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Forest truck fuel consumption survey

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Introduction

Fuel accounts for as much as 40% of the total costs of forestry trucking. To reduce fuel consumption it is vital to understand the most significant factors that influence fuel use.

Fuel consumption is highly variable and is influenced by truck specifications (trailer configuration, engine, transmission, tyres, etc.), road conditions (hills, lead distance, road surface, speed, etc.), weight, driving technique and operational management (queue times, loaded kilometres to unloaded kilometres travelled). To comprehensively model the influence of each of these variables would require a detailed study that isolates each variable and would be conducted under highly controlled conditions. This study, through a small sample of operational data, will highlight the more important variables that industry can influence with relatively simple changes in their transportation systems.

Study conditions

The study was conducted with centrally dispatched radiata pine plantation haulage operations in south-east Victoria. Data was collected over a one-month period in July 2009. Daily fuel consumption data and kilometres travelled, recorded by the drivers of three different haulage contractors, was collected and combined with net weight and loaded travel distance recorded by the dispatch system.

Results

Table 1 provides an overview summary of the study fleet and operating conditions. A similar number of configurations of 6-axle single or semi-trailer trucks (42.5-45.5 tonnes Gross Vehicle Mass (GVM)) and 9-axle B-double trucks (62.5-68 tonnes GVM) were included in the survey. The B-doubles tended to travel further daily and had a higher percentage of loaded kilometres than the single trucks.

Table 1. Summary of average study fleet values

	Single	B-double
Trucks in the study	12	14
Daily distance (Km)	413	581
Daily fuel (L)	256	382
Average net load (t)	29.2	45.7
Distance loaded	52.5%	52.8%
Fuel consumption (L/100Km)	62.0	67.3
Fuel intensity (L/t-km)	0.021	0.015

Figure 1 shows the wide range of fuel consumption values in both single and B-double configurations. Single configurations had lower fuel consumption; 8% less than B-doubles on average. The range in average fuel consumption was between +/– 32% for single configurations and +/– 37% for B-doubles. This variation in fuel consumption resulted in a variation of the overall transport cost of about +/– 10%.

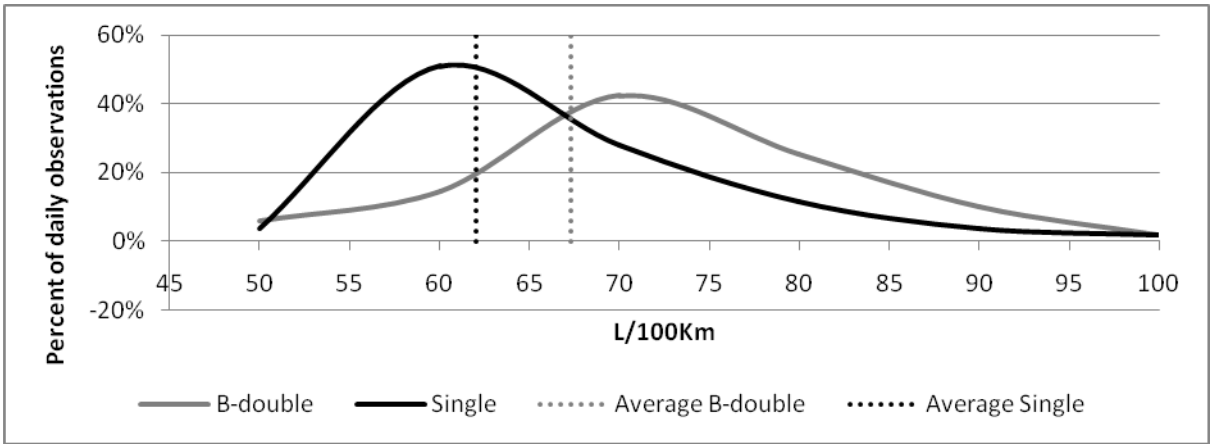

Figure 1.
Distribution of fuel consumption for study fleet

Figure 2 is fuel consumption per tonne of wood hauled per kilometre travelled and shows a narrower range of fuel consumption for both singles and B-doubles. The B-double distribution becomes more tightly grouped showing that the net weight being transported has an influence on fuel consumption. For a given haulage task B-doubles were found to use approximately 28% less fuel per tonne hauled per kilometre travelled.

