

## DIFFICULT TERRAIN FOR HARVESTING: WHAT IS IT AND WHERE IS IT?

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### INTRODUCTION

Difficult terrain for harvesting can mean different things to different people. For the logging planner, it may mean a lot more time planning roadlines and landings on difficult areas.

For the logging manager, it may mean a lot more time talking to adjoining landowners, it may mean having to accept higher harvesting costs through the adoption of more costly harvesting and roading practices.

For the logging contractor, it may mean much more operational planning of areas that are steeper or more broken.

For the logger on the ground, it may mean a much greater physical effort getting up and down steep hillside.

For the soil conservator or his counterpart in the Regional Council, it may mean much more time spent walking the area before issuing permits and much more time monitoring operations.

For the local resident over-looking the forest, it may mean a picturesque view becoming a landscape of roads, landings, sidecast spills and slash heaps for the next few years.

For the rural landowner who draws his water from the stream draining from the

forest, it may mean discoloured drinking water for the next few months.

This may seem like a rather gloomy prognosis - but for difficult terrain, it is the reality. The challenge is to balance the economic costs and the environmental impacts in a manner that is socially and politically acceptable.

For the purpose of this paper, I have considered difficult terrain for harvesting to be terrain which imposes additional constraints on harvesting operations that are over and above those normally experienced in the area.

There are many factors that can impose constraints. In this paper, they have been grouped under five headings. These are:

1. Soil and water issues.
2. Other environmental issues.
3. Operational factors.
4. The forest resource.
5. Social and political issues.

These headings are a convenient means of identifying a range of important factors from a complex mass of interlinking issues. They will not occur in isolation.

### SOIL AND WATER ISSUES

Traditionally, soil and water issues have been important in most logging

operations and will continue to be important. In difficult terrain, soil and water issues become more important, particularly on steeper slopes and on more erodible soils.

One method of assessing the potential erodibility of a site is to use the land use capability classification system developed by the Water and Soil Division of the Ministry of Works and Development from an American system during the 1960's and early 1970's.

This used information on certain site characteristics; these included soil type, geology, slope, vegetation cover and active erosion. This information was used as a basis for classifying areas of land in terms of its productive capability and its potential for sustainable use into a land use capability (LUC) class, subclass and unit. New Zealand was mapped in the early 1970's and the information on vegetation cover was updated in 1983. This information has been used by planners, soil conservators,

**Table 1: Plantation forest area (in thousands of ha) by regional council, on hill country with severe limitations for productive use.**

Regional Council	Area under LUC subclass		Total area under 7e and 8e	Total plantation area in region	As % of total plantation area
	7e	8e			
Auckland	15.8	0.8	16.5	40.6	41
BOP	55.0	11.4	66.4	239.6	28
Canterbury	2.1	0.0	2.1	56.2	4
Gisborne	43.7	2.4	46.1	61.9	75
Hawkes Bay	14.2	5.5	19.6	71.5	27
Manawatu - Wanganui	13.4	1.7	15.1	46.5	33
Nelson - Marlborough	80.5	3.6	84.1	125.6	67
Northland	37.1	3.8	40.9	92.7	44
Otago	2.8	0.0	2.8	72.6	4
Southland	0.2	0.0	0.2	24.7	1
Taranaki	1.5	0.0	1.5	3.8	38
Waikato	53.8	6.4	60.2	305.5	20
Wellington	8.3	0.1	8.4	20.3	42
Westland	15.1	0.3	15.4	38.0	41
<b>TOTAL</b>	<b>343.4</b>	<b>36.1</b>	<b>379.5</b>	<b>1199.5</b>	<b>32</b>

Source: DSIR Land Inventory Database ca. 1983

foresters and others as a broad land use planning tool.

The LUC class ranges from 1 to 8, in terms of increasing limitations on use. The subclass identifies whether the major constraint for its use is erosion, soil, wetness or climate.

LUC data from the database held by the DSIR Land Resources Group in Wellington have been extracted. The results are summarised in Table 1 by regional council for subclasses 7e and 8e. These are subclasses with severe limitations on their use because of their erosion potential, but they are often suitable though not necessarily desirable for plantation forestry. The information on the plantation estate was collected around 1983, as part of the updating of the 1976 data.

