LOGGING INDUSTRY RESEARCH ASSOCIATION
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FUEL FOR LOGGING IN N.Z.

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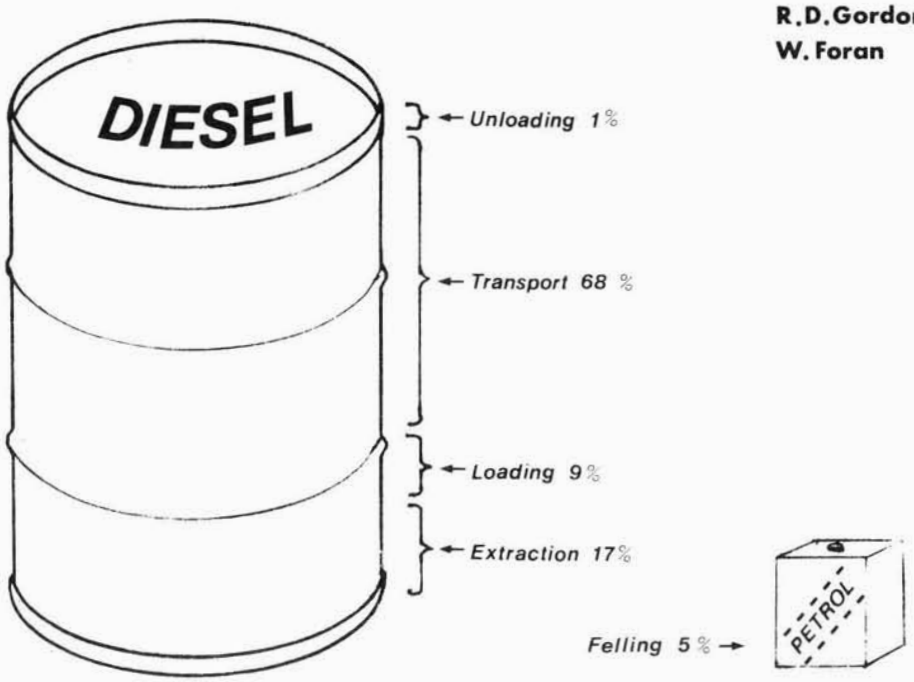

Figure 1. Distribution of Fuel Usage in the N.Z.Logging Industry

INTRODUCTION

The supply restrictions and rising cost of imported fuels into New Zealand has resulted in pressure on users to improve fuel use efficiency.

The logging industry is one user which is almost totally reliant on petrol and diesel fuels. It is, therefore, important that the industry knows the distribution of its fuel usage, and where improvements can be made.

LIRA recently quantified the energy requirements of the logging process so that areas for future research, to effect improvements, could be identified.

ACKNOWLEDGEMENTS

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Fuel usage patterns for various categories of common logging equipment were first established using information from both equipment specifications and actual operators records. This was then used with data on the numbers and sizes of machines in the industry to give an indication of where the fuel is used.

EQUIPMENT FUEL USAGE RATES

For most of the common categories of machines used in the logging process reasonably good correlations of fuel consumption rates versus engine size exist. For all equipment however, there are many factors other than power that determine fuel usage rates, such as rate of working, the load while working, the standard of engine maintenance, the operating conditions, etc. The patterns shown here are indicative only in estimating fuel usage patterns.

CHAINSAWS

The bulk of felling and delimbing is done by chainsaws powered by petrol. An indcation of chainsaw fuel usage rates with saw size is shown in *Figure 2*. The 'actual' fuel usage pattern is based on data from chainsaws used for production logging, whether in thinning, clearfelling, or landing work.

