

# The learning curve of a new CTL mechanised harvesting system.

AND – looking at some links to silviculture.



# The challenge

- General:
  - Slope: at least 40%
  - Across boundaries (plantations/districts)
  - Multiple clients and products – very complex
- Clear felling:
  - Tree size: 0.8 – 1.4 average (max 2.0m<sup>3</sup>)
  - System bottleneck: Forwarder
- Thinning:
  - Tree size 0.2– 0.5 average (max 1.0m<sup>3</sup>)
  - System bottleneck: Harvester
- Resistance to change!

# Equipment selection - overview

- Track vs tyre
  - Tracks for both – due to terrain constraints
- Dedicated vs excavator
  - Dedicated - due to extreme work load and in-field application
- Levelling vs non-levelling
  - Levelling – slope issues
- Convert feller-buncher vs dedicated carrier
  - Convert (cheaper and had the same volume capacity)
- Forwarder size
  - Thinning – row spacing
  - Clear felling – as big as possible!





# Equipment selection

- Thinning:
  - Carrier: Zero-tail swing machine
  - Head: Logmax 7000XT
  - Software: Logmate 500
  - Forwarder: 14 t
- Clear felling:
  - Carrier: converted Feller buncher (Tigercat L870C)
  - Head: Logmax 10000XT
  - Software: Logmate 500
  - Forwarder: 20 t (TimberPro)



# Operational design

- 235 days a year (no weekends)
- 2 shifts (05:00 – 14:00 – 23:00)
- 9 hours per shift = 7 mhrs = 3 300mhrs/yr

We are working some weekends – just to catch up when needed!

- Production targets:
  - Clear felling:  $45 \text{ m}^3/\text{mhr} = 140\,000 \text{ m}^3/\text{year}$
  - Thinning:  $15 \text{ m}^3/\text{mhr} = 50\,000 \text{ m}^3/\text{year}$



# Team design

- 10 operators:
  - 2 dedicated per machine = 8
  - 1 alternating between harvesters
  - 1 alternating between forwarders
- 2 chainsaw operators – 1 per team
- 8 tally people – 4 per team
- 1 service truck driver
- 0 Supervisor
  
- Total = 21 people
- TLP = 38 m<sup>3</sup>/man-day



# Incentive design

- Hurdles (team): **all or nothing**
  - Productivity ( $\text{m}^3/\text{shift}$  or  $\text{m}^3/\text{mhr}$ )
  - Cost control (within budget)
- Disqualifiers (individual): **all or nothing**
  - AWOL
  - Disciplinary
- Modifiers (individual and team): **pro-rata**
  - Quality claims – team
  - Absence - individual





# Lessons learnt .....

- Initial learning fast – later slow
  - Pre-learning is very important
  - Once operators know what to do, leaning becomes difficult
    - Initial competence at about 9 months
    - Detail learning = proficient = ?? (time will tell)
  - Initial learning on harvester difficult, however final mastering of forwarder more difficult to achieve
- Incentives work well

# Lessons learnt

- Markets and log-mix
  - Products-client mix increased from 10 to more than 40
  - Long vs short log target ratio was 70:30 - is about 50:50 now – this is a real challenge for the overall target
- Log quality in saw timber
  - Especially end-splitting is a challenge due to tree size
- Resistance To Change
  - Management adjustment substantial
  - Special management systems required
  - Needs a very hands-on approach
- Dedicated R&M capability



# Impacts on silviculture .....

- Slash:
  - Worse than motor-manual:
    - Branch size (problem during pitting)
  - Better than motor-manual:
    - Spread of slash (good mulch cover after planting)
  - Timber off-cuts: infield (good if you don't want to use it for biofuel)
- Weed management:
  - Bigger problem than anticipated:
    - Lack of visibility - especially at night
    - Chains jumping off – cutting small stems
    - Significant impact on productivity is weeds above cab height

# Impacts on silviculture

- Tree planting rows – for thinnings:
  - Spacing:
    - Boom length is driven by head size (weight)
    - Cannot reach 3<sup>rd</sup> row – spacing needs to be revised in long term
    - Planting line – side sloping quite a problem due to incorrect row planning – planting needs to follow the slopes which may require some innovative designs
    - Tree spacing – wider spacing yields lower throughput and bigger branches – may need to re-look at stocking – a bit denser is better!
  - Damage to remaining trees is minimal
  - Compartment size
    - Consolidate compartments (up to 5 years either side)
    - Aim at least at 20ha units



# What does it require to implement?

- Needs lots of management time
- Determination and perseverance
- Willingness to make mistakes and learn
- A dedicated and focussed team and good team work
- An ability to think out of the box and find solutions to problems you didn't anticipated
- Attention to detail





# Status quo?

- On time
- Within budget
- Ahead of production targets

My sincere thanks to a dedicated team of people!

Thank you!