Integrated biomass harvesting system: A case study in pine plantations in Western Australia

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Integrated biomass harvesting

- Previous trials on separate biomass harvesting (Slash-bundler, Bruks mobile chipper) → High operating cost/low productivity
- Integration of biomass harvesting with industrial wood recovery:
  - Lower cost
  - Higher yield per ha
  - Lower environmental impacts

Operations

Conventional harvesting

Integrated biomass harvesting

Harvester/processor (Cat 541)/Rosin RD977 processing head

Forwarder (Valmet 890.3)

Study site

- *Pinus radiata* plantation (south west Western Australia)
- 32 years old
- DBH: 42.1 cm
- Tree volume: 1.53 m^3
- Plots:

Control (1.1 ha)

Fibre-plus (1.2 ha)

Study objectives

- First replication in NSW pine plantations (Walsh et al. 2011): 23 GMt/ha of Fibre-plus

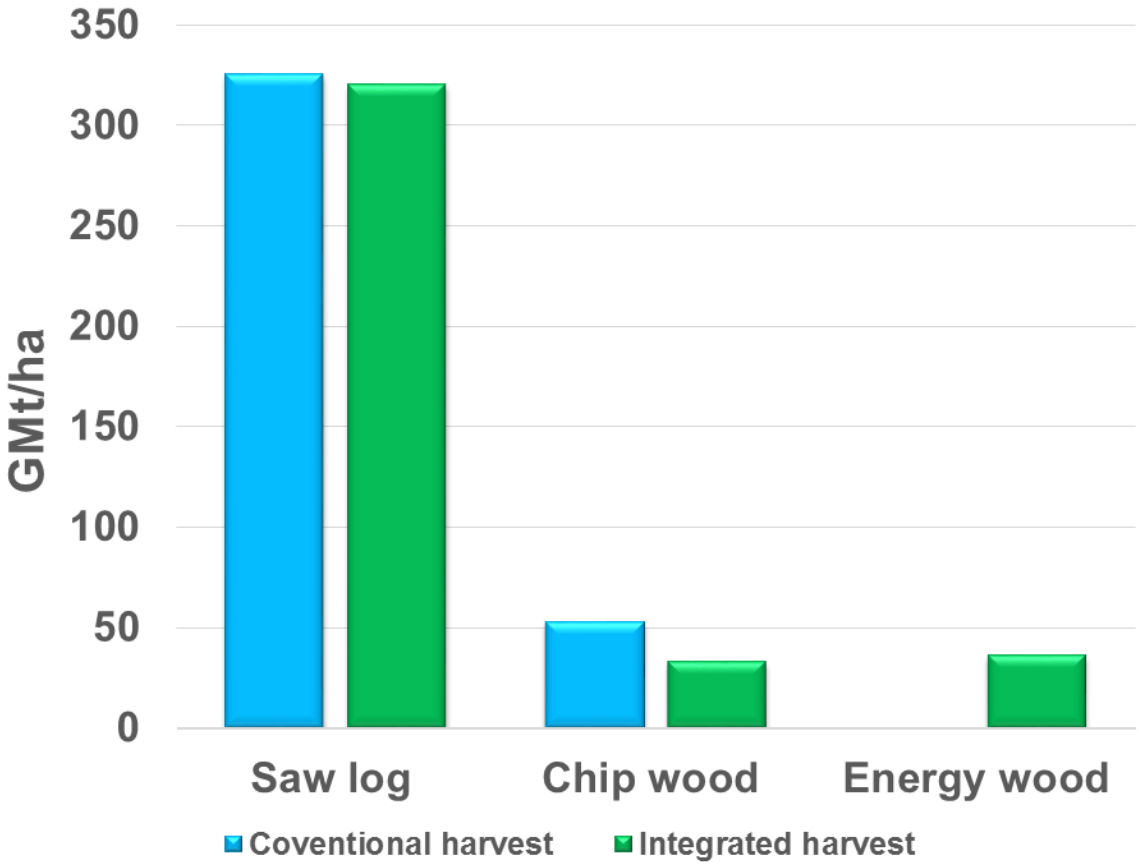
- Evaluate and measure:
- Machine productivity/cost
- Machine fuel consumption
- Yield and biomass recovery rate

