

# Forest Engineering Developments in New Zealand

**6<sup>th</sup> International Forest Engineering  
Conference**

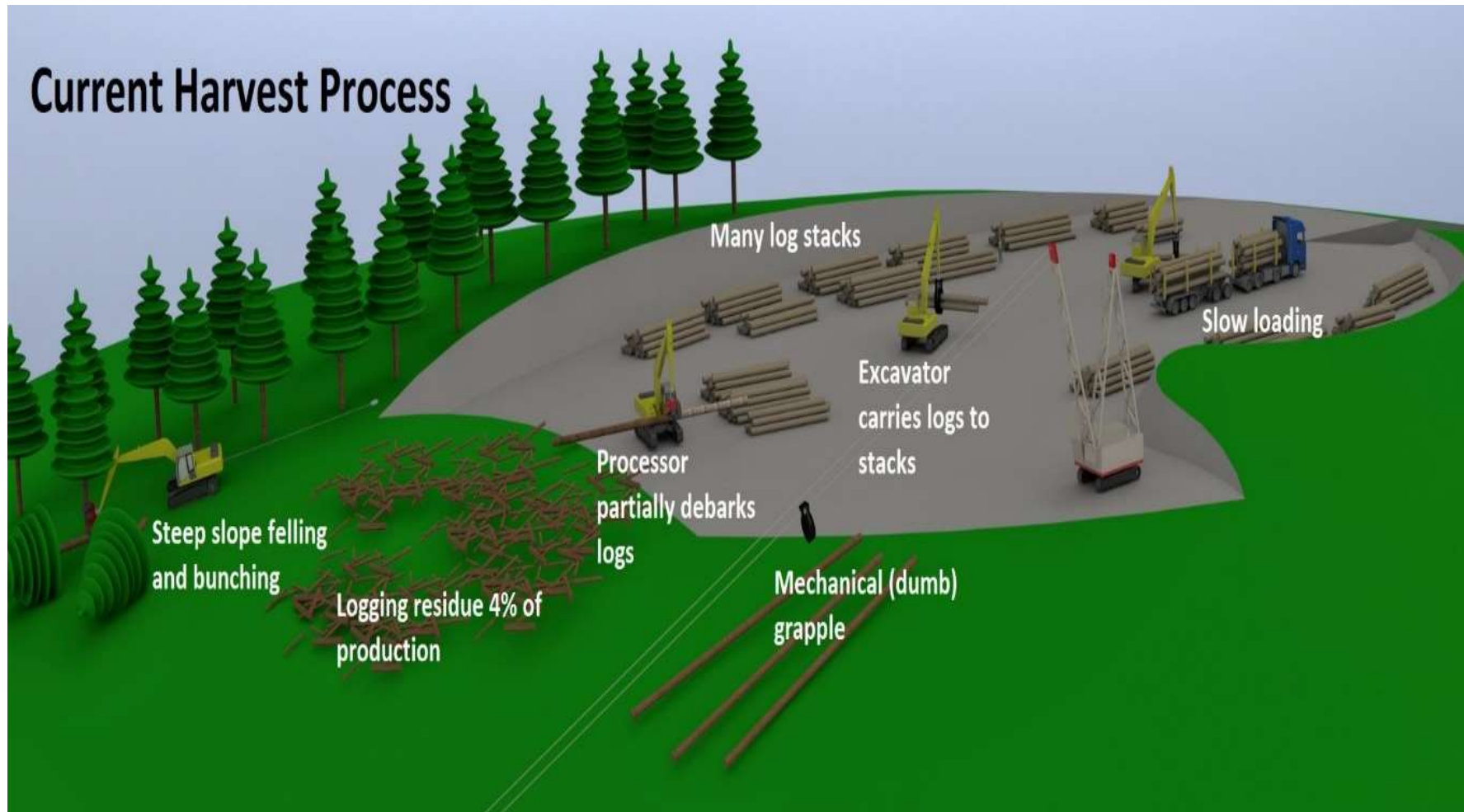
**17 April 2018**



# Harvesting issues & development drivers

1. **Labour shortages are limiting industry growth**
2. **Safety is still an issue**
3. **Environmental ‘licence to operate’ is under threat**
4. **Rising harvesting costs and marginal profitability of some forests**
5. **Need to continue to mechanise forestry operations**

