LOGGING INDUSTRY RESEARCH ASSOCIATION

LOG TRANSPORT WEIGHBRIDGE SURVEY NO 1

(A Pilot Study in the Rotorua Area)

As part of LIRA's research in the log transport sector, the use of selected weighbridges to obtain data which typifies the characteristics of trucking rigs being used, and the conditions under which the log trucks in New Zealand operate, was investigated. A pilot study was carried out at Whakarewarewa weighbridge near Rotorua, with the aim of checking the usefulness of collecting data in this manner, and at the same time, indicating some of the main elements that affect log trucking operations. Identification of the main elements of cost in log transport and establishing the most variable and controllable elements, can enable research to be directed to these areas.

This report summarises the data collected in this very limited pilot study, and is presented for those readers who may not be familiar with log transport statistics in this Rotorua area, or who may not be fully familiar with the extent to which some basic aspects affect log truck operation.

LIRA acknowledges the assistance provided by the N.Z.Forest Service staff for enabling this survey to be carried out, and also the log truck operators surveyed who participated with interest in this exercise.

METHOD: The Whaka weighbridge is a focal point for logs being transported from the Kaingaroa and Whakarewarewa Forests and which are destined for mills mainly in the Rotorua area. Much of the trucking is done by owner/operators, a large variety of log types are handled, and the logs have a wide range of destinations, hence a relatively large variation in truck characteristics was expected.

A full weighbridge shift was monitored covering 11 hours, recording approx.20 different items of data for each truck passing over the weighbridge. The data collected covered truck rig aspects (such as truck make, combination axle configuration, power rating, number of transmission ratios, owner, current mileage, current age, etc.), and operational aspects (such as load type, source, destination, pay-load, etc.). The method used was aimed at not interrupting the normal flow of traffic at the weighbridge and involved noting specific detail as the truck arrived, briefly questioning the driver as he waited, and obtaining data from the weighing record sheet.

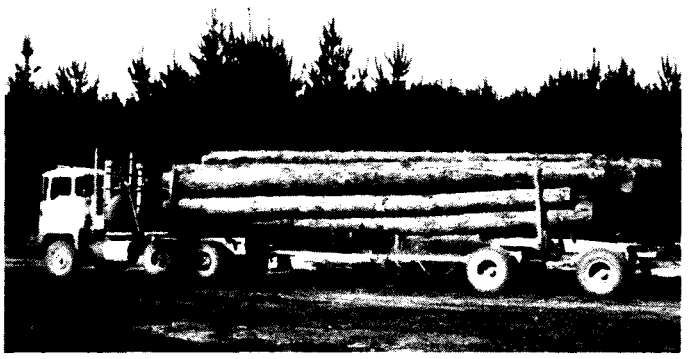
Although the survey only covered one day, the traffic was considered by weighbridge staff to be normal, and indicative of the normal log truck operation for that locality.

RESULTS: A total of 41 different trucks were recorded from 24 different firms and detail on 110 different loads was obtained. In terms of log truck numbers, this represented approximately 5½% of the estimated total number of log trucks in New Zealand and in terms of log quantities carted, represented approximately 6½% of the estimated total New Zealand daily log cartage volume.

The detailed results are as follows:-

A. TRUCK RIG CHARACTERISTICS:

The most common log truck rig layout which showed up in the survey *(see Fig.1)* was a 6 x 4 truck with a 2-axle, 8ft. spaced-axle log trailer set up for carting long length logs. These 15 rigs however only comprised 37% by number of the total trucks as there were eight different layouts recorded in total.



L.I.R.A. Photo

Fig.1.

Of the trucks surveyed, the average characteristics are listed below:

Average truck age:- 3.6 years.
Average truck mileage life to date:- 212,000 miles.
Average truck power rating:- 290 h.p.
Average number of transmission ratios:- 13.
27 trucks had 5 axles, and 14 trucks had 6 axles.
Average 5-axle rig tare weight:- 13.0 tonnes.
Average 6-axle rig tare weight:- 14.4 tonnes.
51% of units were serviced by operators.