Methods

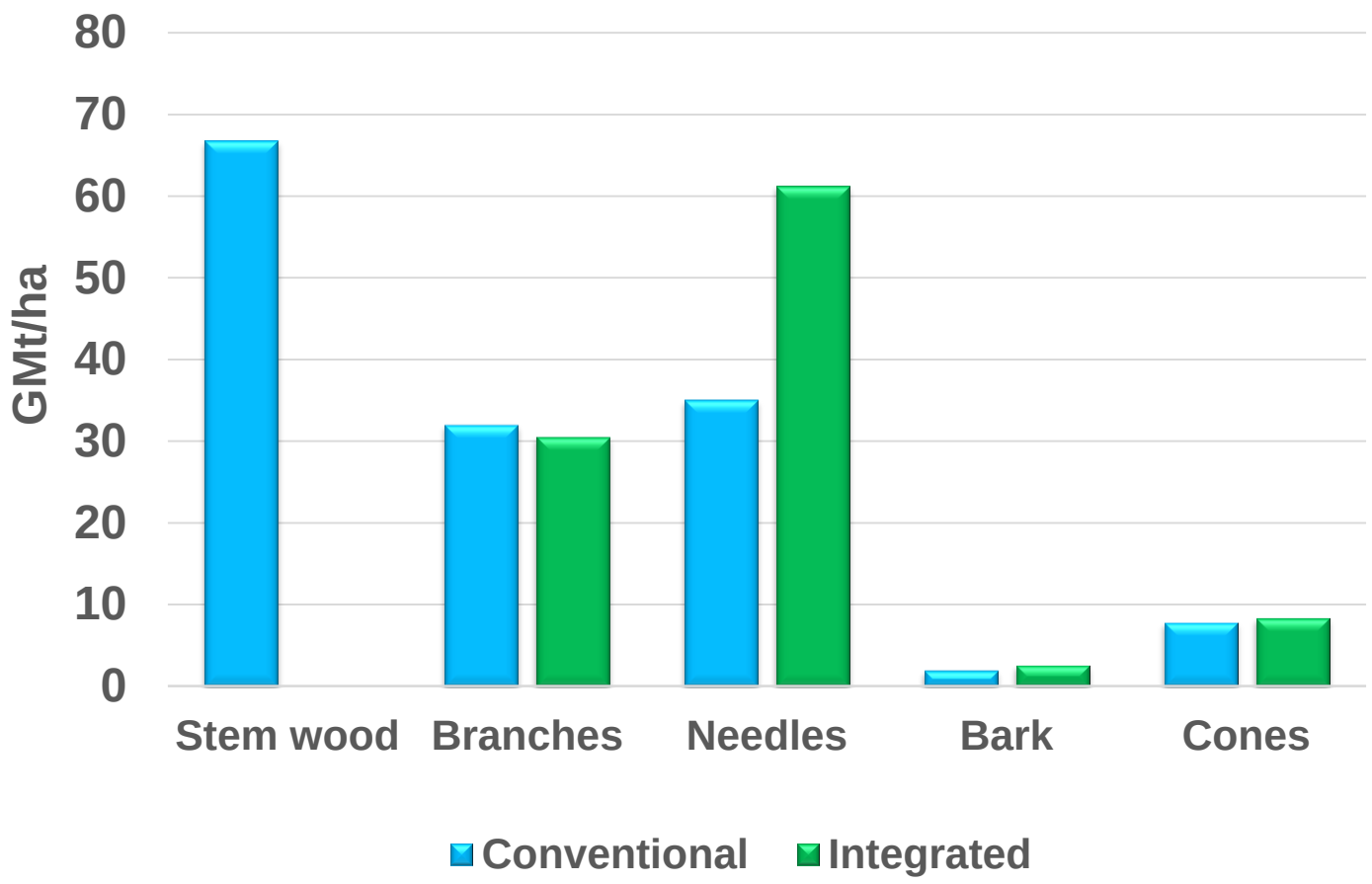
- Elemental time study
- AFORA left-slash measurement procedure
- Product specification:

Product	Min SED (mm)	Min length (m)	Max length (m)
Sawlog	200	3.6	6.1
Chip wood	75	3.5	5.4
Energy wood	0	3.5	unrestricted

