

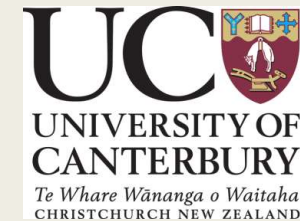
Machine utilisation using GPS tracking

A Pan Pac Case Study

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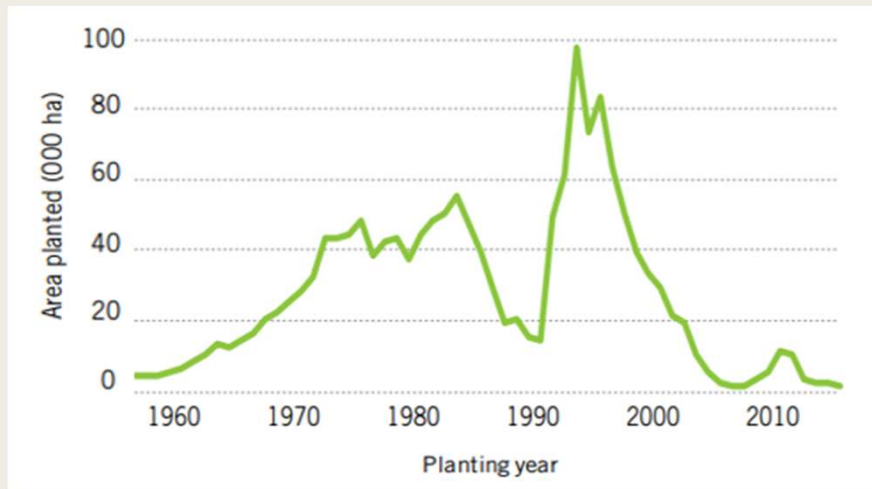
University of Canterbury



New Zealand Forest Industry

Forest Harvest is expected to increase to 35 million m³ by 2025.

New planting increased by 80,000 hectares in the 5 years following 1990.



Sources: National Exotic Forest Description, 2016 p5. & MPI 2016 - Wood Availability Forecasts (Scenario 3)

Safety

Manual



Mechanised



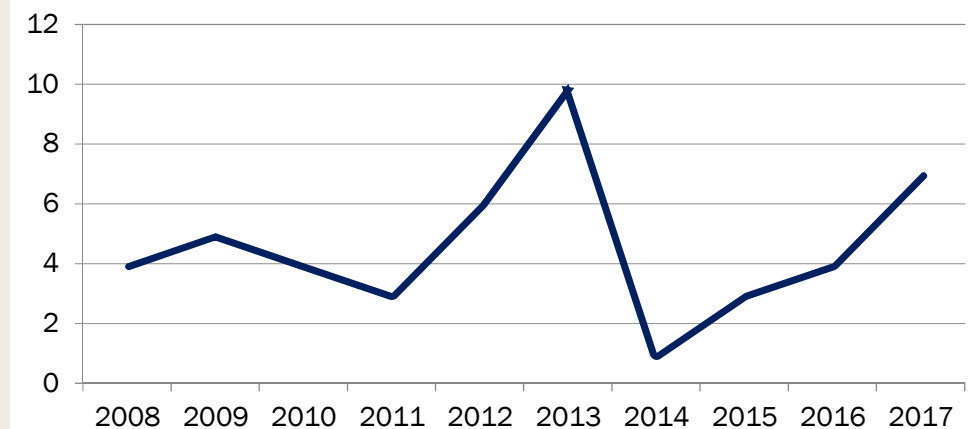
2013: Highest Number of forestry deaths

2014: Overhaul of Forestry Industry

→ 2015: Introduction of new Health and Safety at Work Act

2017: Number of Fatalities beginning to rise again

Forestry Industry Fatalities



Background on Winch-Assist Machines



“To provide traction assist for mechanised felling machines on steep slopes”

Background on Winch-Assist Machines

- Allows felling machine to operate on up to 45 to 50 degree slopes.
- Reduces soil disturbance (Important in steep terrain due to erosion).



Scope of the project

- Winch-assists have become increasingly common in forest operations: Both in NZ and around the world.
- Until now, there has been no in-depth or long term evaluation of winch-assist machines.
- Utilization rate is still an unknown.

Objectives

1. What is the current utilization rate for a Tractionline winch-assist machine?
2. What influences utilization rate?
 - a . Can utilization of the winch-assist be improved?

