

**NZ FRI/INDUSTRY
RESEARCH COOPERATIVES**

MECHANICAL SITE PREPARATION SURVEY

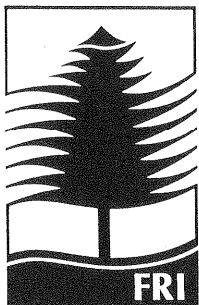
By

P. HALL

REPORT No. 79

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**NEW ZEALAND FOREST SITE MANAGEMENT
COOPERATIVE**



**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 questionnaires 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 be 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 re-established 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 whether 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 Zealand's 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 show 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 year's planting; this gives some variation around 100% replanting for each year's harvested area.

Question 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	Compaction	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 Bulldozer	Windrow Excavator	Line Rake	Rip Mound	Spot Mound	Towed Roller	Gravity Roller	V Blade
Average	255	360	245	315	480	270	430	230
Range	275 - 350	150 - 700	140 - 400	175 - 500	160 - 800	135 - 320	180 - 700	175 - 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	
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 policies 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

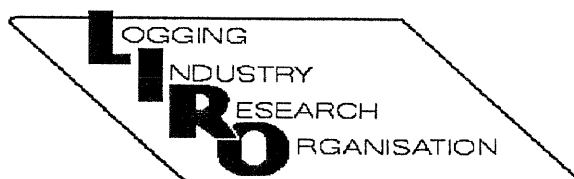
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				Question					
			5						
SOIL TYPE AND AREA OF ESTABLISHMENT (ha)									
clay	loam	pumice	scoria	sand	gravel	sandst.	granite	shcist	
400	0	0	0	0	500	1600	0	1500	
60	570	2280	1710	1140	0	0	0	0	
2500	0	0	0	0	400	0	0	0	
27000	0	1500	0	0	1500	0	0	0	
75	0	0	0	0	0	0	115	0	
11385	0	0	0	0	115	0	0	0	
31000		0	0	0	0	0	0	0	
1171	0	0	0	0	0	0	0	0	
49400	0	0	0	3000	0	1600	0	0	
11115		0	0	0	0	0	0	0	
520	0	0	0	210	0	0	0	0	
100					450	150	50		
480	1400	6120	0	0	0	0	0	0	
	250			50					
250					350				
2000	40000	0	0	0	0	0	0	0	
242	1400	0	0	183	0	0	0	0	
0	0	0	0	0	930	0	0	0	
25100									
100					800		200		
7000					4000				
0	0	200	0	0	0	0	0	0	
200	100	500	1200	0	0	0	0	0	
		400							
1000				500					
2E+05	43720	11000	2910	5083	9045	3350	365	1500	

[illegible]

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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 and to members of the New Zealand forest industry on the range of mechanical site preparation operations available and the reasons for using them. The emphasis is on soil cultivation treatments and the costs and benefits of the treatments specific to different soil types.

Company Name: _____

Region: _____

Respondent: _____

Contact Number: _____

Date: _____

Note: All data provided will be summarised and presented in way that preserves the confidentiality of individual companies.

Please return replies to;

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 forest (net) in your region?
_____ ha.

2. What area of forest is logged per annum?

1995 _____ ha

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
1996 _____ ha
1997 _____ ha

5. What is the total area of establishment by soil type?

Clay _____ ha
Loam _____ ha
Pumice _____ ha
Scoria _____ ha
Sand _____ ha
Gravel _____ ha
Other _____ ha (please state soil type)

6. What mechanical site preparation operations are currently used? (for different soil types). That is: windrow, rip-mound, spot mound, etc.

Clay _____
Loam _____
Pumice _____
Scoria _____
Sand _____
Gravel _____
Other _____ (please state soil type)

7. Why are these operations used, (by soil type)? That is, what are the benefits of these site preparation operations in each soil type?

Clay _____

Loam _____

Pumice _____

Scoria _____

Sand _____

Gravel _____

Other (please state soil type) _____

8. What do the 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, _____

\$ _____ ha, _____

\$ _____ ha, _____

9. What is the net economic gain from these operations?

10. What restrictions are imposed (by either regulatory bodies or company policy) that limit your choice or use of mechanical site preparation?

11. Comments.

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