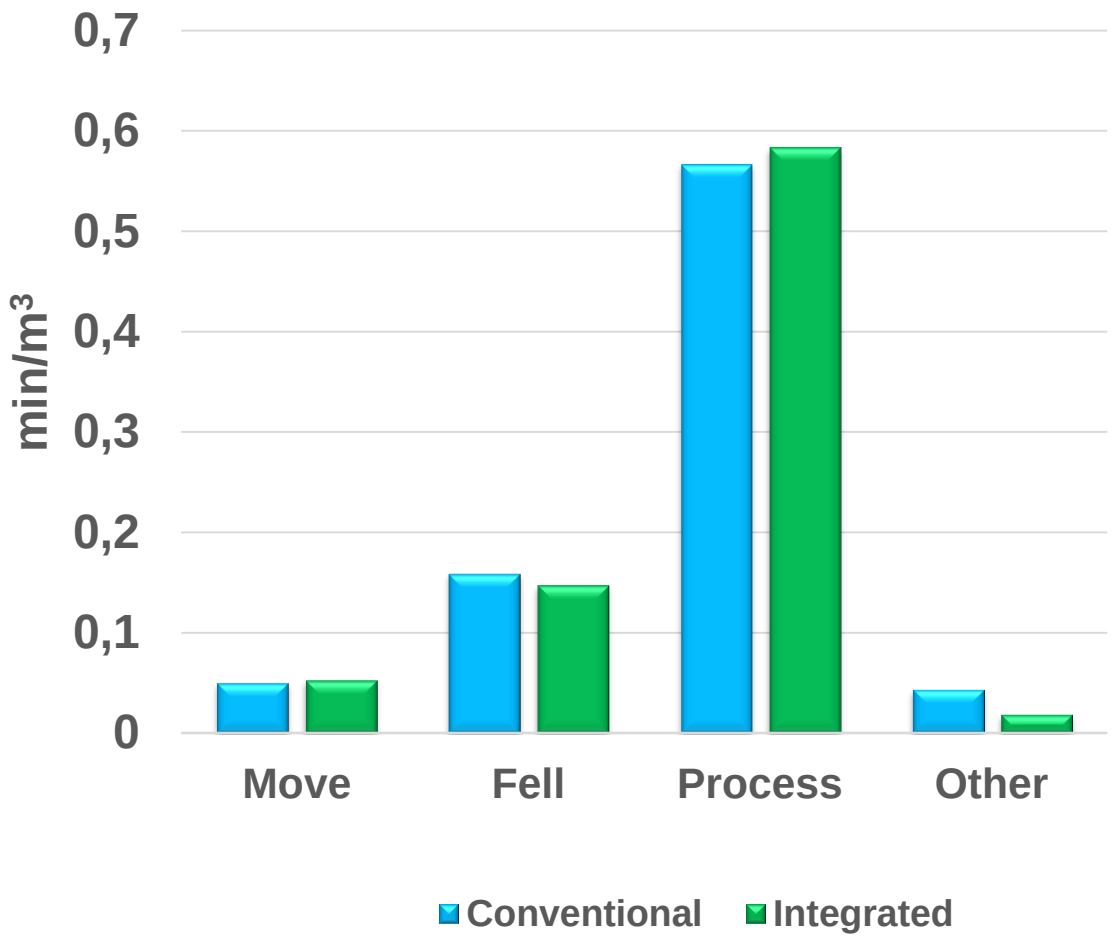
Yield: 36.6 GMt/ha of energy wood



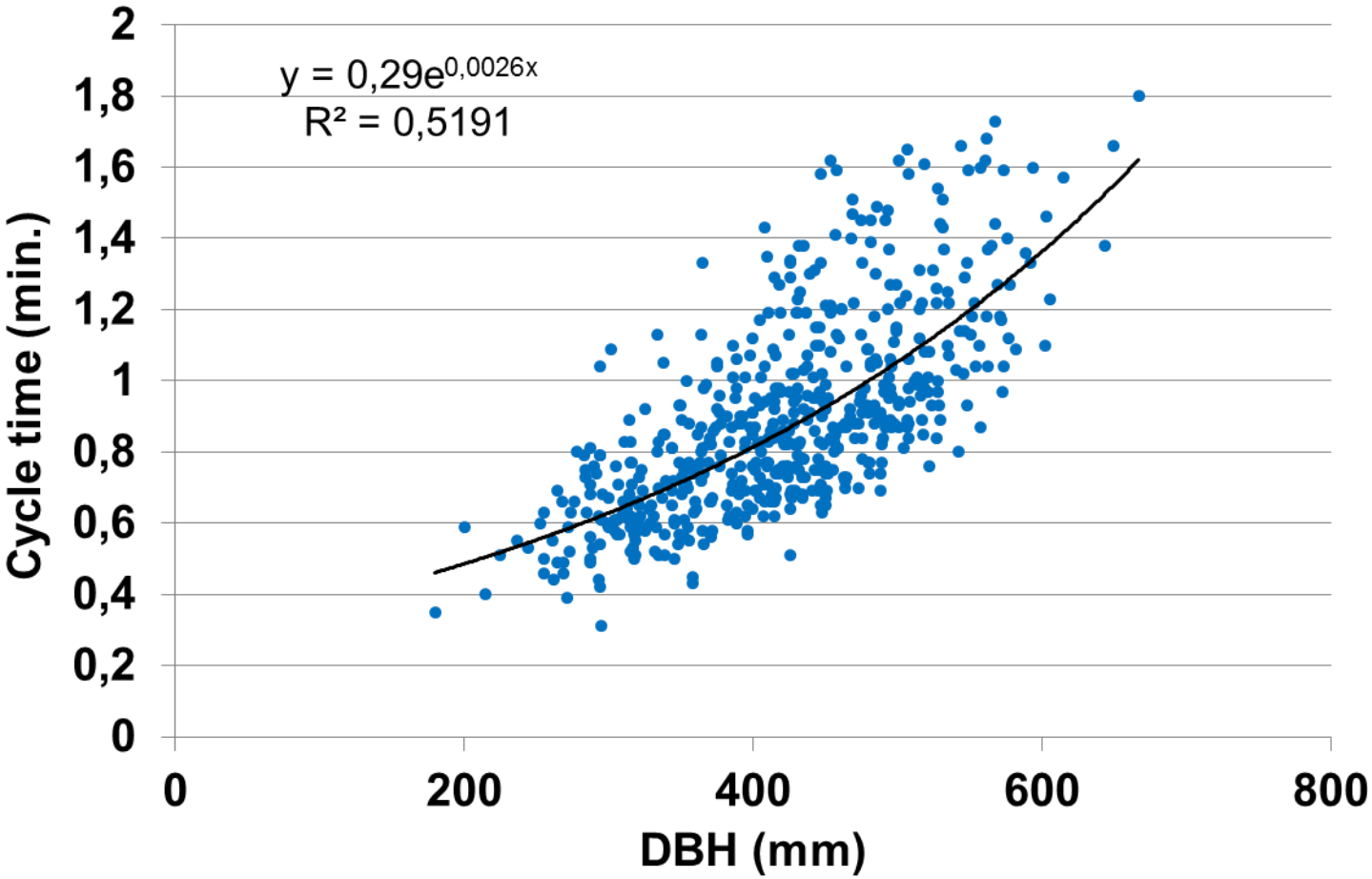
Residues: 41 GMt/ha reduction



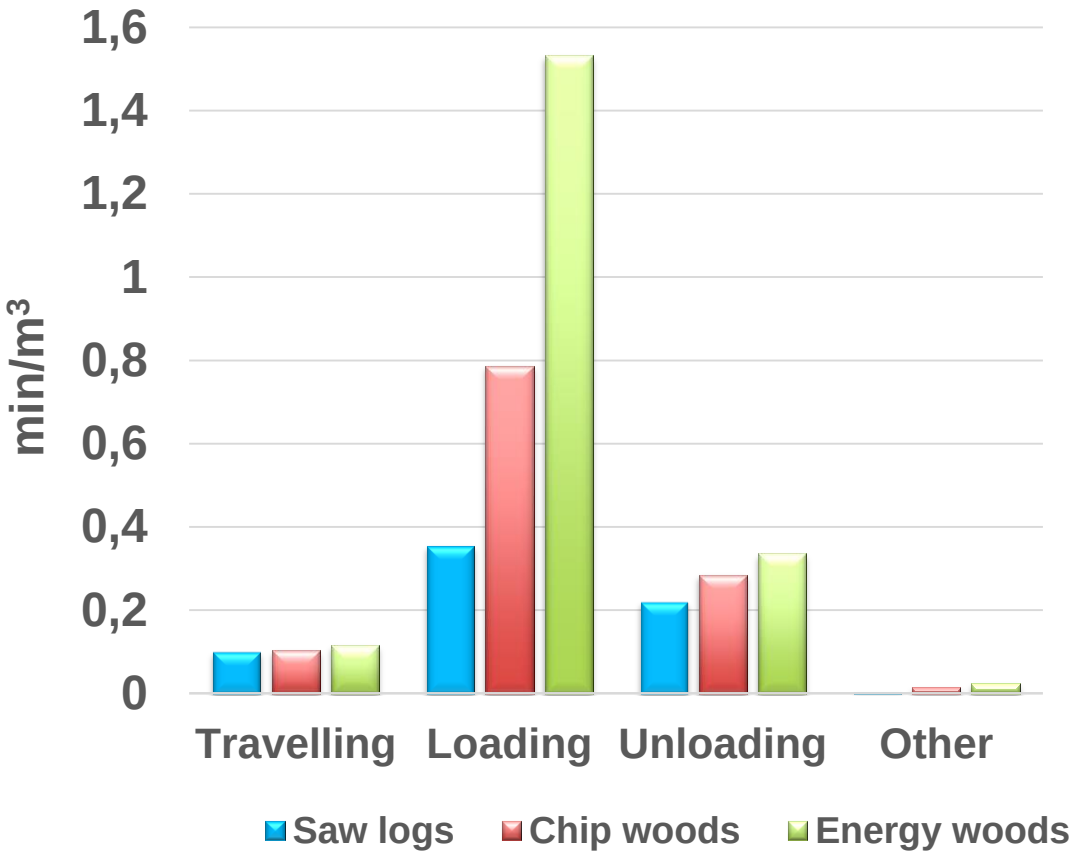
