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Best practice harvester calibration

Martin Strandgard [1,2]

[1] CRC for Forestry
[2] University of Melbourne

Introduction: the importance of calibration

Studies elsewhere have highlighted the potential for significantly improving the value recovery of logs by improving the merchandising accuracy of harvester heads. Accurate merchandising relies on accurate measurements being recorded by the harvester head and that requires regular calibration of the head to minimise length and diameter measurement bias caused by wear and tear, maintenance and new components.

Calibration reduces bias in harvester head measurements by scaling harvester measurements against manual measurements of the same set of logs. However, it will not correct random errors, such as slippage of the length measurement wheel.

This bulletin points out some inherent pitfalls in the current calibration procedure and outlines simple methods to improve calibration while at the same time minimising the cost and time required to perform this important procedure.

What is wrong with the current calibration procedure?

The current calibration procedure assumes that manual measurements of log length and diameter form a reliable and accurate base for calibration. Unfortunately this is not necessarily always the case. Manual measurements can have significant levels of variability caused by logs with off-square ends and eccentric cross-sections. A recent CRC for Forestry study at Mt Gambier found that poor practice during manual measurement could introduce errors in the calibration process and potentially increase the cost and time required to complete a good calibration. The following photographs show an off-square log end and an eccentric log cross section.

Off-square log end

Eccentric log cross-section

[1]

[1] From http://www.cehwiedel.com/blogs/redcountycalifornia/.

Depending what side of the log is measured to record length, off-square ends will impact the measurement significantly. Butt logs are the greatest contributor to errors generated by off-square ends. Log eccentricity is a particular issue if diameter measurements are recorded using a single calliper measurement.

Suggested calibration procedure

The following procedures are recommended to enhance the manufacturers' recommended calibration procedure by minimising the impact of these potential manual measurement errors and to achieve an effective calibration of the harvester head in the quickest possible time.

Length calibration

Log selection

- Logs should cover a range of sizes. Length errors caused by harvester bias increase with increasing log length. Therefore, a range of log sizes is needed to detect bias.
- Logs should be straight with minimal branch stubs and bumps. Calibration fixes bias errors, not errors caused by the measurement wheel slipping or going over branch stubs or bumps.
- Logs should not include butt logs as they generally have the most off-square log ends. (Some harvesters calibrate butt logs separately.)

Procedure

- Process stems close to the ground and place logs where they are unlikely to roll to keep the harvester measurement line visible.
- Make length measurements along the same line as the harvester measured, where possible, to ensure direct comparison with harvester measurements. This can be identified by length measuring wheel marks or paint (if applied).
- Exclude measurements where the difference between harvester and manual measurements is significantly bigger than the norm (as this indicates a measurement problem such as measurement wheel slippage).
- Use a steel tape measure as fibreglass tapes can stretch.
- Measure parallel with the stem, avoiding branch stubs and bumps.

Table 1 indicates the reduction in sample size possible by excluding irregular logs and using correct measurement techniques. Actual log sample sizes will depend on the variability at each site and the required accuracy level.

Table 1: Log sample size to get within ±1 cm of actual length difference (95% C.I.)

	Uniform site*	Variable site*
Using all logs	30 logs	100 logs
Eliminating butt logs and other variable logs	15 logs	20 logs

* Number of logs to be measured for **each** target log length.

Diameter calibration

Diameter calibration may use a single diameter value or a range of values for diameter classes. Refer to your harvester's calibration procedure.

Log selection

- Select logs that are regular in cross-section. Irregular or eccentric cross-section logs cause errors in both manual and harvester measurements.

Procedure

- Measure diameter with a diameter tape or average two calliper measurements at right-angles. Never use a single calliper measurement as they are badly affected by eccentric cross-section logs.
- Use a steel diameter tape as fibreglass tapes can stretch.
- Don't measure over bumps or knots.

Table 2 indicates the reduction in sample size possible by excluding irregular logs and using correct measurement techniques. Actual log sample sizes will depend on the variability at each site and the required accuracy level.

Table 2: Log sample size to get within ±4 mm of actual diameter difference (95% C.I.)

	Uniform site*	Variable site*
Using all logs	25 logs	80 logs
Eliminating eccentric logs (>15 mm min/max diameter difference)	20 logs	50 logs

* Number of logs to be measured for **each** diameter class. Some calibration procedures specify multiple diameter measurements along each log which will reduce the number of logs required.

Take-home messages

- In operations that rely on the harvester to optimise the value of logs recovered from the forest, good calibration is an important first step to maximising value recovery.
- Failing to recognise that manual measurements of log diameter and length used for calibration may themselves be inaccurate can severely reduce the value of the calibration process and result in considerable loss of product value.
- Through careful log selection and attention to simple procedural steps as outlined above, in conjunction with the methods provided by the harvester manufacturer, a quality calibration can be achieved for the minimum investment in cost and time.

Organisations supporting this science

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More information

CRC for Forestry website: http://www.crcforestry.com.au/research/programme-three/index.html Project scientist Martin Strandgard: mnstra@unimelb.edu.au