

Methodologies for Setting Timber Harvesting (Logging) Rates

Rien Visser

Associate Professor, School of Forestry

Timber harvesting has always been a significant business cost component for forest owners and or forestry management companies. Maintaining a cost-effective harvesting workforce is a major task for many forestry companies; and operating a financially successful harvesting business is also a major challenge for logging contractors. With increased global competition for wood based products there has been real pressure on reducing the cost of harvesting.

Harvesting has evolved from manual labour with basic tools to a high capital equipment cost and low labour input system. In modern operations labour may amount to only about 30% of the total operating cost and the effective utilization of the specialised equipment becomes paramount. Technological advances in equipment and systems have resulted in incremental improvements in logging efficiency. However, there have also been real cost increases (over and above inflation) and these have included labour rates, raw materials and insurance.

One major 'step-change' that significantly improved harvesting efficiency was the recognition that using independent logging contractors captured both the innovation as well as the motivation of those managing harvesting operations. Since the 1980's most developed countries extensively use a contractual based logging workforce. What combines the forestry company and the logging contractor financially, through a contract, is the timber harvesting ('logging') rate. In an idealised open market system the logging rate would be determined by supply and demand of services. However, in forestry, a true open market system is rarely used to set logging rates. An increased emphasis is being placed on determining 'fair' rates, but is this good for the industry?

Defining the Logging Rate

In its simplest form, the logging rate is a payment for services, whereby the service provided by the logging contractor to the forestry company is the conversion of standing trees into a series of specific log products. We commonly refer to this as the Cut-Skid-Load (CSL) rate. The logging rate is most commonly expressed in terms of the scaling system used by the customer / destination. If the product is weighed then a rate is typically \$/tonne, if the product is scanned or measured in some way then the rate will be in \$/unit volume (e.g. m³). A greater level of uncertainty is introduced if the logs are scaled on expected output from a mill - for example m³ JAS or in the USA Board Feet (MBF).

Meeting specific log specifications is not the only criterion set out in a typical logging contract. Common

additional requirements include meeting safety and environmental standards. While compliance with safety standards tends to be a straight forward assessment, environmental compliance is more of a moving target for most companies and contractors depending on person and region. Few logging rates are ever adjusted for excellence in environmental or safety performance.

Establishing the Logging Rate

The logging rate can be broken down into its two basic components: whereby the logging rate is the quotient of the harvest system cost divided by the harvest system productivity for a given time frame (note: loggers will often assess their costs on a weekly or even monthly basis, companies often seem to prefer a daily rate, and researchers will often use a relatively short time frame, such as a Scheduled System Hour).

$$\frac{\text{System Cost} \left(\frac{\$}{\text{day}} \right)}{\text{System Productivity} \left(\frac{\text{m}^3}{\text{day}} \right)}$$

For the purpose of simplification the logging rate concepts are grouped into three methodologies: (1) free market, (2) retrospective and (3) predictive model.

Free Market Methodology

In a *free market* system that in theory optimises the effectiveness of using logging contractors the simple supply and demand principle is used to set logging rates. The dual benefit being the forestry companies get the lowest possible cost logging services, and the most cost effective logging contractors makes the largest profits. In such a system the forestry company would use a *competitive bidding process* for a logging service contract (specifying all the required standards). Only the logging contractor need concern themselves with determining a competitive logging rate. This seems ideal in that the logging contractor should most accurately know their systems cost and productivity. In a free market system the agreed rate for services is, in fact, the fair rate.

Forestry companies tend to shy away from a true free market system for two main reasons. First is that forest land holdings tend to be quite regional in nature, and most logging contractors work in a preferred 'home base' region. There is quite a considerable transportation and relocation cost associated with trying to compete with existing logging

crews in another region. The knowledge and skill required, as well as the initial capital required means that often there are very few people who can enter the market as new logging contractors.