Harvester working time



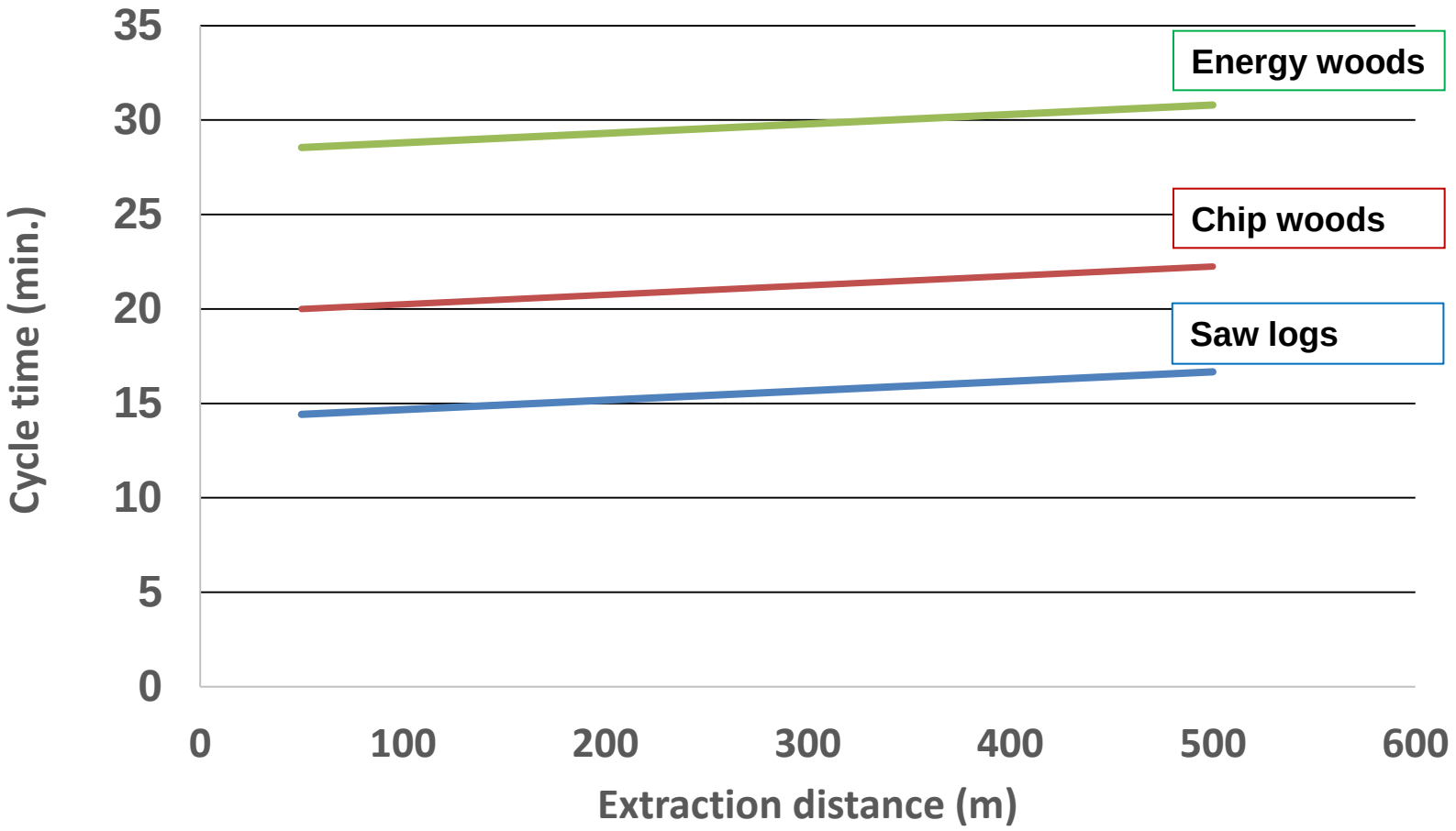
Harvester time predicting model



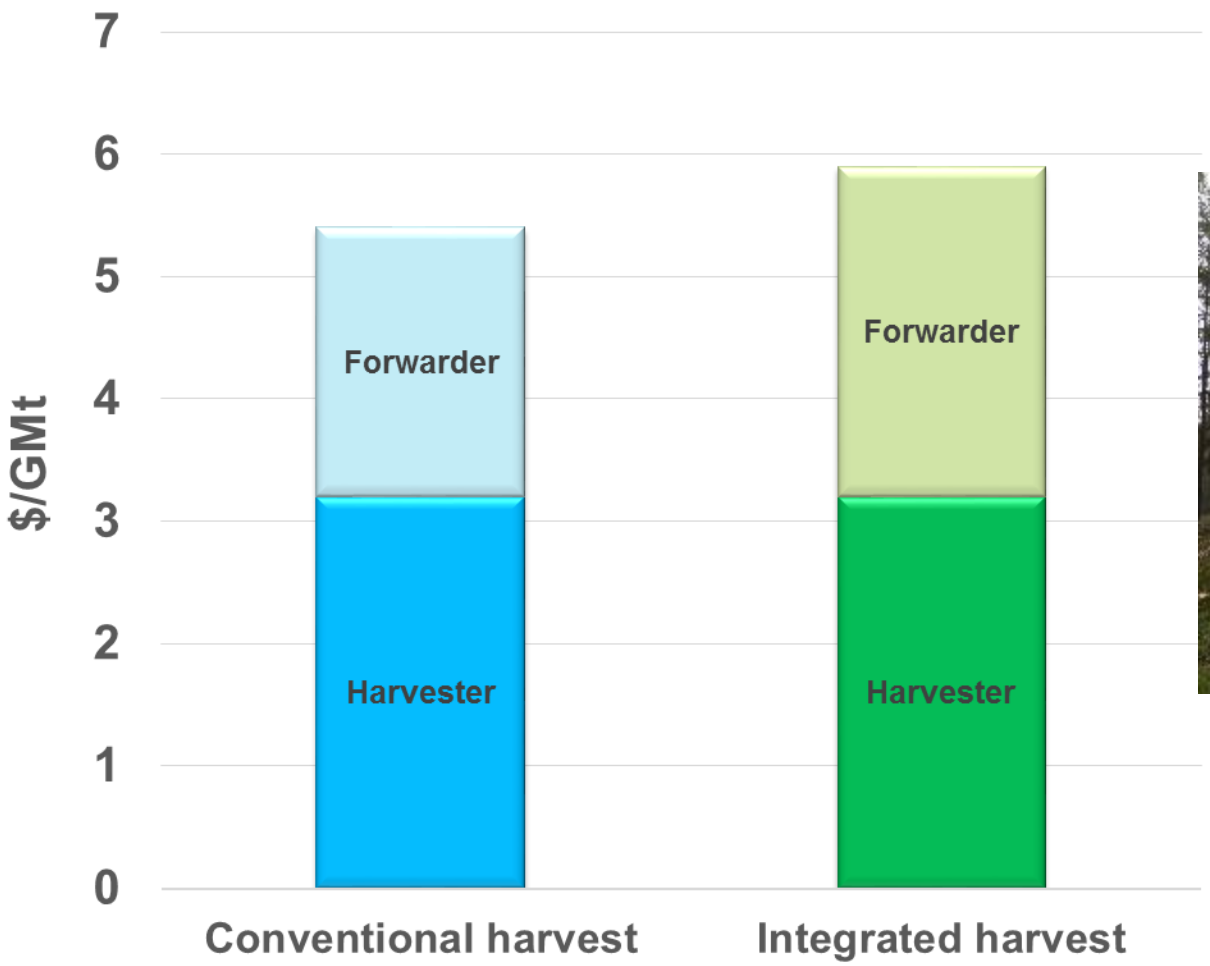