In terms of difference in truck layouts, the following table indicates the extent of some popular, but by no means most common, alternatives in layout:

Description	No.of Units	Proportion of Total
Trucks with twin-steer front axles	5	12%
Trucks with three axles in driving set	4	10%
Trucks with conventional long nose cabs	16	39%
3-axle log trailers	5	12%
2-axle 1.8 metre wheel base log trailers	6	15%
Short log cartage combinations	11	27%

A simple indicator of the potential of a highway log truck rig is provided by its legal payload weight to tare-weight ratio. This ratio can be indicative of initial cost (every 0.1 tonne of constructional material, costs from $100 to $500); operating cost (additional tare weight means additional energy consumption used moving the rig itself); and payload value (every kilogram of constructional material reduces legal payload by one kilogram). Individual Class I payload to tare ratios varied from 1.4 on the most lowly rated unit, to 2.0 on the best rated unit. The better Class I payload to tare ratios of similar groups of trucks were provided by:

(a) 6 x 4 trucks with two-axle 1.8 metre wheel-base log trailers for carting long length logs: ratio 1.81 (range 1.68 to 2.02)

(b) 6 x 4 trucks with two-axle 2.4 metre spaced-axle type trailers for carting long length logs: ratio 1.77 (range 1.57 to 2.00)

(c) 8 x 4 trucks, twin steer with two-axle 2.4 metre spaced-axle type trailers for carting long length logs: ratio 1.87 (range 1.78 to 1.97)

(d) 6 x 4 trucks with two-axle shorts trailer for carting short length logs: ratio 1.76 (range 1.59 to 2.00)

It should be noted that the use of payload to tare ratio is limited as an indicator. Logging equipment needs to be sufficiently robust to take the shock loadings that exist in this industry. A rig with a high payload to tare ratio may achieve it without due regard to required strength and

robustness and this would show up over the vehicle life in terms of a higher operating cost.

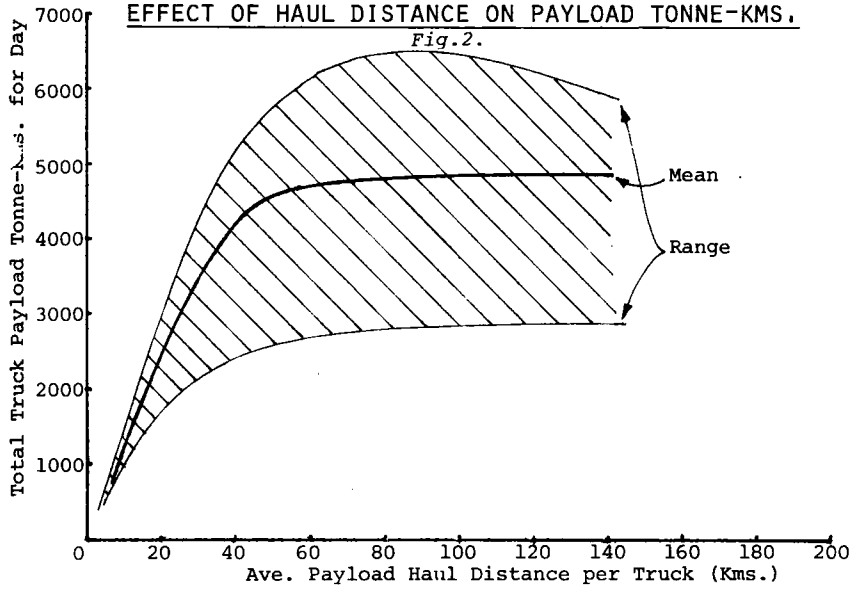
B. OPERATIONAL ASPECTS:

The survey showed that trucks here averaged 2.7 loads per day. The average payload attained was 25.6 tonnes and average haul distance, source to destination was 60.5 kilometres. All loads were exotic logs, with 44% of loads being Radiata, and 65% of loads being in 10-12 metre lengths.

A basic measure of productivity in log trucking is payload tonne-kilometres per day. Average truck payload tonne-kilometres for the day of the survey was 4,084 tonne-kilometres. However a number of factors can affect this productivity measure, including haul distance, number of loads per day, truck power, and actual payload achieved.