# Current harvesting operations: A partially mechanised process



# Forest Engineering Developments

1. **Winch-assisted felling**
2. **Teleoperated felling**
3. **Felling carriage**
4. **Grapple carriages**
5. **In-cab vision systems**
6. **Skyline shifting**
7. **Processing and loading**
8. **Robotics**





# Winch Assisted Felling

- **ClimbMAX Steep Slope Harvester**
  - Single winch integrated into feller buncher track frame
  - Commercially available (ClimbMAX Equipment Ltd)
  - 11 units sold (3 in NZ, 7 in Canada, 1 in U.S.)

**ClimbMAX**  
INTERNATIONAL LTD [WWW.CLIMBMAX.CO.NZ](http://WWW.CLIMBMAX.CO.NZ)



**FFE**  
FALCON FORESTRY  
EQUIPMENT

- **Falcon Hydraulic Winch Assist**
  - Single winch excavator-based system with remote camera and multiple operating alarms
  - Commercially available (DC Equipment Ltd)



• 63 units sold (including exports)

# Winch Assisted Felling

- **Tractionline winch assist**
  - Dual winch excavator system
  - Commercially available (EMS Ltd)
  - 71 units sold (35 in NZ)
- **Remote Operated Bulldozer (ROB)**
  - Dual winch system with operating alarms
  - Commercially available (Rosewarne and May Ltd)
- 32 units sold to date (10 in NZ)





# Winch Assisted Felling

- **Waka Engineering winch assist**
  - Single winch excavator based system
  - Commercially available (Nathan Hill, Waka Welding Ltd, Waikouaiti)
  - 6 units sold (all in NZ)
- **Performance Mechanical winch assist**
  - Dual winch system on bulldozer or excavator base
  - Commercially available (Performance Mechanical & Engineering Ltd, Taupo)
- 2 units sold to date (both in NZ)



# Teleoperated Felling

- Full teleoperation of John Deere 909 feller buncher
  - First teleoperation console built and tested
  - Full machine functionality
  - HD low latency cameras and LCD displays
  - Full size joysticks
  - Trailer side control system
  - Video interrupt warning system
  - Commercially available (Applied Teleoperation Ltd)





# Remote controlled felling carriage

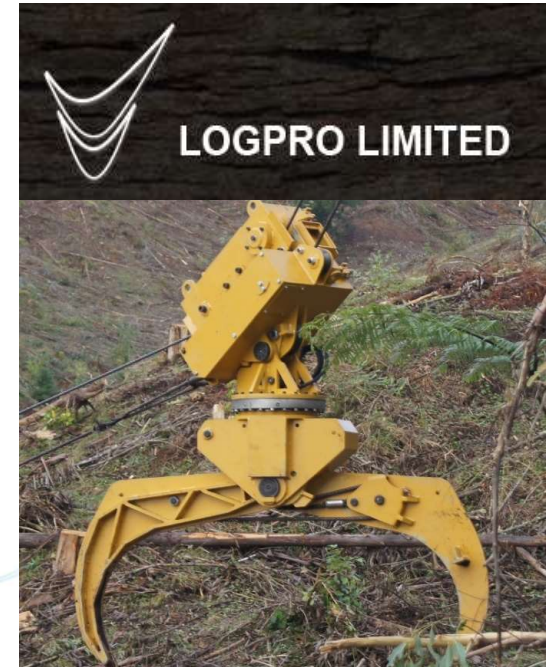


- **Falcon Felling Carriage Prototype**
  - Prototype developed by DC Equipment Ltd
  - Features two felling saws: a smaller front saw and a larger rear saw
  - Hydraulic operated arm to raise/lower felling head
  - Currently being trialed
  - Released at HarvestTECH 2017 in Rotorua – June 2017
  - Planned for commercial production and sale later in 2018



