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Manipulating chain type and flail drum speed for better fibre recovery in CFDDC operations

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Overview

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- Background
- Description of study and site
- Results
- Conclusions

Background

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- Western Australia has 253,000ha hardwood plantations (*E. globulus*), 28% of Australia's total
- Second rotation decline in marginal areas is an issue for plantation managers
- Low yielding sites require an innovative approach

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Study Description

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- Goals of the study was to determine if the installation of new lighter chains run at a slower speed would result in a measurable increase of:
  - Fiber recovery
  - Productivity and
  - Fuel efficiency
  - Without incurring a significant decline in quality of chip product

Study Description

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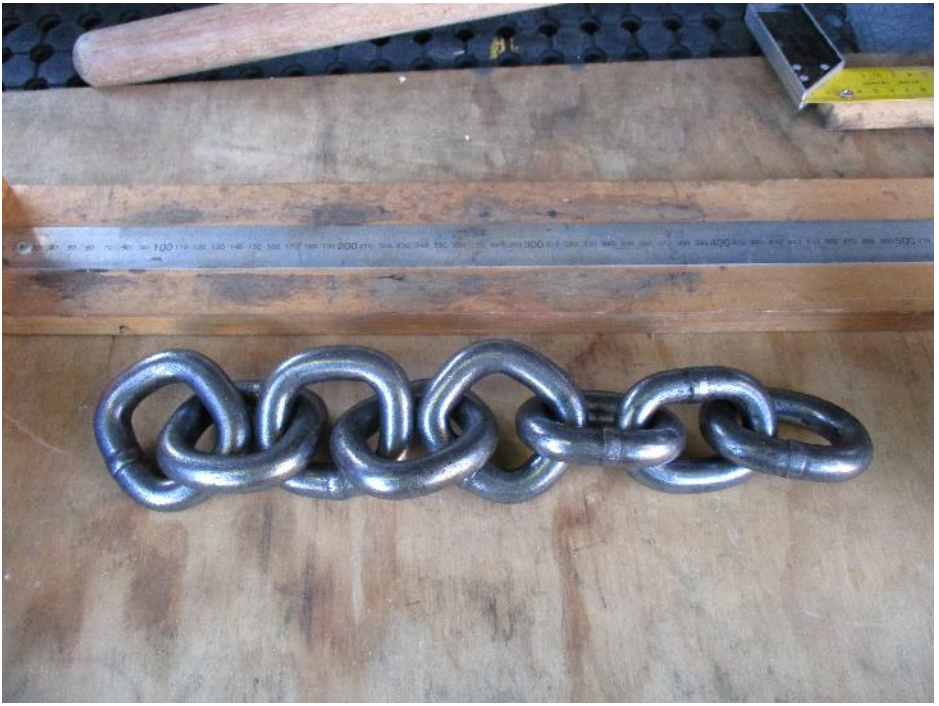
- Compare flail chains within a Peterson Pacific 5000H Chain Flail Delimber Debarker Chipper (CFDDC)
  - Standard chain
  - Light chain
- The CFDDC was run under three different treatments
  - Control – Standard chain, standard settings (661rpm)
  - Light – Light chain, standard settings (661rpm)
  - Light Slow – Light chain, optimised settings (440rpm)



Function Standard chain –
17mm, 5 square 3 oval, 2492g

Function Light chain –
15mm, 8 oval, 1919 g

Study site

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- 12-year-old (P.94) second rotation Bluegum plantation, originally harvested in 2006, then coppiced. ~120km NE of Albany
- Coppice thinned at age ~2 years
- 21.1ha
- 64 green tonnes/ha chips
- Average piece size 0.1m3