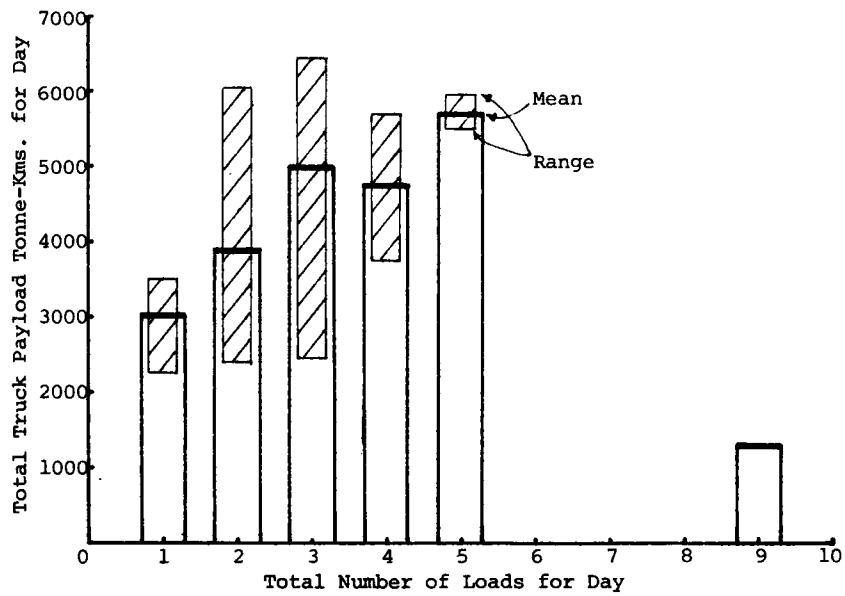
EFFECT OF HAUL DISTANCE ON PAYLOAD TONNE-KMS.

Fig.2.



The effect of haul distance on the trucking in this area is indicated in *Fig.2.* While the range of results is widespread, the mean result indicates that haul distances greater than 50Km give best productivity. Productivity increases rapidly with increasing haul distance up to approx.50Kms., and then levels off for haul distances greater than 50Kms. The widespread of the graph on the larger haul distances also indicates that other factors have a significant influence on productivity.

The effect of trip time or scheduled loads per day on productivity is reflected by *Fig.3.* Best productivity, in payload tonne kilometres per day in this Whakarewarewa area seems to be achieved with 3-5 loads per day. Trip time is affected by truck speed which in turn is governed by route characteristics, vehicle power and transmission ratios, payload aspects, and the operator. In this brief survey, truck speed was not studied in detail.



EFFECT OF LOADS PER DAY ON PAYLOAD TONNE-KMS.

Fig.3.

Of the 41 trucks covered, 17 of them (41%) were operating in the general region of highest productivity (i.e. 3-5 loads per day on hauls in the 40Km. to 110Km. range). The average power rating of these higher producing trucks was 305 h.p. compared to an average of 277 h.p. for the trucks operating outside the higher productivity area, indicating that higher power rating was playing its part in producing a higher productivity. However, of the trucks rated at greater than 300 h.p., only 60% of them were achieving operation in this higher productivity area, indicating room for improvement in the operational efficiency of many of these higher powered trucks.

Another important influence on productivity is the actual payload achieved. Log trucking is characterised by having to work under a one-way payload system and this makes payload size doubly important. Furthermore, the log payload is one which varies in length, diameter, taper, and density, making it a particularly difficult one for even experienced truckers to gauge in terms of weight. Common long Radiata logs weigh from 1 to 2½ tonnes, thus the last log added to a load can represent up to a 10% variation in total payload weights. In the survey at Whaka weighbridge, overloads were characterised by being loads of four or less logs high against the staunchion, indicating difficulties by some operators in gauging load size with larger logs. While it is important that a maximum load is carried, highway loads must conform to legal limits imposed. Road quality is affected by overloading and this not only affects the cost of roading, but also the cost of log haulage, through the poorer road conditions affecting performance. On shorter hauls (less than 40 kilometres) the effect of payload size on productivity was found to be not as influential as haul distance, however on longer hauls where only one or two loads per day were achieved, payload size influenced productivity more markedly.

DISCUSSION: Part of LIRA's aim in carrying out this pilot weighbridge traffic study was to identify some of the significant elements in log transport operations. This short study highlighted how aspects such as tare weight, haul distance, scheduled loads per day, power, actual loading, and log size, influence trucking operations and productivity in this Rotorua area. Trucking is predominantly on easy flat downhill country, with a high proportion of sealed highway roads. The forest roads have crushed metal surfaces on well drained pumice. Some aspects not covered in this brief study include loading, unloading, and unscheduled delays, and the importance of these needs to be investigated also.

Other areas throughout New Zealand have different operating conditions and it is LIRA's aim to study these in a similar manner to highlight how their local conditions affect trucking and reflect on the characteristics of the trucking rigs used, plus performance achieved. This data collected in truck rig characteristics and operating aspects, when obtained on a New Zealand wide basis and compared with forest/mill log-transport requirements, is the basic information required for identifying the areas where research and improvement will be most effective.

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