The results indicate that, in absolute terms, the region with the largest area of "difficult" terrain is Nelson - Marlborough (84,000 ha); followed by Bay of Plenty (66,400 ha) and Waikato (60,200 ha) and then Gisborne (46,100 ha) and Northland (40,900 ha).

If expressed as a percentage of the forest area in each region, then Gisborne leads (75%), then Nelson - Marlborough (67%), followed by Northland (44%), Wellington (42%), Auckland (41%), Westland (41%), and Taranaki (38%).

At the lower end of the scale is Canterbury (4%), Otago (4%) and Southland (1%). By comparison, the national figure is 32% of the plantation forestry area.

A different system of classification was proposed by Hunter et al (1988), who grouped New Zealand soils into four classes of susceptibility to productivity decline. This was based on their

nutrient status (susceptibility to depletion) and on their susceptibility to compaction. However, there was no indication of the area of forests established on these soil types.

## 2. OTHER ENVIRONMENTAL ISSUES

The second category of "Other environmental issues" cover a wide range of values. These include:

- scenic values
- cultural values
- recreational values
- scientific and ecological values
- off-site impacts

These environmental issues will be locally important in all regions. They will also be regionally important in a number of localities, and include:

- the scenic backdrop formed by plantations in the Coromandel, in Whakarewarewa and Hanmer Forest Parks, in the Marlborough Sounds, and alongside public high ways in areas like Rai, Hira and Golden Downs Forests.
- recreational values in Hanmer and Whaka Forest Parks, and in plantation forests like Riverhead and Woodhill located close to major urban centres with a tradition of recreational use.
- off-site impacts in the forests draining directly into Marlborough Sounds and in the Maori lease forests draining directly into Lake Taupo.
- cultural values in coastal forests and in areas adjoining major lakes, close to the Maori settlements in pre-European times. Waiuku forest is one of

the better known examples.

### 3. OPERATIONAL FACTORS

Operational factors are the factors that are under the direct control of the people managing the operation and include both human resources and harvesting systems. The constraints imposed by difficult terrain will be magnified if there is either a shortage of experienced planners, a shortage of experienced contractors, or a shortage of the appropriate type of logging equipment.

The recent influx of least 14 North American haulers, predominantly four-drum machines, over the last 12 months or so, recognises the increasing amount of difficult terrain coming on stream, particularly in the Nelson, East Coast, Hawkes bay and Coromandel regions.

### 4. THE FOREST RESOURCE

The changes in the forest resource have been well documented in previous LIRA seminars. Hill country forests were examined by Peter Olsen at the 1989 LIRA seminar on Cable Logging. Average rotation lengths are down to less than 30 years of age. This, coupled with wider initial spacing and heavier early thinnings, are producing shorter trees and heavier branching, substantially increasing delimiting requirements.

High debt/equity ratios from recent acquisitions have imposed severe financial pressures on some of the major forestry corporates. Reducing the level of debt has been a factor in driving the substantial increases in plantation roundwood removals; these rose from 9.8 million m<sup>3</sup> in the 1988 calendar year to a provisionally estimated 13.9 million m<sup>3</sup> in 1991, a 42% increase over a three year period.

There has also been a substantial increase in demand for the smaller size logs, particularly K grade logs, from the woodlot resource. Frequently, stands in their early twenties have been clearfelled, producing concern about the quality of timber cut from these youthful stands and their effect on the long term goal of moving radiata pine into higher value markets.

Large areas of woodlots and small forests, planted in the early years of the Forestry Encouragement and Loan Schemes, are now coming on stream. Many of these woodlots were planted by farmers and other landowners at a time when pastoral farming ruled supreme. As a result, many of these small woodlots were planted on the "dirty back acre", often on eroding hillsides or in weed-covered gullies. These areas provide major challenges for efficient harvesting and roading, and were well described in the 1985 LIRA seminar on Limited Scale Logging.