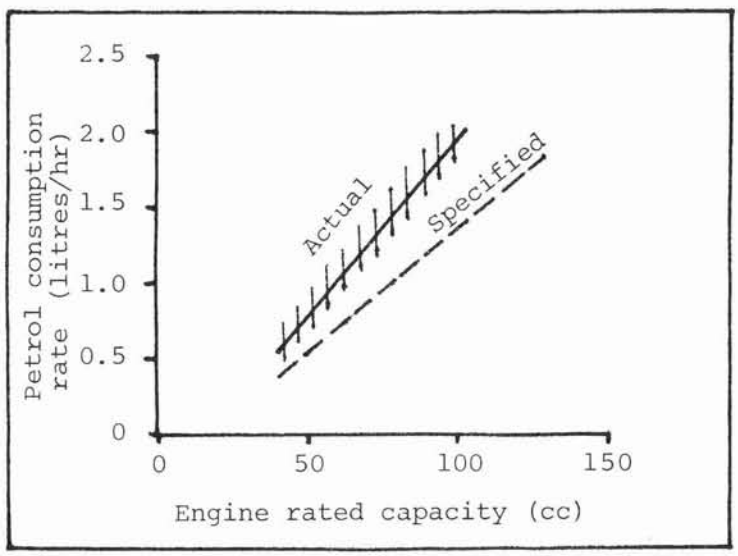

Figure 2. Chainsaws - Fuel Usage Rates

A notable feature is that 'specified' fuel usage rates from equipment specification brochures are lower than those actually achieved in practice. One of the reasons for this is that specified fuel usage rates are measured under controlled working conditions. As well, the difference indicates such aspects as the results of poor engine tuning for fuel economy, the extent of fuel spillage due to in-field refueling practices, etc.

EXTRACTION MACHINERY

'Actual' fuel usage patterns for the common extraction machinery of crawler tractors, rubber-tyred skidders, and cable haulers (which all use diesel) are shown in *Figure 3*. The 'specified' fuel usage patterns for tractors and skidders were almost identical to the rates actually achieved. No comparison of 'specified' with 'actual' was obtained for cable haulers due to insufficient specified data being available in brochures.

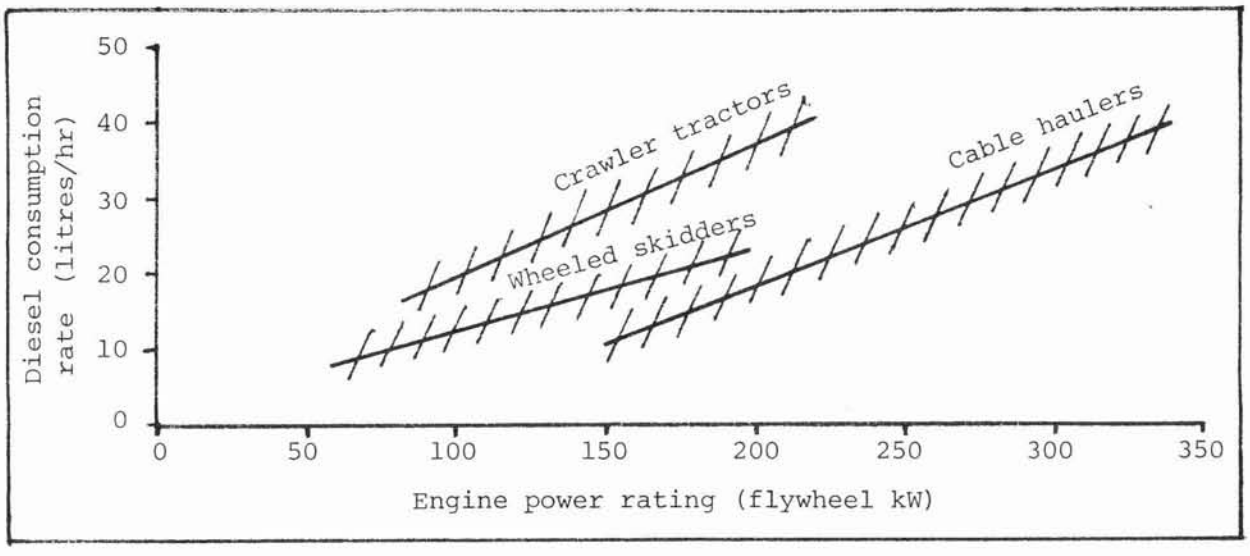

Figure 3. Extraction Machinery - Actual Fuel Usage Rates

While *Figure 3* gives a good comparison of fuel usage rates relative to power between the different extraction machines, the comparative production rates of the different machines need to be taken into account to provide a true comparison. The following table indicates the comparative fuel usage per tonne of wood produced in typical old crop radiata pine logging.

