SESSION 8
Paper (a)

A REVIEW OF THE FUTURE LOG RESOURCE AND ITS TRANSPORTATION RESEARCH NEEDS

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SUMMARY

From a brief review of the log resource to 1995 the following transportation research needs are identified:

(i) Short log cartage

The requirement for short log cartage capability is predicted to increase significantly. Previous LIRA work comparing the economics of different log truck layouts needs to be updated, particularly in the light of recent experience with 'Bailey Bridge' type units. The place of self loading trailers in short log cartage needs to be looked at too.

(ii) Roading Standards/Truck Specifications

Growth in log transportation in areas with marginal road infrastructure points up a need to summarise and disseminate the available knowledge on road/truck interaction.

Other points of interest:

- Road transport of logs and chips will consume 5 to 6% of the nation's diesel usage by 1995. Diesel usage by all transport modes within the industry i.e. road, rail and offroad, hauling logs, chips and mill products will be 8 to 10% of the nation's total.
- New capital expenditure on trucking for forest products from 1981 to 1995 will be approx. $38 million (in 1981 $).

INTRODUCTION

This paper briefly reviews information concerning the wood resource and its transportation needs in the next 10 to 15 years.

Primary interest is in the resource information of the 1980's and early 1990's - the Transportation Working Group considered that the immediate research needs concerned the next generation of investment decisions in trucks, covering a 7 to 10 year life.

The resource up to 1995 is looked at under three headings;

- Volume
- location
- Nature

VOLUME

The regions showing significant increases in yield forecast in the second half of the 1980's are:

- N.Northland
- Rotorua (Coastal)
- Hawkes Bay

The really big increases in transportation needs begin occurring in the first half of the 1990's with further expansion in the above areas, plus in:

- King Country
- Wellington/Wairarapa
- Manawatu/Wanganui
- Nelson
- Otago and Southland

Rotorua (Coastal) shows the most significant increase in volume with 800,000 m³ p.a. more to be hauled in 1991-95 than in 1981-85. At an assumed average haul distance of 80 km an additional 50 truck units would be required over current levels.

Detailed analysis of expected forest yields would be of limited benefit to this review as the main decisions affecting transportation i.e. the processing options have not yet been made in many areas.

Of general interest are summaries and conclusions drawn from more comprehensive investigations of the future resource -

- New capital expenditure on trucking for forest products, 1981 to 1995, $83 million (1981 $) (1)

The report also predicts capital requirements for roading, rail, ports and shipping.

- Diesel fuel usage by all transport modes within the industry i.e. road, rail and offroad transport of logs, chips and mill products will total 110 to 150 million litres over the period 1981 to 2005, depending on processing options. In 1994/95 this consumption will be 8 to 10% of the forecast total diesel used in New Zealand. Road transport of logs and chips alone will use 64 to 102 million litres or 5 to 6% of the national consumption (2)

LOCATION

The location of the resource within each region vis-a-vis its likely destination, and therefore the routes and distances it will follow, throws up the critical link between roading and transportation.

The fact that much of the new forest resource coming on stream in the next 10 to 15 years is on back country estates with a much less developed roading infrastructure than we have been used to, has already been the source of much debate and concern. The concern is mainly centred over the adequacy or otherwise of existing rural roading to cope with the high-loading, high-intensity but often short-duration logging traffic, and who will pay for new roading and upgrading and maintenance of existing roads.

In many cases it is concern over future roading which is at the heart of opposition to forest establishment and land use debates.

The truck operator will find himself at the sharp end of this debate when the time comes to haul the logs. In areas where roads are likely to be marginal with respect to strength and geometry (particularly grades) he will need to have some basic technical information to combine with local knowledge in order to make the right decisions regarding truck configuration and job pricing.

NATURE OF THE RESOURCE

Some clear trends come out of examination of the nature of the resource to be transported.

(i) Short logs

An increasing proportion of the resource coming forward in the next 10 to 15 years has been pruned to 6 to 7 m height and forest owners will obviously be looking to segregate this most valuable part of the crop at the landing.