# Grapple Carriages

- **Falcon Claw Grapple Carriage**
  - Designed and built in NZ (now 3 models: 1250 / 1580 / 2150)
  - Kohler KD425-2 & KD625-2 air-cooled Diesel engine
  - Commercially available (DC Equipment Ltd)
  - **40** units sold (34 in NZ)
- **Alpine Grapple carriage**
  - Designed and built by Alpine Logging Equipment (SA)
  - Non-motorised (hydraulic accumulator)
  - Modified and trialed in NZ
  - Commercially available (Logpro Ltd) - **13** sold to date in NZ



# Grapple Carriages

- **Hawkeye grapple carriage**
  - Designed and built in NZ
  - Kohler 350 5.5kW Diesel engine
  - Remote control grapple open/close from cab
  - 360 degree powered grapple rotation
  - Integrated digital camera and LED lighting
  - Commercially available (EMS Ltd)
  - **20** units sold (including exports)





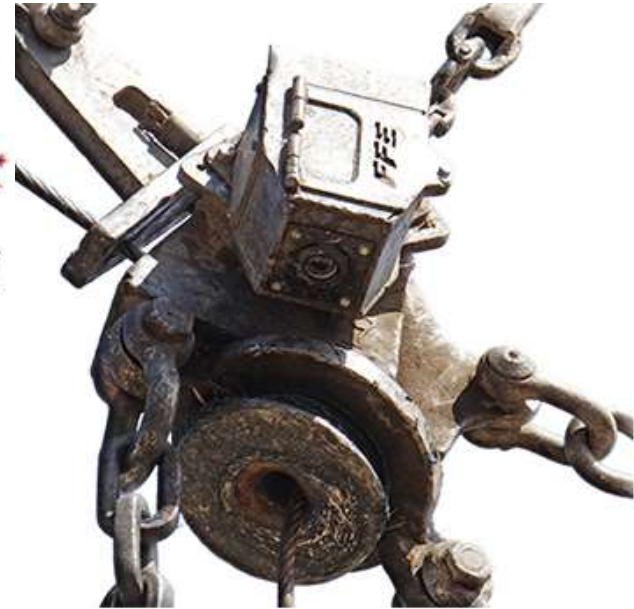
# In-Cab Vision Systems

- **HarvestNav on-board navigation**
  - Harvest plan with GPS navigation and machine slope warnings
  - Commercially available (Margules Groome Ltd)
  - 18 implemented as free download 'app' plus 2 new version sold
- **CutoverCam hauler vision system**
  - Joystick control of pan, tilt and (optional) zoom
  - Light weight one piece construction [3.5kg]
  - Low latency video link with HD display
  - Commercially available (Applied Teleoperation Ltd)



# In-Cab Vision Systems

- **Falcon Grapple Camera**
  - Can be fitted to any swing yarder grapple system
  - Clear vision day or night with range up to 900 metres
  - Commercially available (DC Equipment Ltd)
  - 78 installed and operating in swing yarders in NZ
- **Falcon tension monitoring 'app'**
  - Prototype developed by University of Canterbury
  - Two prototype units installed and being trialled
  - Commercially available later in 2018 (DC Equipment Ltd)



# Skyline shifting

- **Skyshifter Tail Hold Carriage**
  - Lateral movement of skyline
  - Prototype built, tested and demonstrated in field
  - Available for production trial or lease (Awdon Technologies Ltd)
- **Cab Assist Backline (CAB)**
  - Low latency cameras and video link with warning system
  - High-definition LCD display
  - Commercially available (Applied Teleoperation Ltd)

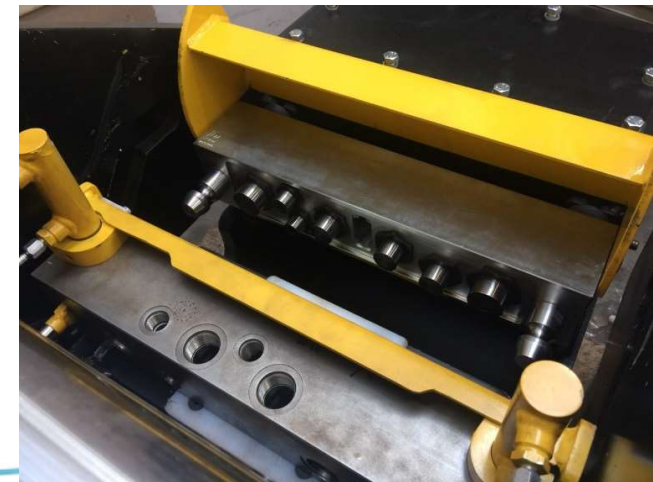
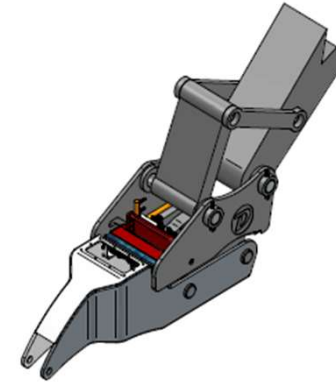
## AWDON SKYSHIFTER





