



Choosing the right feller-buncher head for maximum volume extraction

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Introduction

Large areas of eucalypt plantations have been established in Australia in the past two decades, mainly for pulpwood production. An important consideration for managers of these plantations is to maximise the volume of wood they can extract. This is particularly critical in low-yielding stands.

A number of harvesting systems are used in these plantations. Most of these systems use feller-bunchers to fell the trees. The three types of heads used by feller-bunchers (shears, hotsaw and chainsaw, see Figure 1) have different properties in terms of stump height, saw kerf, productivity, fire risk and maximum tree size.

The objective of this bulletin was to compare feller-buncher heads in terms of estimated volume and value lost in stumps and saw kerf during harvest. Other issues including productivity, site impacts and fire risk were also considered.

Study description

Height and underbark diameter (average of two measurements at right angles) of stumps cut by chainsaw and hotsaw feller-buncher heads were measured in a *Eucalyptus nitens* (shining gum) stand in north-west Tasmania, and of stumps cut by a shear head in an *E. globulus* (blue gum) stand in south-west Western Australia. Approximately 160 stumps were measured at each site. The sites were flat with little surface rock, but the Tasmanian site had a small number of remnant large stumps that restricted felling of some trees, resulting in

higher stumps. Estimates of chainsaw kerf (~1 cm) and hotsaw kerf (~5 cm) were obtained from other studies. Both stands yielded approximately 220–240 m³/ha. Stump volumes were estimated assuming the stumps were cylindrical.



Figure 1. Feller-buncher head types (a) shear; (b) hotsaw; (c) chainsaw

Study results

Figure 2 shows the estimated volume lost in stumps and saw kerf for the three feller-buncher head types. Lower average stump heights may be achievable with the chainsaw and hotsaw heads with different operators or on different sites. However, these heads could not consistently achieve equivalent results to the shears as saw kerf losses (~0.5 m³/ha for the chainsaw and ~2 m³/ha for the hotsaw) would still be incurred. Of the three types of head, chainsaw heads also generally have the greatest distance between the base of the head and the saw, limiting the minimum stump height. Operators of chainsaw and hotsaw heads will also cut higher stumps on rocky sites to avoid damage to the saw.

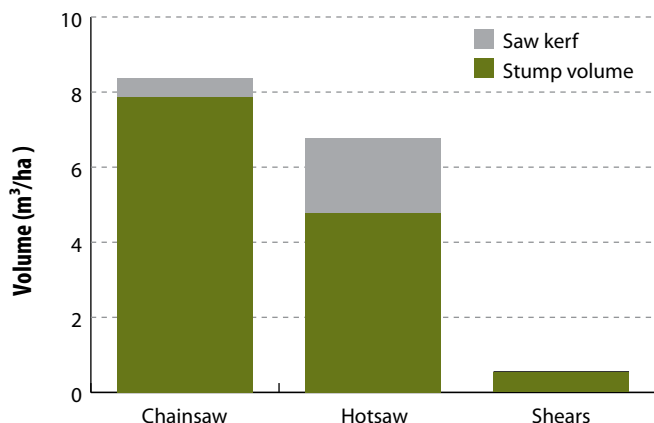


Figure 2. Estimated volume lost in stumps and saw kerfs for the three feller-buncher head types

Table 1 shows the volume lost through stumps and saw kerf in terms of loss of value and in terms of the harvested area required to achieve a pulpwood volume of 100 000 m³ per year. The higher stump volumes and greater saw kerf of the chainsaw and hotsaw heads clearly equate to considerably greater losses in value and additional harvested area required, compared with shear heads. For low-yielding stands this value loss could have a significant impact on the profitability of the harvesting operation.

Table 1. Value lost through stumps and saw kerf, and additional harvested area required to achieve an annual harvest volume of 100 000 m³*

Head type	Value lost in stumps & kerf (\$/ha)	Additional area (ha) required to cut 100 000 m ³ /year
Chainsaw	251	16
Hotsaw	203	13
Shears	16	1

* Assuming an average stand yield of 230 m³/ha and a stumpage of \$30/m³

Advantages and disadvantages of feller-buncher heads

Stump heights are only one consideration in selecting a feller-buncher head. Table 2 lists some of the relative advantages and disadvantages of each type of feller-buncher head.

Table 2. Advantages and disadvantages of the three types of feller-buncher heads

Head type	Advantages	Disadvantages
Chainsaw	Suited to large trees Relatively low fire risk	Low productivity cutting smaller trees Only harvest one tree at a time Increased maintenance/running costs Higher stumps which can increase wear and tear on other machines and impede site preparation for the next rotation
Hotsaw	Productive	Higher fire risk Danger from flying debris—unsuitable for rocky ground Can take time for saw to regain speed when cutting quickly Not suited to large trees
Shears	Productive Low fire risk Low maintenance	Not suited to large trees Not suitable for coppice stands on subsequent rotations Damage to lower stem reduces sawlog value

Take-home messages

- Using feller-buncher shear heads can recover more volume and value per hectare than other feller-buncher head types through lower stump heights and lack of saw kerf.
- Chainsaw heads are better suited to larger trees and stands producing sawlogs.

Organisations supporting this research

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More information

CRC for Forestry website:

<http://www.crcforestry.com.au/research/programme-three/index.html>

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