



Programme Manager: Keith Raymond

HARVESTING PROGRAMME UPDATE

Issue Number: 30

Date: May 2017

Summary

This update highlights the upcoming field demonstration of technology arising from the Steepland Harvesting PGP programme, in conjunction with the Harvest Tech 2017 Conference in Rotorua. The new Primary Growth Partnership proposal in automated forestry value chains is also highlighted. The focus of project work in Quarter 3 of the 2016/17 Annual Programme has been in commercialisation of the products arising from the programme. Significant progress has also been made in completion of technical developments in each of the projects.

Innovative Yarding System



Teleoperated felling with HarvestNav navigation system



Alpine Grapple extraction



CutoverCam hauler vision

Awdon Skyshifter Tail Hold Carriage



**Primary Growth
PARTNERSHIP**

FGR FIELD DEMONSTRATION: Gammons Forest, Bay of Plenty Monday, 19th June 2017

Forest Growers Research Ltd is organising a field demonstration of the products arising from the Steepland Harvesting Programme (dubbed the Innovative Yarding System). This field day will be held on Monday 19 June, the day before the Harvest Tech 2017 Conference in Rotorua.

The Field Demonstration will be hosted by contractor Mr. Ian Harvey and his FPNZ Ltd crew in PF Olsen's Gammons Forest 25km north-west of Rotorua. The harvesting operation consists of a Thunderbird 6355 swing yarder along with ground based operations.

A wide array of innovative products and equipment will be demonstrated that have been recently developed by equipment manufacturers in conjunction with FGR and local logging contractors. Equipment to be demonstrated has



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been designed to improve both safety and productivity of steep slope harvesting operations, including:

- Teleoperated John Deere 909 feller buncher and mobile tail hold machine (Applied Teleoperation Ltd) – no operator in cab of machine
- HarvestNav machine navigation system (Margules Groome Consulting Ltd) – with machine slope warning system
- Alpine Grapple Carriage (Logpro Ltd) – eliminates manual breaking out
- New model CutoverCam hauler vision system (Cutover Systems Ltd) – gives hauler operator full vision of breaking out zone
- Skyshifter tail hold carriage (Awdon Technologies Ltd) – reduces manual skyline shifting
- Doherty Automatic Quick Coupler (Doherty Engineered Attachments Ltd) – rapid switching between processor head and loading grapple
- New UAV ('drone') technology (Interpine Group) – harvest planning, flying straw line, post-harvest assessments etc.
- Synthetic logging rope (Total Rope Worx Ltd) – for guy ropes and straw line

A marquee will be set up to display the drone view of the harvesting operation, the CutoverCam view of the grappling site, and other videos of products which are part of the Steepland Harvesting Programme.

The Field Demo is part of the Harvest Tech 2017 Conference and available only to conference delegates. Please register using this link: <http://www.fiea.org.nz/harvesttech/>

NEW PGP PROGRAMME

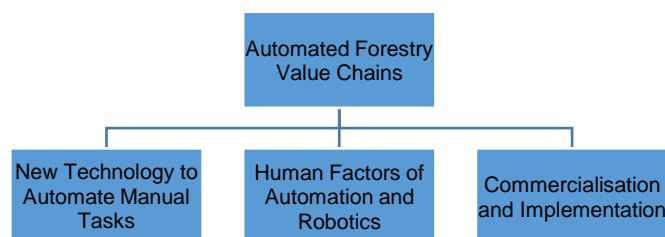
The proposal for a new Primary Growth Partnership (PGP) programme in automated forestry value chains has been titled "Te Mahi Ngahere I te Ao Hurihuri – Forestry Work in the

Modern Age" to reflect the focus on new automation and robotics technology.

The programme builds on the concepts of forestry mechanisation, remote control and teleoperation developed in the Steepland Harvesting programme and extends into the field of automation and robotics in forestry.

Projects that were identified as the highest priority projects as a result of the extensive industry consultation undertaken in 2014/15 have been included in the funding bid. Our vision is "No boots on the ground, no hands on the log", to eliminate all manual handling and deliver a step change in forest operations. By 2025 all harvesting operations will be fully mechanised, and at least 10% of operations will be automated to some degree.

The scope of the programme covers tree felling and extraction, log processing, sorting and loading and transporting log products. It has a much wider scope than the previous PGP programme, which covered felling and extraction on steep terrain only. There are three themes centred on technologies, people and commercialisation:



New commercial products will be built for domestic and export sale:

- An automated log debarker-processor
- Log tagging and tag reading technology
- A robotic log sorter
- A large capacity semi-automated truck loading gantry and load securing system
- Development of the tree-to-tree robot for thinning to waste



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- Semi-automated yarder grapple and control system
- An automated wood residue management system

Outcomes will be:

- reduced forestry value chain costs by \$10.00/m³ through increased labour productivity and improved efficiencies
- workforce shortages will be alleviated through automation of some functions
- skill levels in the industry will increase, labour turnover will reduce and career opportunities in forestry will be enhanced
- environmental sustainability benefits through reduced landing size (sorting logs off-landing), less chemical fumigation (through increased debarking), increased HPMV use from log sort yards, and utilisation of forest residues that are currently unmerchantable.

