Automated weighing platform for estimation of drying rates of logs and woody biomass

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Background
Logs and forest biomass can contain over 50% water when green, most of which is removed prior to the final use. Reduction in moisture content through infield drying can reduce transport costs which can account for 30-50% of the delivered cost of logs and biomass. In the case of forest biomass used as biofuel, reduction in moisture content can also increase its calorific content and its value. Drying infield can also defer payment for logs and biomass and can impede site preparation and replanting. Forest managers and owners need information about drying rates to make informed decisions about how long to leave logs or biomass drying infield. However, collection of drying data is often expensive and only performed for short periods on small quantities of material producing results that may be unrepresentative of real-world drying rates.

This bulletin describes an automated weighing platform developed by the Australian Forest Operations Research Alliance (AFORA) that can be used to automatically determine accurate drying rates for large quantities of logs or biomass (up to 12 tonnes) for extended periods.

Brief description
The automated weighing platform consists of two rails that rest on the ground or are raised on blocks. At either end of these rails are vertical “U” shaped uprights that hold the logs or biomass (Figure 1). Dimensions are L: 3m, W: 3m, H: 2m. Wire mesh can be attached between the uprights when drying loose biomass (Figure 2).

Figure 1. Weighing platform.
Figure 2. Weighing platform loaded with Pinus radiata logging residue. Wire mesh has been added to the sides and underneath to hold the residue in place.
Between the bottom rails and the uprights are four load cells (Figure 3) which measure changes in weight as changes in voltage.

A variant of the automated weighing platform has also been developed to weigh whole small trees. It has extensions to the frame to position the uprights 1 m higher and 6 m apart (Figure 4).

The load cells must be calibrated prior to use with a known weight and the zero point must also be set to exclude the weight of the uprights and any wire mesh attached to the structure to support loose biomass.

The load cell data are captured and recorded by a solar-powered data logger every four hours. The recorded data is sent via the mobile phone network to a website that is accessible via the World Wide Web. If there is sufficient interest from industry partners, a system could be developed to process the data and email reports to designated recipients.

System cost
AFORA has constructed three automated weighing platforms that are available for industry partner use. Additional units could be constructed by industry partners. Indicative costs are:

- Data logger $1500
- Load cells $600
- Weighing platform $7,000
- Balance of system (solar panels, wiring etc) $500
- Total price $9600
- Extended version is an additional $1500

1 https://en.wikipedia.org/wiki/Load_cell has a basic explanation of how load cells work