Extraction Machine Type	Typical Engine Size	Fuel Usage Rate	Typical Log Production Rate	Fuel Usage per tonne of Production	Normal Logging Application
CRAWLER TRACTOR	110-150 kW	24 litres/hr	40 tonnes/hr	0.6 litres	Rolling terrain
WHEELED SKIDDER	110-150 kW	15 litres/hr	40 tonnes/hr	0.4 litres	Flat terrain
CABLE HAULER	185-225 kW	20 litres/hr	20 tonnes/hr	1.0 litres	Steep terrain
	300-335 kW	39 litres/hr	27 tonnes/hr	1.4 litres	

Rubber-tyred skidders show up as being the most fuel efficient followed by crawler tractors and then the cable hauling systems. The comparison however, does not account for the fuel requirements involved in road construction, which differs for the various extraction systems. Nevertheless, with the future trend to a greater portion of cable logging being anticipated then more fuel will be required in the extraction phase, unless improvements in the fuel efficiency of cable logging machines can be attained.

LOADERS

The diesel usage data compiled for log loaders showed no significant difference between rubber-tyred front-end loaders and rope-crane type loaders. There was however, a significant difference between 'actual' rates achieved and manufacturers specified rates, as shown in *Figure 4*. The resason for this is considered a reflection of the work cycle for log loaders. Usually only a small proportion of time is spent under heavy work load conditions, such as when loading a truck, and consequently the 'actual' fuel usage rates are lower.

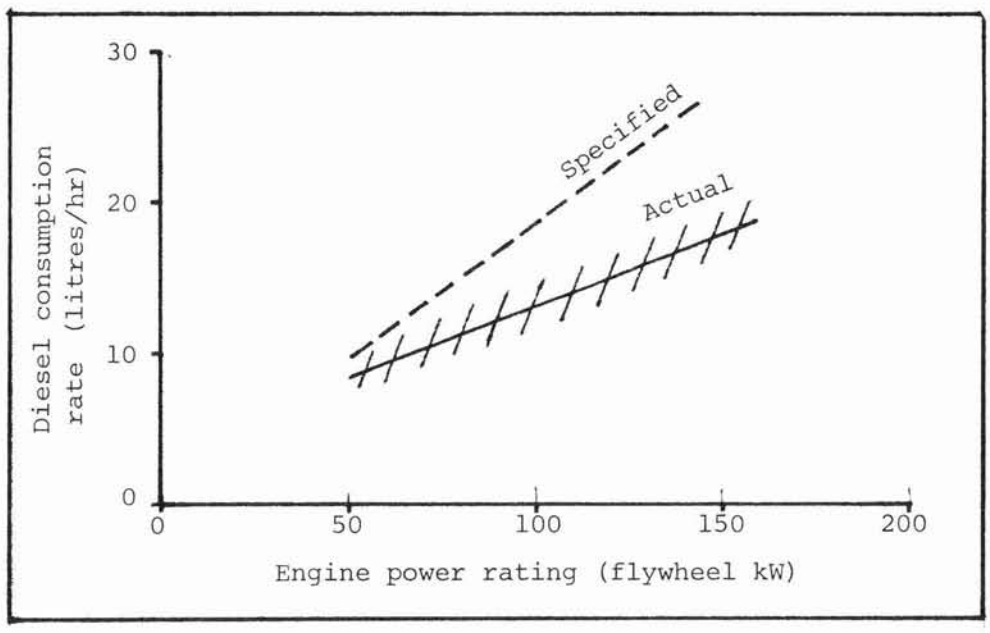

Figure 4. Loaders - Fuel Usage Rates

LOG TRUCKS

While 'actual' log truck diesel usage data was obtained for a large number of trucks, the data covered only a small power range. However, a wide spread of truck gross weight limits and haul types were involved. The spread of results shown in *Figure 5* basically indicates that for the typical log truck operation, fuel consumption rate is not clearly determined by engine size alone. Other factors obviously have a significant influence and these need identification.