The second more critical factor is artificially imposed, and best described as 'company control'. In reality, most forestry companies don't just want the harvesting service (as per contract) - but they wish to retain a greater level of control over the logging process. For example, most wish to retain the right to ask a logger to stop producing when customer demand declines, and retain the right to ask a logger to move when a different log type is in demand. They may also ask their logging contractors to purchase additional equipment, or change their equipment mix depending on their perceived optimisation strategy or future needs. This problem is exacerbated when the loggers need to maintain cash flow for machine payments - in which case there is little opportunity for a contractor to 'demand' adherence to the original contract.

Retrospective Costing Methodology

Retrospective costing uses a combination of *cash flow* analyses to determine logging system cost as well as *recent productivity* records to determine production. This is perhaps the most accurate method of setting a logging rate that reflects actual cost, but only if the system and conditions do not change.

Cash flow analyses is simply predicting future costs based on recent costs. It requires going 'through the books' (cost records) of a logging contractor to assess the actual cost of operating either individual machines or the system as a whole. Problems can occur with adequately spreading the 'big-item' costs, such as major repairs, as well as correctly accounting for machine depreciation or tax liabilities. Establishing production retrospectively is quite simple, as typically both logging contractors and forestry companies have access to the weighbridge information.

There are a number of limitations to using a retrospective costing method. This includes attempting to assess the impact of changing stand and terrain conditions. Also, a forestry company should never be allowed to review the books of their independent contractors. If a logging contractor does cooperate, the forestry company has to have faith that the costing numbers being presented are in fact accurate. A logging contractor who is paid primarily on the basis of his actual cost and production will behave much like a company logging crew, as opposed to an independent contractor.

Predictive 'Model' Methodology

Predictive 'Model' systems use either *costing spreadsheets* or simple programmes to estimate logging cost. The spreadsheet systematically sums up all the labour, machine, supplies and operating costs to give an overall system cost. Spreadsheets allow simple increases in supplies and materials requirements, and or analysing changes such

as the costs of adding new equipment. Such spreadsheets are well developed and understood and used by a majority of forestry companies (and loggers to some degree). An example spreadsheet system is set out in the Business Management for Logging handbook. The main problem with using the spreadsheet approach to establish a 'fair' cost is taking into account all of the small costs, as well as to what degree risk and profit should be included.

Predicting productivity, which is hard enough for a single machine, is especially difficult for a whole system. The equations below shows that while 'Cost' is effectively just a summation of all the parts that make up the harvesting system, the 'Production' prediction is a complex interaction of many parameters that includes the harvest system itself.

$Cost = fn(machines + workers + material + vehicles + ..)$

$Prod = fn(DBH, distance, slope, total vol, .. + Harvest System)$

Although setting logging rates using the predictive model approach is the most robust in a changing work environment, and it allows companies and harvest contractors to work 'together', it tends to be less accurate than the retrospective approach and does not optimise to production demand.

Review of Actual Logging Rates Setting Practices

In a review of logging rate practices I interviewed 18 companies and two common practices emerged. Some use a relatively stable work environment to build a level of status quo: harvesting rates are developed and ingrained over an extended period of time by relying on experience, with adjustments made based on cost indices (with fuel cost being the most common). This also leads to companies attempting to introduce longer term contracts which limits the benefits of using a contractor workforce.

When not relying on experience, most companies appear to follow a process of convenience. System costs are determined using spreadsheets (predictive) but production expectation is set based on weighbridge records (retrospective). This system can provide the best outcome if we assume that more knowledge about improving the harvesting system is harboured by the forestry company as opposed to the logging contractor, or if we assume the logging contractor is freely willing to surrender innovation and motivation. This would clearly go against the grain of a free market system.

It is hard to conclude clear benefits of one logging rate setting methodology over another, given the geographical constraints of our NZ forest operations. However, the true reason for the great efficiency 'step-change' from using logging contractors should not be forgotten. We can only expect to minimise our harvesting cost over time if forestry companies provide a contract basis that allows the loggers to maximise their profits.

(Note: This paper is a shortened version of Methodologies for Setting Timber Harvesting Rates, 2007. The full paper is available from rien.visser@canterbury.ac.nz)