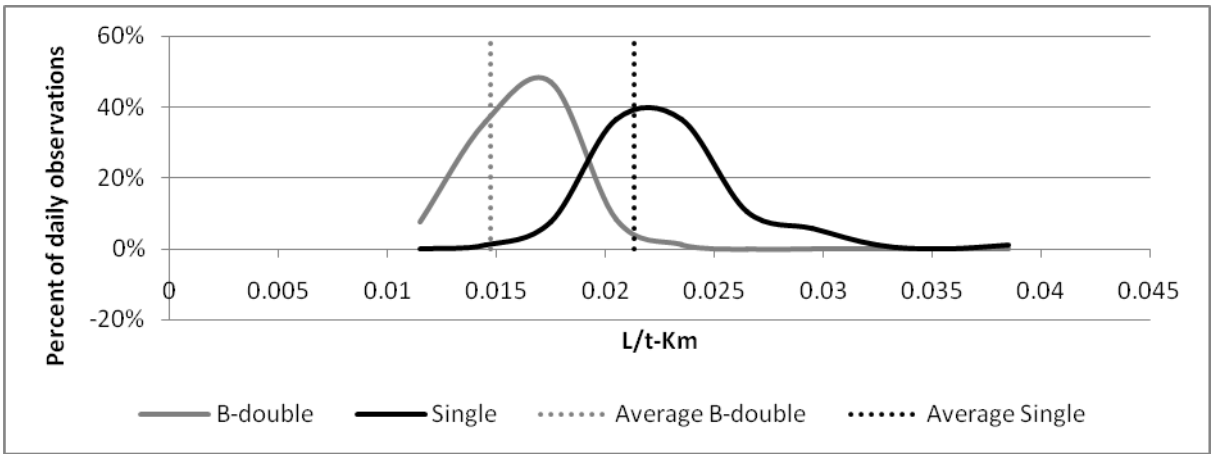

Figure 2.
Distribution of fuel intensity for study fleet

Figure 3 shows how fuel consumption, on a litres per hundred kilometres basis, increases as the ratio of loaded to unloaded kilometres travelled increases by truck configuration. The ratio of loaded to unloaded kilometres travelled appears weakly correlated to the variation in fuel consumption, with other uncontrolled variables (such as truck age, truck condition, driving technique, and road condition) likely to have an equal or more significant impact.

Increasing the ratio of loaded to unloaded kilometres travelled from 0.5 to 0.6 increased fuel consumption, on a litres per hundred kilometres basis, by 3% for single and 5% for B-double configurations—reflecting the higher kilometres travelled under load. From an operations management perspective, it is more important to note that the fuel required to complete a given freight task (litres per tonne of wood moved) actually *decreased* by about 9% for the singles and 8% for B-doubles, even accounting for the nominal increase in fuel consumption on a litres per hundred kilometres basis.

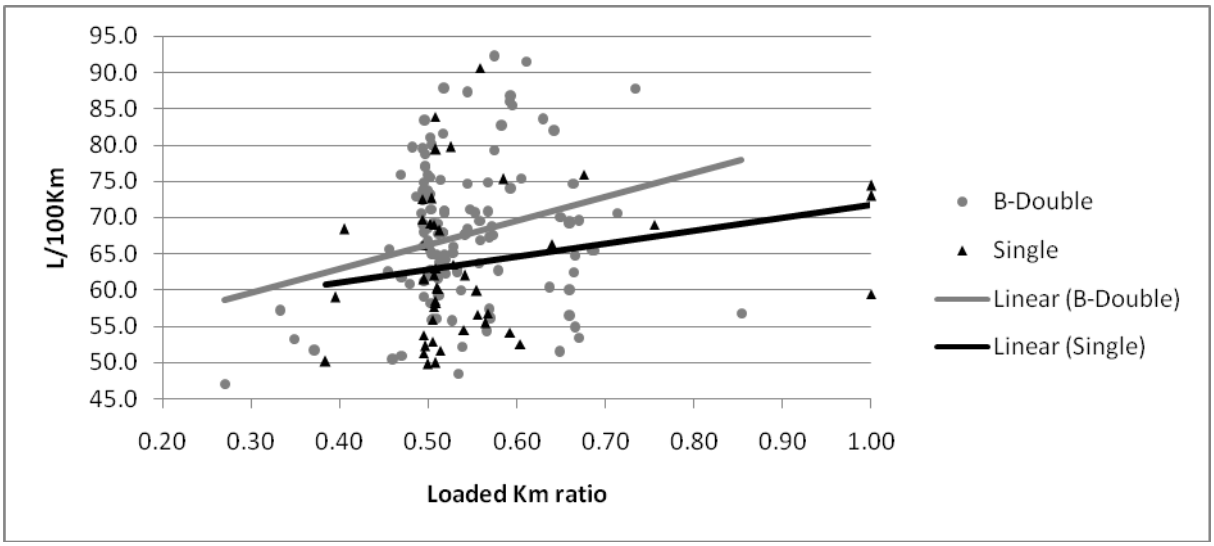

Figure 3.
Relationship between ratio of loaded kilometres and fuel consumption

Take-home messages:

- Truck fuel consumption is highly variable, and this variation can have an important impact on the costs of transport of up to +/– 10%.
- Increased weight increases fuel consumption, with B-doubles consuming 8% more fuel on average. However, the greater payload of B-doubles significantly improves the fuel usage per unit hauled, with B-doubles using 28% less fuel to move a tonne of wood one kilometre than a single.
- Similarly, increasing the ratio of loaded to unloaded kilometres travelled increases fuel consumption but, like the increased payload, the net fuel use per unit hauled is improved.

Organisations supporting this science

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More information

For more information, visit the CRC for Forestry website at http://www.crcforestry.com.au/research/programme-three/index.html.