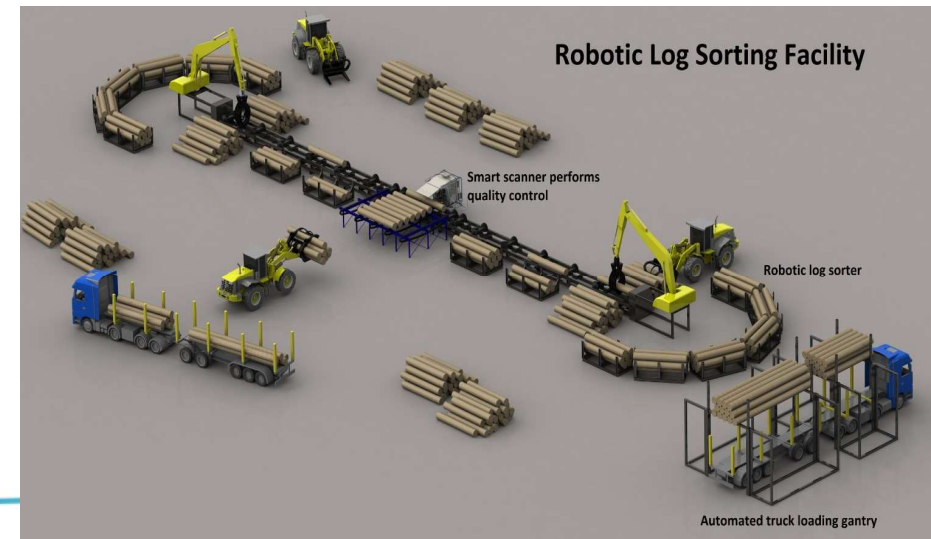
# Processing and loading

- **Doherty automatic quick coupler**
  - Rapid changeover from processor to log grapple
  - Single base machine to process logs and load trucks
  - First prototype designed and built
  - Ready for pressure testing in workshop
  - Installation to first adopter machine and field trials later in 2018
  - Marketed by Doherty Engineered Attachments Ltd and serviced by Total Hydraulic Solutions Ltd



# Robotics

- **Robotic Tree-to-tree machine (prototype)**
  - Concept design by Scion
  - Prototype built by University of Canterbury Mechatronics programme
  - Field tested and demonstrated in Christchurch - Sept 2016
  - Needs more investment to develop further
- **Robotic Log Sorting Facility (design)**
  - Scan, sort and bulk load logs to HPMV trucks
  - Part of a new forestry automation programme
  - To be designed and built by Skookum Technology Ltd)



