state soil type)
8. What do t	he mechanical site preparation operations you use cost?
Windrow	
- Bulldozer	\$ ha
- Excavator	\$ha
Line rake	\$ ha
Rip-mound	\$ ha
Spot mound	\$ha
Roller crush	
- Towed	\$ha
- Gravity	\$ha
V-blade	\$ ha
Scarification	\$ha
Other (please	state method)
\$ha,	
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0 Whatiath	
	e net economic gain form these operations?
10. What re	strictions are imposed (by either regulatory bodies or company
policy) that li	mit your choice or use of mechanical site preparation?
No. 7	

11. Comments.				
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