How to Calculate a Fuel Cost Adjustment

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Introduction

I have received several urgent emails recently from loggers, suppliers, and procurement foresters trying to calculate fuel cost adjustments. This is a good sign in that mills and suppliers want to work with loggers to address skyrocketing fuel costs. On the other hand, it suggests that the previous cut-and-haul rates may have been negotiated without careful consideration of the underlying costs involved in harvesting and transportation. Forgive me if I am too cynical. Fortunately, calculating a reasonable fuel cost adjustment is simple math. However, it does require data, or without solid data, reasonable estimates. Loggers should have data while foresters may have to rely on estimates.

Measuring Fuel Consumption

To calculate a fuel cost adjustment, a logger will need to know how much fuel is consumed per ton of wood harvested. Fuel consumption data should include in-woods equipment, support vehicles (i.e., company pickups, fuel trucks, parts trucks, etc.), and log trucks. Fuel consumption by in-woods equipment can be collected easily. Many machines collect fuel consumption data using onboard computers. If machines do not measure fuel consumption, a fuel meter can be purchased for less than $100. Every time a machine is refueled, the operator should record the date, number of gallons pumped, and machine engine hours.

Finally, fuel consumed by log trucks should be measured. It is important to determine the fuel economy of the log trucks. Record miles driven from odometers and gallons of fuel consumed. Log truck fuel consumption per ton will obviously vary by haul distance and so it should be calculated on a tract-by-tract basis. Fuel consumption per ton can be calculated using the formula below. Accurate values for tons per load, miles per gallon, and percent-loaded miles are obviously important. Do not assume 50% loaded miles unless there is data to support this value. Log trucks often average 40–45% loaded miles once trips home and moves between sites are counted.

Divide gallons of fuel consumed by the number of tons produced to calculate gallons per ton. Make sure that fuel consumption data and production data cover the same period. Estimates based on a week or a month’s data will be more accurate than estimates based on daily records.

Several studies have measured fuel consumption by logging equipment (Greene et al. 2014, Kenney et al. 2014). While this data is several years old, it can get a company in the ballpark if they do not have their own data. These studies estimated that logging equipment consumed between 0.4 and 1.0 gallon per ton to cut, skid, and load. Loggers have shared log truck fuel economy data with me in the past several years and they averaged 4.5–5.5 miles per gallon. This included a mix of loaded miles, unloaded miles, and idling (i.e., real-world conditions).

Calculating Per-Ton Fuel Costs

Let's look at an example using data from one month's production. During this month the logging crew produced 8,500 tons of timber and consumed 9,909 gallons of diesel (Table 1). Logging equipment consumed 0.38 gal/ton, support vehicles burned 0.05 gal/ton, and log trucks consumed 0.74 gal/ton. All these values will vary from one harvest to another. I would expect in-woods fuel consumption to be most consistent, although it would vary based on skidding distance and site conditions. Log truck fuel consumption per ton will vary considerably based on haul distance.

At $2.60/gal for off-road diesel and $3.00/gal for on-highway diesel, fuel costs accounted for $3.35/ton of delivered wood (Table 2). When fuel prices increase to $4.60/gal for off-road diesel and $5.00/gal for on-road diesel, fuel costs increased to $5.69/ton of delivered wood. For this logger, a $1.00 per gallon increase in fuel prices increased onboard truck costs by approximately $0.43 per ton. A $1.00 per gallon increase in fuel prices would raise cut-and-haul costs by approximately $1.15 per ton. Cut-and-haul costs would increase even more if haul distances exceeded the 50 miles used in this example.

For this logger, a fuel cost adjustment should add at least $0.43 per ton to the base cut-and-load rate for every $1.00 per gallon increase in the fuel price, or approximately 4 cents per ton for every 10-cent per gallon increase in the fuel price. The cut-and-haul rate should be increased by approximately $1.17 per ton for every $1.00 per gallon increase in the fuel price, or 12 cents per ton for every 10-cent per gallon increase in the fuel price.

The impact of rising fuel prices on hauling costs varies substantially by haul distance. At a 30-mile haul distance, a $1.00 per gallon increase in the fuel price increased hauling costs by approximately $0.45 per ton, whereas at a haul distance of 70 miles the same increase in the fuel price increased hauling costs by approximately $1.04 per ton (Table 3). If haul distances are highly variable, the fuel cost adjustment should be structured accordingly. A one-size-fits-all fuel cost adjustment may be lucrative at short haul distances and insufficient at long haul distances.