Study site

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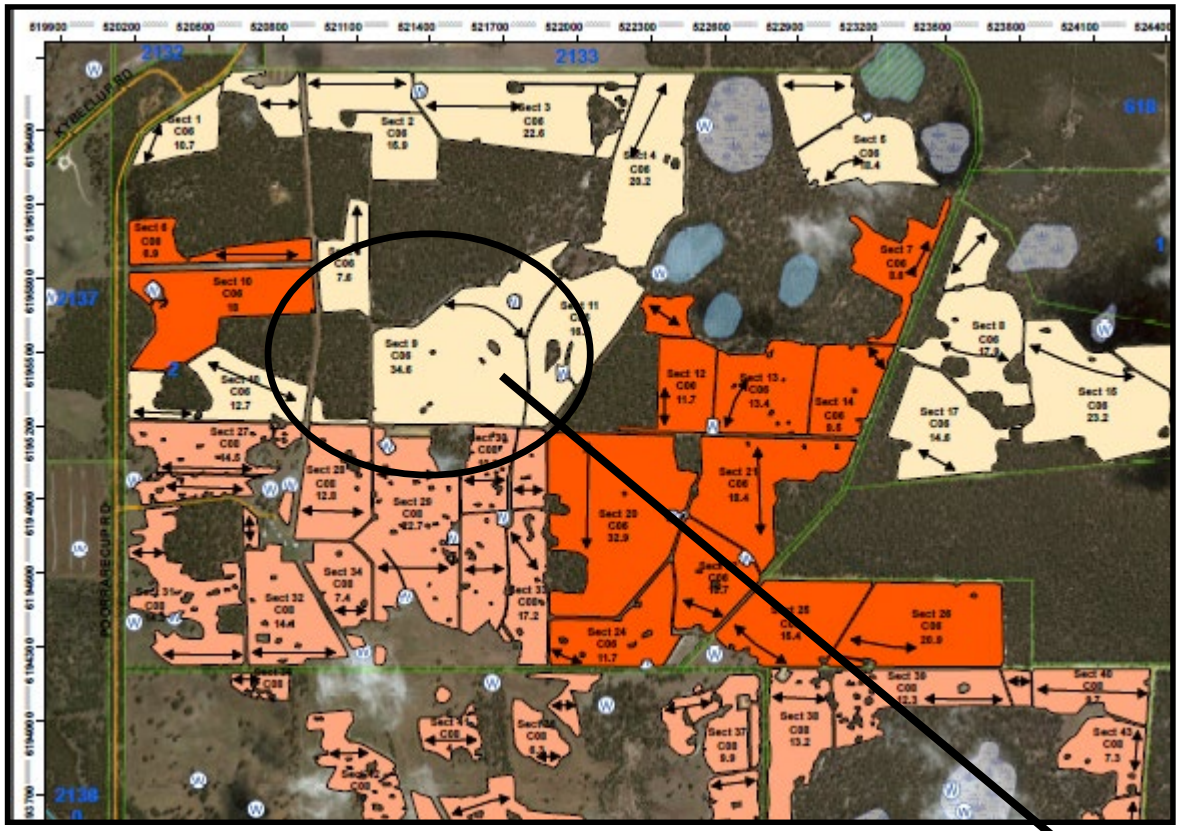

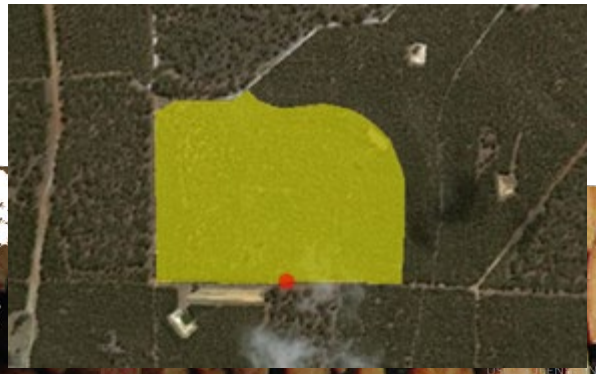

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Site was cut using different gullets for each treatment

Measurements

- Fiber recovery was estimated by matching the mass of a chip load with the raw mass of the trees fed to the CFDDC in order to produce that same chip load.
- Each tree pack for the whole compartment was weighed on a purpose built 12t frame.
- 452 packs, 2611t, ave pack weight 5.8t
- Productivity and fuel efficiency were estimated by associating chip mass output with time and fuel inputs.

Chip quality

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- 1348.5t of chips harvested (64t/ha)
- Chip quality determined at the receiving plant, where 2kg samples were collected from the trucks upon arrival during the unloading process
- Fraction classified with a Kazon vibrating separator
- Bark allowance <1%

Results of the chip quality study (% of sample weight)		
	Mean	
Bark	0.5	0.7
Accepts (28 - >5mm)	88.9	88.4