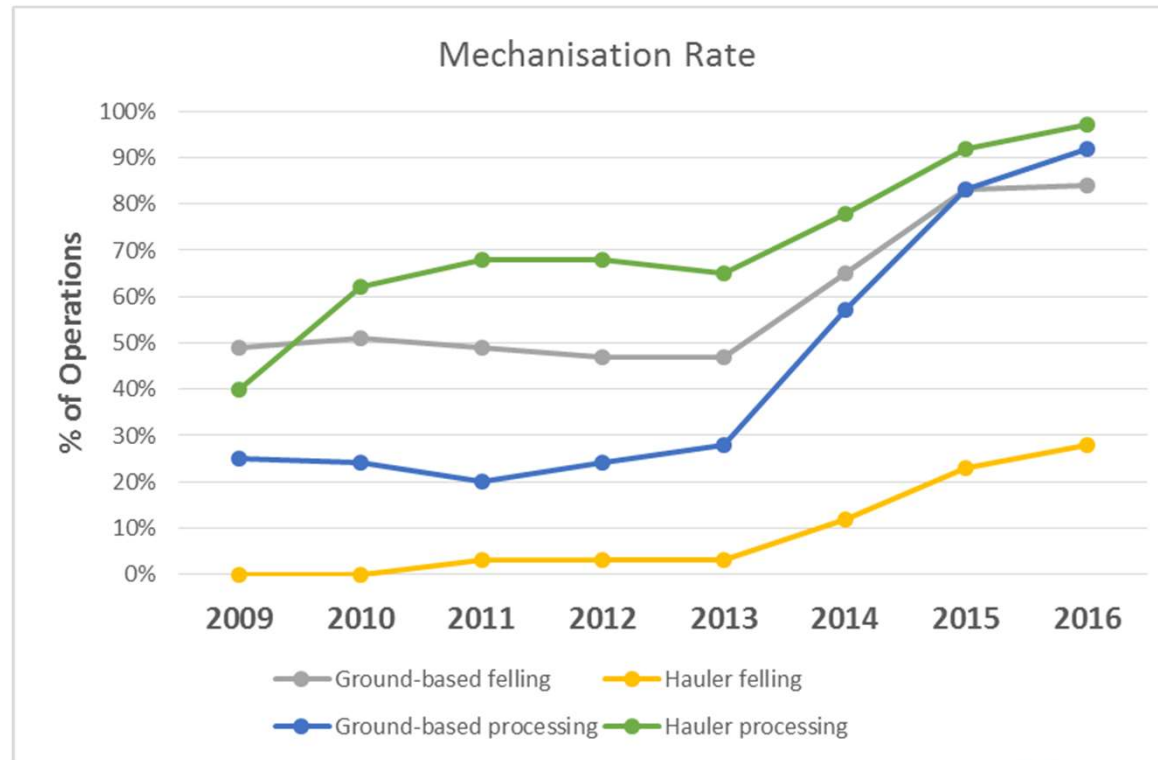
# Results of engineering developments to date

- **19 new products developed in last 5 years – 13 commercialised and 6 prototypes**
- **Suited to NZ forestry conditions**
- **Collaboration between forestry companies, contractors, Government and manufacturers has de-risked investment**
- **Growth of NZ forestry machinery manufacturers and technology developers**
- **Continues to catalyse innovations in harvesting**
- **Speeded up delivery of productivity and safety benefits**



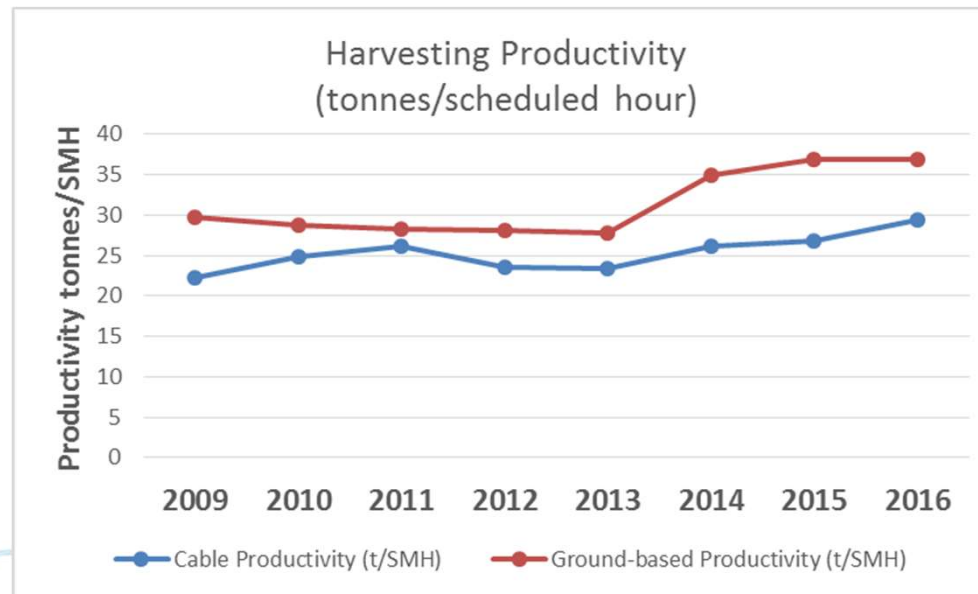
# Sector-wide benefits: Mechanisation

- Mechanised processing in over 90% ground-based and hauler
- Mechanised felling in over 80% ground-based and almost 30% hauler