Merchantable stem height will be shorter and taper greater in early waste thinned areas too which will also produce more short logs in maximising log value outturn.

Transport operators in Canterbury, Wellington and S.Northland areas are no strangers to hauling short logs, but, as developed later in this paper, it is the combination of short logs in areas with marginal road infrastructure that points up some interesting challenges.

(ii) Multiple markets

Recent major studies of log processing options (3, 4) favour solid wood processing near the resource, but conversely the economies of scale in the pulp and paper sector dictate expansion of existing residue using plants. Therefore logs are likely to be transported to a number of different destinations from the same landing.

(iii) Haul distance

Following from the processing location comments in (ii), the likely trend is for sawlogs and peeler logs to be hauled to mills within the region, but pulpwood arisings and wood residues to be hauled longer distances to a few major plants.

DISCUSSION

The location and nature of much of the resource coming forward in the next 10 to 15 years gives rise to conflicting requirements for transportation.

Marginal road standards require trucks with good traction capability, both loaded and unloaded, and good manoevrability. The conventional 5 or 6 axle truck and jinker combination services many such marginal areas throughout the country now.

However, the requirement to handle increasing quantities of short logs, up to 6 m, means double units or skeletal semi-trailer (Bailey Bridge) units. Such units, particularly the Bailey Bridge, offer flexibility to handle a range of lengths but have distinct disadvantages in: traction capability (particularly unloaded), payload size and hauling cost in general.

Table 1 compares the traction capability of common log rigs using the simple relationship suggested by McNally(5)and used by Cornelius (6).

Looking at Bailey Bridges in particular, the economic comparison of different rigs carried out by Gordon (7) following the 1979 LIRA seminar on Log Transport and Loading, estimated the hauling costs of Bailey Bridges to be approximately 20% higher than conventional short or long log units. However, the proliferation of these units since suggests that, at least in their owners' eyes, the benefits of better utilisation through flexibility of log length capability offsets the disadvantages. Payload has improved with reduced tare weight.

There is a need to review the economic evaluations comparing different short log carrying rigs to see if changes in e.g. fuel costs, road user charges, capital costs, tare weights etc. or other factors not previously incorporated such as utilisation, have altered their relative cost effectiveness.

There is more experience now too on folding bolster options which can convert a conventional long log truck to short log carrying.

The recent introduction of self loading self unloading trailers in New Zealand might also be extended to partially or fully piggybacking short log trailers without the need for a large capacity loader at the forest landing, and significant gains in traction capability.

Since in many 'new' forest areas, road construction and/or upgrading work will be taking place with logging trucks in mind it is timely to carry out extension work in this area as a guide to roading engineers and truck operators alike. Most of the basic research has been done, it is mainly a matter of summarising and publishing it in simple usable form.

Two computer-based techniques, which have been used by highway engineers for a number of years, but have had limited application in log transportation to date:

- road digitization. A method of recording the geometry of an existing road

- truck performance simulation. A truck with given specifications is 'run' over the road in a computer. The road can be an existing road as described by digitization above or a theoretical road still on the drawing board.

A recent FERIC Report (8) describes the use of these two techniques in a case study in British Columbia.

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TABLE 1 CALCULATED TRACTION CAPABILITY OF DIFFERENT LOGGING TRUCK CONFIGURATIONS

Truck	Maximum Adverse Grade,*%		
	Empty		
	Trailer down	Trailer up	Loaded
Conventional 5 axle truck and jinker trailer	10	15.2	8.2
Double unit, 6 x 4 truck plus 2 axle trailer	9.5	13.8	8
Double unit 6 x 4 truck plus 3 axle trailer	8.7	14.4	7.4
6 x 4 Tractor plus semi trailer - 'Bailey Bridge'	9.4	N.A.	7.4

* Calculated using formula

$$\text{Grade} = \frac{f. \times A.W. \times 100}{G.W.}$$

where f = coefficient of traction, taken as 0.2 - slippery road

AW = Weight on driving axle(s)

GW = Gross weight of combination