Pan Pac's expectation of winch-assist utilization is >75%

The importance of utilization

- Winch machine is paid on a day rate.
- If the machine is under utilized or not used at all, the cost to productivity ratio begins to increase significantly.
- An accurate estimate of utilization rate will allow for better planning and efficiency of the winch-assist system.

Methods – GPS Tracking



Using the units to collect machine “On” and “Off” times, to be used in the formula below.

$$Utilization (\%) = \frac{PMH}{SMH} \times 100$$

What I have found so far

There is a clear difference between how often the winch-assist has been used compared to the felling machine.

The winch-assist has been used on 49/70 possible days.

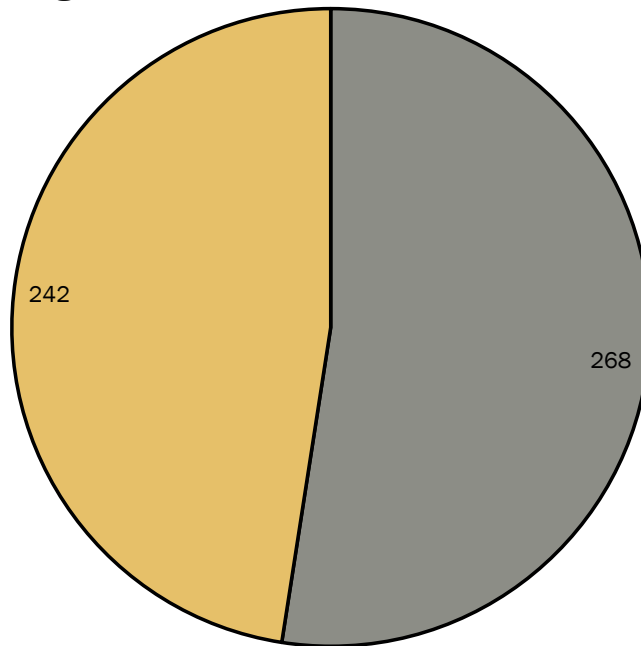
Machine	Total hours "On" (Dec 18 th – Mar 31 st)
Winch-assist	268
Felling Machine (Only on days used with Winch)	357
Felling Machine (Total)	510

That's 21 Days not used!

Results

Winch-assist use as a proportion of total felling machine time.

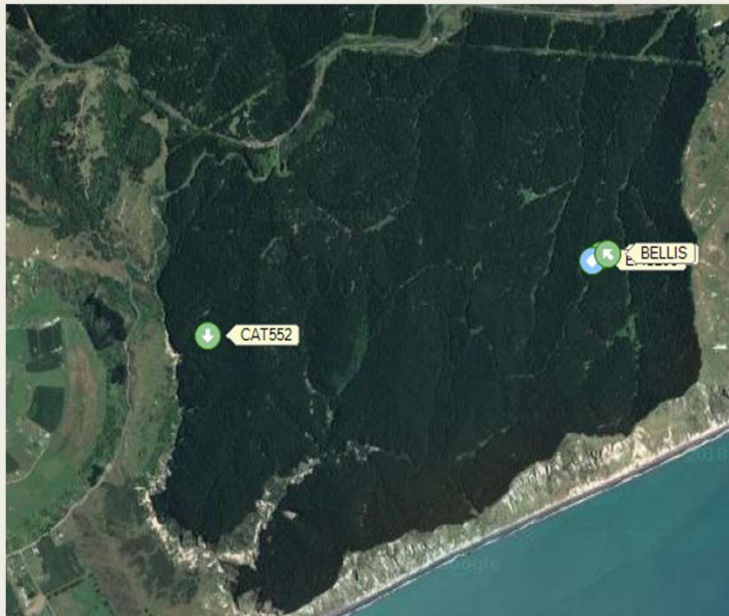
- Total Hours winch-assist used with felling machine
- Total hours winch-assist not used when felling machine is



- Utilization rate of the winch-assist is 75% when the two machines are used together.
- Utilization rate of the winch-assist as a proportion of total felling machine time is 53%
- When used, SMH for the winch-assist average 5.5 hours/day.

Other potential uses for GPS software

Forest level machine location.



Single machine movements – whole day.



Discussion

Limitations:

- GPS data captures the total hours a machine has been “On” and “Off”, but not able determine causes of delays.

Opportunities:

- Second felling machine to potentially be used with winch-assist.
- Effects results from delay study will have on PMH.
- Other potential uses for GPS tracking units.

What's next?



- Continue with dissertation project.
- Provides a starting point/foundation for future research into winch-assist machines.
- Insight and feasibility for the use of GPS tracking in forest machinery.