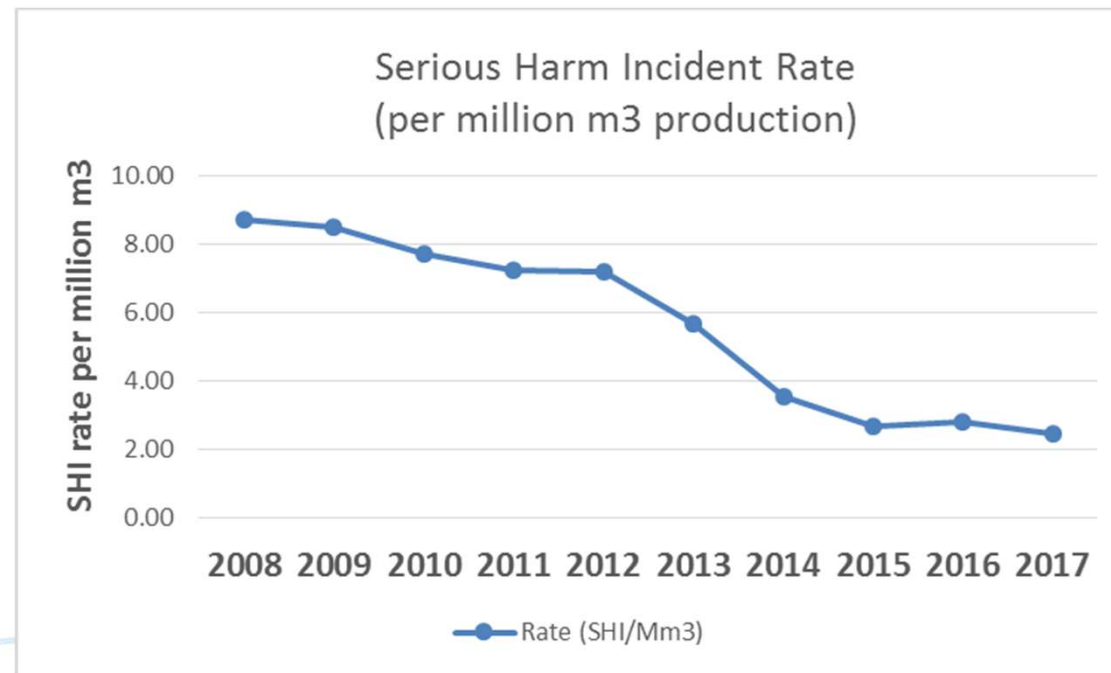
# Sector-wide benefits: Productivity

- **33% increase in ground-based productivity since 2013**  
(36.8 tonnes/hour in 2017 vs. 27.7 tonnes/hour in 2013 – FGR Benchmarking)
- **25% increase in cable harvesting productivity since 2013**  
(29.4 tonnes/hour in 2017 vs. 23.4 tonnes/hour in 2013 – FGR Benchmarking)



## Sector-wide benefits: Safety

- **60% reduction in serious harm injuries from 2012 to 2017**  
(75 SHI incidents in 2017 vs. 194 SHI incidents in 2012 – WorkSafe NZ)
- **Over 200 workers removed from manual felling and breaking out**





## Sector-wide Commercial Outcomes

- **Over 180 new winch-assist felling units sold**
  - Including over 90 machine exports to North and South America
- **Over 70 new grapple carriages sold**
  - Alpine, Falcon and Hawkeye grapple carriages
- **Over 100 new camera systems sold**
- **20 HarvestNav navigation systems in use**
- **Over \$110 million sales of new harvesting machinery and equipment since 2012**

# Future Vision: An automated forestry value chain

“No boots on the ground, no hands on the log”