Results

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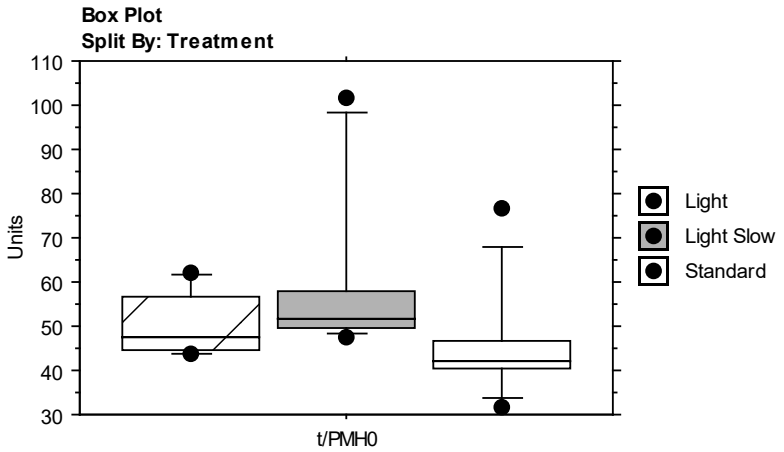

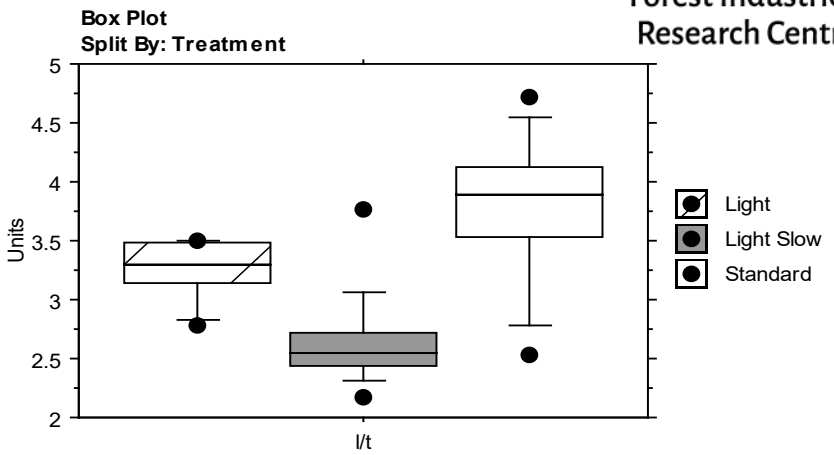

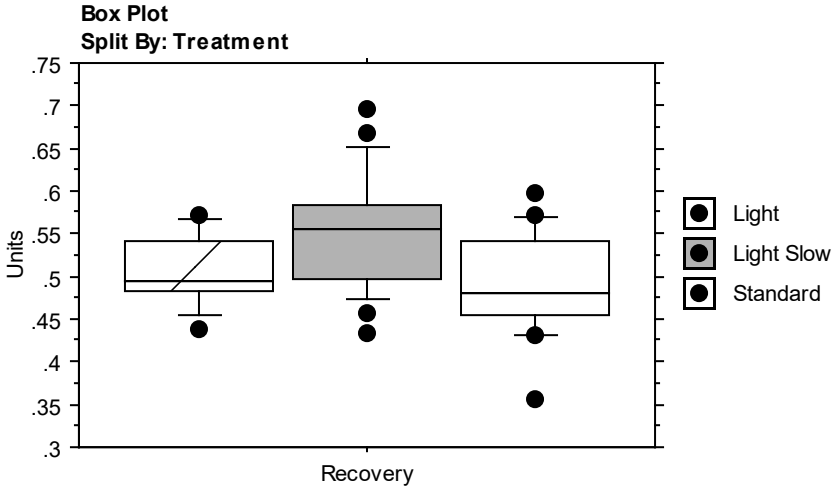

Results

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Results of the productivity study			
	Treatment	Mean	n
Productivity t PMH^{-1} p= 0.0120	Control	45.7	8
	Light	50.4	6
	Light slow	59.7	12

Differences were statistically significant at the 5% level.

Results

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Results of the fuel efficiency study			
	Treatment	Mean	n
Fuel use $l\ t^{-1}$ p=0.0009	Control	3.8	8
	Light	3.2	6
	Light slow	2.6	12

Differences were statistically significant at the 5% level.

Results

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Results of the fiber recovery study			
	Treatment	Mean	n
Fiber Recovery % Mass in	Control	49	16
	Light	51	12
	Light slow	55	24

Differences were statistically significant at the 5% level.

Conclusion

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Comparison of Standard verses Light slow

- Fibre recovery +12%
- Fuel consumption -30%
- Nett productivity +20%
- Chip quality no significant difference

- Light slow in this type of plantation is now the preferred method

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Thank-you