# Forest Engineering R&D in New Zealand

### Workshop for Growers of Small Forests 30 August 2019



## **Winch Assisted Felling**

- ClimbMAX Steep Slope Harvester
  - Commercially available (ClimbMAX Equipment Ltd, Nelson)
  - 11 units sold (3 in NZ, 8 exports)

- Falcon Winch Assist
  - Commercially available (DC Equipment Ltd, Nelson)
  - 92 units sold + 23 on order (including exports)







ON FORESTRY



## **Winch Assisted Felling**

- Tractionline winch assist
  - Commercially available (E.M.S. Ltd, Rotorua)
  - 100 units sold (incl. 50 exports)

- Remote Operated Bulldozer (ROB)
  - Commercially available (Rosewarne and May Ltd, Whangarei)
  - **32** units sold to date (incl. 22 exports)







## **Grapple Carriages**

- Falcon Claw Grapple Carriage
  - Designed and built in NZ (now 3 models: 1250 / 1580 / 2150)
  - Commercially available (DC Equipment Ltd
  - 62 units sold + 10 on order (including exports)

- Alpine Grapple carriage
  - Designed and built by Alpine Logging in South Africa
  - Commercially available (Alpine Logging Equipment Ltd, NZ)



• 13 units sold (all in NZ)



## **Grapple Carriages**

- Hawkeye grapple carriage
  - Designed and built in NZ
  - Commercially available (E.M.S. Ltd, Rotorua)
  - Over 50 units sold (including 20 exports)





## **In-Cab Vision Systems**

- HarvestNav on-board navigation
  - In-cab harvest plan plus machine slope warnings
  - Commercially available (Margules Groome Ltd)
  - 20 units implemented
- CutoverCam vision system
  - Many applications from monitoring operations, to safety of operators, to security of road entrances etc.
  - Remote control of pan, tilt and zoom



Commercially available (Applied Teleoperation Ltd)









## **In-Cab Vision Systems**

- Falcon Grapple Camera
  - Suitable for any grapple system
  - Commercially available (DC Equipment Ltd)
  - 150 units sold in NZ

- Falcon tension monitoring 'app'
  - Prototype developed by University of Canterbury
  - Commercially available later in 2019 (DC Equipment Ltd)



• 2 prototype units installed in haulers



## **Remote control skyline shifting**

- **Skyshifter Tail Hold Carriage** •
  - Enables lateral movement of skyline
  - Available for production trial or lease from Awdon Technologies Ltd (Gisborne).

- **Teleoperated Anchor Machine (TAM)** •
  - Remote control of mobile tail hold machine
  - **Commercially available (Applied Teleoperation Ltd)**



First unit sold

#### **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, built and tested
  - Second prototype designed and ready for build
  - To be marketed by Doherty Engineered Attachments Ltd and serviced by Total Hydraulic Solutions Ltd.





#### **Sector-wide Outcomes**

**Mechanisation Rate** 





### **Sector-wide Outcomes**

- Over **270** new winch-assist felling units sold
  - Including over 100 units exported to North and South America
- Over 140 new grapple carriages sold
  - Alpine, Falcon and Hawkeye grapple carriages (100 sales in NZ)
- Over 200 new camera systems sold (over 150 sales in NZ)
- Over \$170 million sales of new harvesting machinery and equipment since 2012



**3** main manufacturers of winch-assist and **5** new companies

#### **New Harvesting & Logistics Programme**





## **New Programme Goals**

- **1.** Improve economic harvesting of marginal forests
  - By reducing forestry value chain costs

#### 2. Alleviate labour shortages

• Automation and process changes will create opportunities for workforce of the future

#### 3. Further improve worker safety

Eliminate hazardous manual tasks across the value chain

#### 4. Enhance environmental sustainability

• reduce landing size, less chemical fumigation, improved residue management and increased use of HPMV

#### 5. Grow forestry machinery manufacturing sector

New automated technology



#### **Vision: Automated Forestry Value Chain**





**1.** 'Smart' yarder grapple & shovel yarder control system (Alpine Logging Equipment Ltd)





2. Semi-automated processor-debarker (Waratah NZ Ltd)





Debark to export phytosanitary standard and enable 'clean' chip production

3. Processor head-based automated log tagging (Pocket Solutions Ltd)





4. Automated log residue management system (Mural Town Engineering Ltd)



**Chippers (clean chip) or grinders/mulchers (mulch/road aggregate)** 



5. Automatic quick coupler

(Doherty Engineered Attachments Ltd)





Switch from any grapple processor to a log grapp

6. Large capacity log loading grapple (Engineering Services Rotorua Ltd)



Designed for mass loading not sorting, load a truck in 10 minutes



### Landing - Sort Yard Transport

7. Large capacity off-road forwarder (Tatra Log Mover)





**1.** Robotic log sorter (Skookum Technology Ltd)





2. Automated truck loading gantry (Patchell Industries Ltd)





Pre-ioau iogs, ioau trailer in one grau

3. Automated load securing system (Patchell Industries Ltd)





F O R E S T GROWERS RESEARCH

4. Automated tag readers (Pocket Solutions Ltd)





#### **Outcome: Address labour shortages**





#### **Outcome: A safer workforce**

• Serious harm & notifiable injury rate reduced by 64% (2012 to 2018)

(168 incidents in 2012 to 60 incidents in 2018 – forecast is less than 10 p.a. by 2025)

• Incidents per million m3 forecast to trend towards zero by 2025





#### **Outcome: Improve environmental performance**

• Landing size is reduced by 75%





• Landing residues, reduce risk of debris flows



• Chemical log fumigation volume reduced by 1.2 m m3 p.a.

#### **Outcome: Reduce harvesting costs**

- Reduce average cable crew size by 50% (from 8 workers to 4)
- Increase labour productivity from 38 to 65 m3/worker-day (+70%)
- Reduce forest vague chain costs by \$9.71/m3 vs. 2018 base (-12%)





Cable Logging Pate Actual (\$/t) - Cable Logging Pate Forecast (\$/t)

## **Opportunities for Small Forest Growers**

#### **1.** Collaborate to harvest and deliver via new log sort yards

- Scale through centralised log sorting
- Reduce landing size and in-forest roading
- Opportunities to introduce process efficiencies, and reduce harvesting and delivery costs

#### 2. Low cost Shovel Yarder for steep blocks

- Commercially available from Alpine Equipment Ltd
- **3.** Automatic Quick Coupler development
  - Reduce machinery requirements, labour and operational costs

#### 4. Improved residue management

- Clean chip for sale, other uses for harvesting residues
- 5. Increase use of High Productivity Motor Vehicle log transport
  - Opportunities from sort yards to customer, reduce trucks on highway



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8 August 2019

