Comparison of the productivity of cut-to-length harvesting and fuel-adapted harvesting in a *Pinus radiata* clearfell operation in Western Australia

Martin Strandgard  
Senior Research Fellow, University of the Sunshine Coast  
PhD Candidate, University of Tasmania

**Team members:**
Rick Mitchell (USC), Assoc. Prof. Paul Turner (UTas), Dr Luke Mirowski (UTas)
Background

- Increasing interest in Australia in using logging residue as biofuel
- Exploration of methods to reduce delivered costs:
  - Roadside processing
  - Infield drying
  - Fuel-adapted harvesting
Trial objectives

• Examine the impact of fuel-adapted harvesting on:
  • Harvester and forwarder productivity & costs (logs)
  • Forwarder productivity & costs (Logging residue)
  • Logging residue yield and quantity of logging residue retained on site
  • Soil compaction
Trial site

• Location: south-west Western Australia
• Age and species: 29 year old *Pinus radiata* plantation
• Mean tree height: 27 metres
• Mean tree volume: 1.2 m³
• Stems per hectare: 293
Trial setup

• In October/November 2017 half of the 6 ha site was felled and processed using ‘conventional’ harvesting, half using ‘fuel-adapted’ harvesting

• Harvester: John Deere 903KH + Waratah 624C harvester head

• Forwarder: John Deere 1910E

• Five log products were produced – four sawlog types and chiplogs

• Logging residue was extracted by a different John Deere 1910E forwarder and operator
Conventional harvesting

- Cut-to-length at the stump
- Trees felled to the right into remaining plantation
- Processed in front of the harvester leaving residue in harvester’s path
Fuel-adapted harvesting

• Cut-to-length at the stump
• Trees felled to the front into remaining plantation
• Processed to the left of the harvester leaving residue and logs in separate piles alongside the harvester’s path
Results – Harvester productivity

- Harvester significantly less productive on the fuel-adapted treatment site
- ~15% reduction in productivity
Results – Harvester productivity

- Operator inexperience with technique
- Operator spent time adding small residue pieces to the piles
Results – Forwarder productivity – logs

- Forwarder significantly less productive on the fuel-adapted treatment site
- ~11% reduction in productivity
Results – Forwarder productivity – logging residue

- Forwarder productivity
  - Control
  - Treatment

- Forwarder cycle time (min)
  - Control
  - Treatment
Results – logging residue quantity

- Residue weight removed (ODT):
  - Control Odt: 20
  - Treatment Odt: 27

- Residue percentage removed:
  - Control %: 82%
  - Treatment %: 95%
• Harvester and forwarder productivity (logs) were significantly reduced in the fuel-adapted trial area

• Operator inexperience was likely to be the major factor in the productivity reduction

• Forwarder productivity (logging residue) was significantly greater in the fuel-adapted area

• Logging residue removal was greater in the fuel-adapted area
  • Nutrient loss?
Thank you!

Any questions?