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MANAGEMENT CONSTRAINTS ON MACHINE PRODUCTIVITY

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INTRODUCTION

A logger is the interface between the Forest Owner and the utilisation plants that ultimately use the wood. Each places its own constraints on the harvesting operation.

The Forest Owners objective is to maximise the return from the forest. Harvesting operations must minimise damage to the developing crop, and protect the productive area of the forest. To achieve this the Forest Owner must form guidelines for harvesting operations to work under.

The utilisation plant also places certain restrictions on the product. A purchaser often needs a particular species mix, or log quality and quantity.

How they do these rules, regulations and specifications effect the loggers choice of systems, and machines, as well as influence machine performance and productivity. This paper briefly discusses the major points that restrain logging productivity.

1. THE FOREST OWNERS CONSIDERATIONS

It is probably the Forest Managers dream to grow the greatest volume of wood in the shortest possible time. Although the logger assists in attaining this goal by production thinning and efficient harvesting, stringent rules are accepted as normal in most logging operations.

a) Thinning

Naturally production thinning growing stands is a sensitive operation. Not only must damage to the remaining crop be minimised, but the area lost due to road and landing construction, is equally important. This area will remain unproductive for the remainder of the rotation which may be up to twenty years. Hence careful planning is required to ensure roads and landings are located in order to minimise the loss of productive area, but at the same time ensure that the extraction is economically viable.

The terrain to be logged usually dictates the machine to be used and thinning is no exception. The final selection is also influenced by

- (i) Thinning density
- (ii) Volume removed
- (iii) Type of thinning, e.g. selection or row thinning
- (iv) Piece size.

Generally production thinning operations in New Zealand favour motor-manual methods, due in part to a readily available labour source and the high capital cost of highly mechanised systems. Machine selection is therefore confined to skidders, haulers and tractors, the choice is usually influenced by topography.

The skidder dominates as the most efficient and widely used machine for thinning. In marginal areas with a small piece size these machines are often quite old as drag volumes are usually small.

However, where thinnings are more intensive, and the piece size is larger, a machine capable of extracting higher volumes is required.

Where daily production is low, and provided the number of sorts and their complexity is minimised, the sorting of produce at the landing can be handled by the skidder. As production rates increase, and the piece size larger, a rubber tyred loader is often needed to sort and load the days production.

#### b) Clearfelling Operations

Compared with thinning the need to comply with silvicultural constraints is not as demanding, although it still exists.

The protection of the environment and in particular soil and water values is probably the most significant restraint. As public awareness of the environment has increased, so has the pressure to control logging operations. This has brought a number of operations to a halt. To date these have been confined to the dwindling indigenous resource. In the years to come as logging operations move into the sensitive headwaters of major rivers and streams, we may be faced with the halting of operations in these sensitive areas.

As with thinning operations machine selection is primarily determined by topography and then modified by operational constraints. The choice of machine type and logging system will determine the roading density. Generally road density becomes lower in steeper terrain and the longer haul distance and nature of the country means that a cable operation will be used.

The transport system also influences roading density and landing size. The larger off-highway vehicles require larger areas for turning and passing compared with the smaller on-highway rigs.

In sensitive areas near permanent water ways, and on unstable slopes, riparian strips may be required. The location of these could restrict access as well as lower the recoverable volume. In addition to this, bridges and causeways may be required to maintain water quality. In cable areas where hauling across streams is permitted, all slash and logging debris will have to be removed.

On sensitive soils we could see the roading density reduced, causing timber to be skidded further than at present and the emphasis on low ground pressure systems. We may see Forewarders employed more in flat areas and cable operations as the country becomes steeper and more broken cable operations may be preferable to countour tracking.

Highly mechanised systems may be unacceptable due to excessive soil compaction caused by the numerous passes of machines confined to access tracks.

## 2. THE PURCHASER'S CONSTRAINTS

Although the restrictions caused by the log purchaser or processor are significant they effect machine productivity to a much lesser extent than those of the Forest Owner. In fact they should not effect the hauling unit at all until the landing is reached. In the past the need for numerous product types to be sorted on the landing has been necessary only where a number of smaller clients are being supplied, each having specifications peculiar to the nature of the end product. For the larger, integrated Pulp mill/Sawmill complex the need for intensive segregation has not been required as wood yards have had the ability to select departmental requirements from the logs delivered on the basis of cut to length without any regard for quality.

There are now definite trends towards complete segregation of all log types in the bush. This has been partly due to the installation of specialised processing equipment in log yards that demand a log size matched to the specifications required by a particular process. Therefore greater responsibility has been placed on the logger to cut the log to the best possible advantage within the specifications. Our timber resource is indeed a valuable one and a proper understanding of the utilisation process it is intended for is most important.

This changing situation has in fact contributed to the switch to rubber tyred loaders as the rope crane machines were unable to cope with the higher number of sorts required.

Where stocks must be held in the bush to accommodate fluctuations in customer demand and usage, the landing must be large enough to accommodate this stock without overly effecting production. This requirement conflicts with the Forest Owners need to minimise landing area.

### 3. SUMMARY

In summary then, machine selection is primarily determined by topography. This choice however, is modified by the often conflicting constraints of Forest Owner and Purchaser.

The choice of hauling machine is influenced largely by the Forest Owner through

- (i) Topography
- (ii) Silvicultural constraints
- (iii) Environmental considerations

all of which affect the roading density and hence the economic viability of the operation.

The need for a machine to sort and load produce on the landing is largely determined by the Purchaser.

Finally, in years past most loggers have shown their ability to meet the ever changing demands of both the Forest Owner and the customer. The constraints imposed will continue to be met so long as the added cost is also recognised.