Forwarder work time



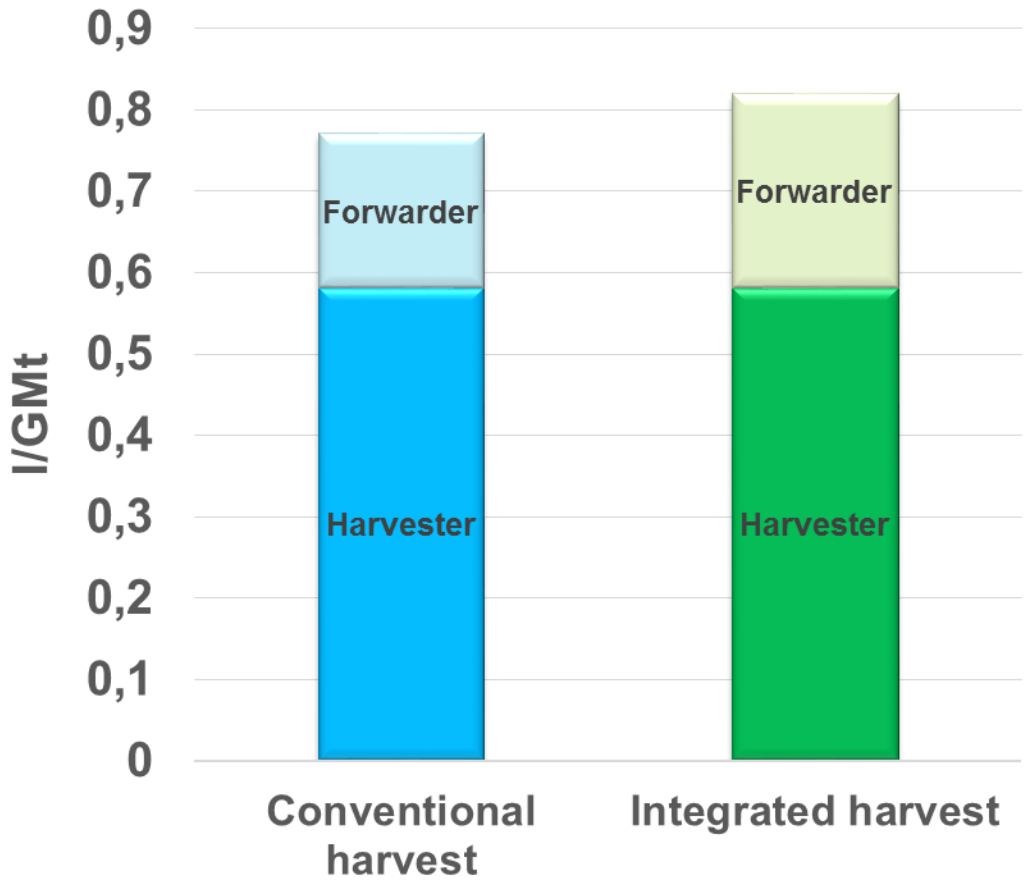
Forwarder time predicting model



Operating costs



Fuel usage



Conclusions

- Higher yield achieved by integrated biomass.
- Lower productivity for forwarder due to longer time to recover small logs.
- Future R/D: Testing modified bin loaders for forwarders to decrease operating costs
- Acceptable remaining residues for site sustainability.

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Thank you!

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