Conclusion

The first step to negotiating a fuel cost adjustment is to prepare for the negotiation. Having accurate and up-to-date data is essential to calculating a fair fuel cost adjustment. As my father used to tell me, the devil is in the details. Measuring the fuel consumption of each machine and truck is worth the trouble to make sure that the business owner understands his costs. Tracking fuel consumption can also help a business owner detect mechanical issues or even theft.

Table 1: Fuel consumption by equipment, support vehicles, and log trucks during one month while harvesting 8,500 tons of timber. Average one-way haul distance was 50 miles and log trucks averaged 45% loaded miles.

Machine	Fuel Consumption (gal)	Fuel economy
Feller-buncher	1,275	0.15 gal/ton
Skidder	1,190	0.14 gal/ton
Loader	765	0.09 gal/ton
Support vehicles	383	0.05 gal/ton
Onboard truck fuel consumption	**3,613**	**0.43 gal/ton**
Log trucks	6,296	5.0 mpg & 0.74 gal/ton

Total		9,909	1.17 gal/ton

Table 2: Fuel cost per ton for in-woods equipment, support vehicles, and log trucks at three fuel prices. This analysis assumes a $0.40/gal difference between off-road diesel and on-highway diesel. This will vary by state – be sure to use local values.

Machine	Fuel Cost @ $2.60/gal off-road & $3.00/gal on-highway	Fuel Cost @ $3.60/gal off-road & $4.00/gal on-highway	Fuel Cost @ $4.60/gal off-road & $5.00/gal on-highway
Feller-buncher	$0.39/ton	$0.54/ton	$0.69/ton
Skidder	$0.36/ton	$0.50/ton	$0.64/ton
Loader	$0.23/ton	$0.32/ton	$0.41/ton
Support vehicles	$0.15/ton	$0.20/ton	$0.25/ton
Onboard truck total	**$1.13/ton**	**$1.56/ton**	**$1.99/ton**
Log trucks	$2.22/ton	$2.96/ton	$3.70/ton
Cut-and-haul total	**$3.35/ton**	**$4.52/ton**	**$5.69/ton**

Table 3: Fuel costs per ton at one-way haul distances from 10–100 miles, assuming 45% loaded miles, 5.0 miles per gallon, and 30 tons per load.

Distance (one-way, miles)	Roundtrip miles (45% loaded)	Fuel consumed (gal)	Fuel cost per ton @ $3.00/gal	Fuel cost per ton @ $4.00/gal	Fuel cost per ton @ $5.00/gal
10	22	4.4	$0.44	$0.59	$0.73
20	44	8.8	$0.88	$1.17	$1.47
30	67	13.4	$1.34	$1.79	$2.23
40	89	17.8	$1.78	$2.37	$2.97
50	111	22.2	$2.22	$2.96	$3.70
60	133	26.6	$2.66	$3.55	$4.43
70	156	31.2	$3.12	$4.16	$5.20
80	178	35.6	$3.56	$4.75	$5.93
90	200	40.0	$4.00	$5.33	$6.67
100	222	44.4	$4.44	$5.92	$7.40

Formulas

$$\text{Cut-and-Load Fuel Consumption Per Ton} = \frac{Gal. fuel\ used\ by\ equipment\ \&\ support\ (per\ week\ or\ month)}{Tons\ produceed\ (per\ week\ or\ month)}$$

$$\text{Log Truck Miles Per Gallon} = \frac{Miles\ Driven}{Fuel\ Consumed\ (gal.)}$$

$$\text{Trucking Fuel Consumption Per Ton} = \frac{One\text{−}way\ haul\ distance\ (miles)}{Tons\ per\ load\ x\ miles\ per\ gallon\ x\ \%\ loaded\ miles}$$

References

Greene, W.D., E. Biang, and S.A. Baker. 2014. Fuel consumption rates of southern timber harvesting equipment. In: Proceedings of the 2014 Annual Meeting of the Council on Forest Engineering. Available online at https://cofe.org/pdfs/COFE_2014.pdf.

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