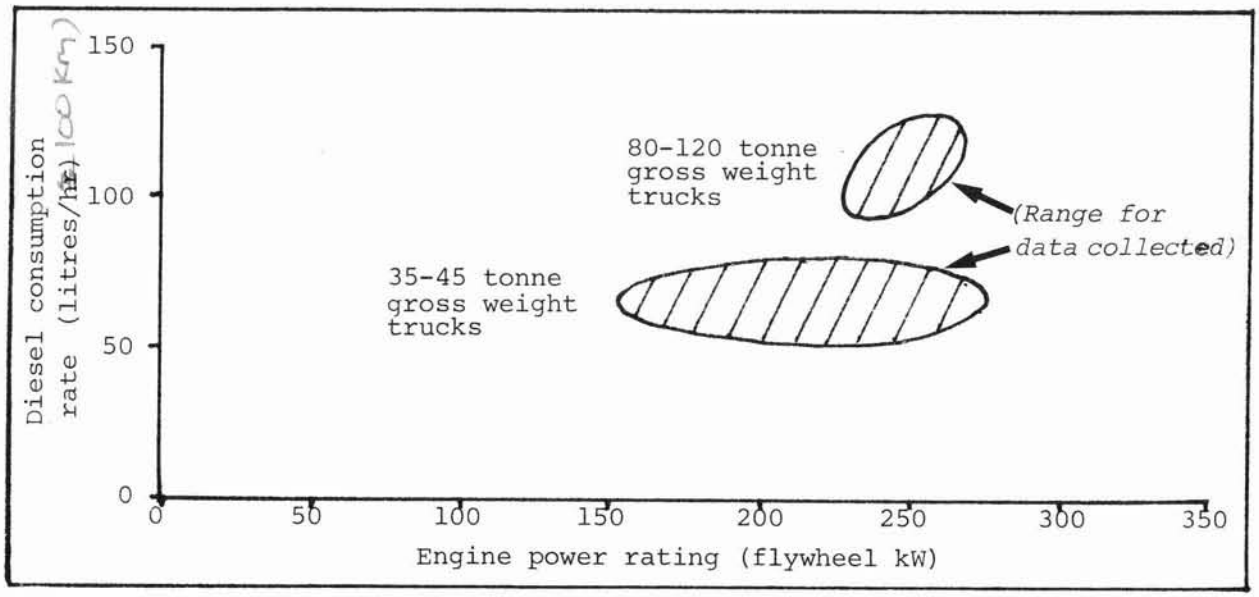

Figure 5. Log Trucks - Actual Fuel Usage Pattern

LOG STACKERS

Only a small sample of 'actual' log-stacker diesel usage rates was available and the results were found to fit into the patterns for rubber-tyred front-end loaders at the high power rating end of *Figure 4*.

THE LOGGING INDUSTRY'S FUEL REQUIREMENTS

Using established information on the number and sizes of machines in use, along with fuel usage patterns derived from this LIRA study, a total current annual industry fuel requirement of 39.2 million litres was obtained. Log production for this period was approximately 9.3 million tonnes. (This compares favourable with the N.Z. Energy Research and Development Committee's 1974 estimate of 38.9 million litres for logging and transport.)

This gross volume of fuel is distributed among the logging and transport phases as shown in *Figure 1* on the front cover.

The notable aspect of this distribution is the large proportion consumed in the trucking of logs from forest to mill or port. Any improvements that can be made to the efficiency of fuel usage for log transport will thus be significant to the industry as a whole.

FUTURE RESEARCH AND DEVELOPMENT

The compilation of this information on fuel usage for logging in New Zealand points to the need for further research and development work in the following areas:

1. Establishing the major factors influencing fuel usage in logging trucks, and investigating means to improve efficiency of fuel usage for transporting logs.
2. Investigating possibilities for improving the fuel efficiency of cable hauling systems.

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