Efforts to obtain economies of scale for smaller forest owners through co-operative harvesting and marketing appear to have had limited success to date, perhaps through the small number of stands, the wide range of age classes, and the limited number of markets. New Zealand's woodlot owners are reluctant to give up their independence to market their woodlots. Unless co-operatives can offer markedly better product prices and reduced harvesting charges, then they will not survive in New Zealand's deregulated market environment.

### 5. SOCIAL AND POLITICAL ISSUES

Social and political issues are these issues that are discussed by forest owners in their dealings with district and

regional councils. Traditionally, this has focused on roading issues and on a number of issues coming under the umbrella of the 1978 Town and Country Planning Act. These included protection of high quality farmland, protection of the physical and social rural infrastructure and protection of indigenous forests. To achieve those goals, a number of councils zoned extensive areas of rural hill country as conditional use for plantation forestry. This resulted in much antagonism amongst forestry companies and a number of appeals were lodged with the Town and Country Planning Tribunal with varying degrees of success.

The Town and Country Planning Act and a large amount of other legislation was replaced in 1991 by the Resource Management Act. A major philosophical change in this Act was its emphasis on sustainable land use and its requirements for local authorities to focus on the effects of different activities. This Act should provide major opportunities for forestry development, particularly where existing rural land uses may not be sustainable. It is, however, somewhat of a double edged sword, as planners and managers of forestry operations will need to consider their impact not only on soil and water values, but on a whole range of other environmental values. This was foreshadowed by development and production of the New Zealand Forest Code of Practice by LIRA.

There are now more than 50 district councils and 14 regional councils currently deciding how they are going to deal with this legislation. Similarly, there are a number of forestry organisations also discussing this approach, with some co-ordination by the NZ Forest Owners Association, who have been developing a regional land

use policy. Approaches by different councils vary but, not surprisingly, councils which have some in-house forestry expertise appear to have a more focused and a more consultative approach than those without that expertise or the forestry industry contacts.

Although it is early days and we are still in the two year transitional phase from the old to the new legislation, well-managed forestry operations should not be unduly impeded.

Access for logging trucks from forests to public highways on district council roads have frequently been a bone of contention between companies and councils, particularly in newer forestry areas when logging trucks first start travelling down roads that have been sealed to provide a "dustcoat", but lack an adequate sub-base.

Well-established companies with forests well into their second rotation seem to have negotiated satisfactory arrangement with district councils in areas like Nelson, but there have been some violent reactions from district councils like Rodney and the Western Bay of Plenty. The issue is further complicated by government reluctance to return all the revenue collected from Road User Charges to the roading authorities. While situations vary, it would be helpful to develop guidelines developed that recognise the interests, the financial contribution and the responsibilities of different parties.

## CONCLUSIONS

Difficult terrain exists in all forestry regions in New Zealand. The proportion that can be described as difficult terrain varies widely between regions with their distinct regional land

forms.

Gisborne and Nelson - Marlborough have the highest proportion of plantation forests on steep hill country with severe constraints to productive use. Other environmental values occur on most forests but are more significant in areas like the Marlborough Sounds and in Hanmer and Whakarewarewa forest parks.

Investment in more sophisticated hauler technology will allow a more flexible approach to the harvesting of difficult terrain; there should be substantial productivity gains as hauler contractors and their workforce move up the learning curve, reducing harvesting costs.

The increasing number of woodlots approaching maturity will continue to pose challenges in terms of their location and size, and will inevitably result in increased harvesting costs.

The Resource Management Act brings a whole new series of challenges and opportunities, with its emphasis on sustainable land use and its focus on the effect of different activities on a range of environmental values. The Forest Code of Practice provides a useful basis for companies and regional councils to develop local guidelines for forestry operations. However, high impact operations in areas with important environmental values can expect much closer scrutiny in future.

In conclusion, the forest industry has the opportunity to harvest difficult terrain with relatively few constraints at present, especially when compared with similar operations overseas. It has shown the ability to successfully undertake operations on difficult terrain in the past. It must continue to do to a high standard in the future if it is to maintain

its credibility and the latitude it currently enjoys.

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