Automation will also drive a new high-tech manufacturing industry within New Zealand, opening up global export opportunities for sales of new machinery and equipment.

The proposal was submitted to the PGP Investment Advisory Panel in April. FGR will present this proposal to the Panel at their next meeting on May 23rd, 2017 and we expect to hear whether the proposal will proceed to business case phase of the funding application process by end-May.

RESEARCH PROGRESS: Q3 2016/17

Progress to Quarter 3 of the 2016/17 Annual Research Plan was reviewed at the Technical Steering Team Meeting on Wed 12th April in Rotorua. Significant achievements during the quarter are summarised below:

1.0 Business Environment Review

Commercialisation of the technology products arising from the programme continued during the quarter with the Commercialisation team

providing support for the technology developers and commercial partners in each project. Business environment reviews have been prepared for the following products:

- HarvestNav on-board navigation system
- Teleoperation control system
- Felling wedge
- CutoverCam hauler vision system
- Awdon Skyshifter tail hold carriage

As a result of the commercialisation team's review further work with the Felling Wedge was terminated.

1.1 HarvestNav On-board Navigation

Further commercialisation of the HarvestNav on-board navigation system to provide a full "out of the box" system has continued. The new system was demonstrated at the FGR Field Demonstration at Greenoch Forest, Whanganui in conjunction with the NZ Farm Forestry Association (NZFFA) National Conference in April.

The Commercialisation team has prepared a report on commercialisation of the HarvestNav on-board navigation system, covering commercial partnership, intellectual property (IP) strategy, and updating the Commercialisation Plan (HDP018).

1.2 Teleoperated Felling Machine

Technical development of the Teleoperation Control System for the John Deere 909 feller buncher has been completed and the system will be demonstrated at the Harvest Tech Field Day in June.

The Commercialisation team has prepared a report on commercialisation of the Teleoperation Control System. An improved Commercialisation Plan for the Teleoperation Control System is in preparation (HDP-039), including economic analysis of costs and benefits, market potential,



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commercial arrangements, marketing plans and manufacturing / scale up considerations.



A new start-up company, called Applied Teleoperation Ltd, will be launched to market all the remote control and teleoperation products (CutoverCam, Teleoperated Feller Buncher Control System, and the Cab-assisted Backline). This company will build, install and service retrofitable teleoperation units for feller bunchers, mobile tail holds and other forestry machinery.

In the Remote Control Mobile Tail Hold project, technical development of the remote control unit (RCU) for the Volvo EC290 mobile tail hold machine has continued during the Quarter as a result of feedback from the first adopter contractor (Wood Contracting Ltd in Nelson).

Specifically, the following improvements are underway:

- three axis joysticks have been used to control the boom and tracks at the same time
- the dead band and sensitivity of the system has been improved to improve control of the machine
- the controls for the tail hold have been mounted near the hauler controls
- the wireless link has been made more robust
- the hauler-side electronics are powered from the hauler rather than from batteries.

Technical development of this teleoperation product, called the Cab-assisted Backline (CAB) will be completed by June and demonstrated at the Harvest Tech Field Day.

2.1 CutoverCam Hauler Vision System

The new model CutoverCam was launched at the FGR/NZFFA Field Day at Greenoch Forest, Whanganui in April. This new model has been redesigned to offer significant quality and price improvements over the earlier model.

The new improved CutoverCam (left) is smaller, lighter, more robust and cheaper than the previous model (right). The new model CutoverCam will be demonstrated at the FGR Demo at HarvestTech in June.



Further commercialisation of the new CutoverCam hauler vision system is underway. An improved commercialisation plan for the new CutoverCam hauler vision system is in preparation. This will cover economic analysis of costs and benefits, market potential, commercial arrangements, marketing plans and manufacturing considerations.



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2.3 Skyshifter Tail Hold Carriage

Modifications to the Awdon Skyshifter twin winch tail hold carriage have been completed:

- Dry sumping the engine to solve the issue of the engine overheating when carriage is on an angle
- Electrics to prevent engine cutting out
- Front sheave assembly to prevent winch rope wear
- Hydraulic controls to allow independent releasing of each winch brake

The carriage was demonstrated in operation at the FGR/NZFFA Field Day in Whanganui in April.



New synthetic rope tail tree guy lines have been purchased to keep the carriage off the ground and production field trials of the tail hold carriage resumed later in May. These trials investigate the following:

- Carriage setup
- Operational productivity
- Winch rope tensions
- Winch rope wear
- Line shifting
- Down rigging

The Commercialisation team has prepared a report on commercialisation of the Skyshifter carriage and are assisting Awdon Technologies Ltd with development of the Commercialisation Plan (HDP030) and IP strategy.

3.2 Doherty Quick Coupler Attachment

Construction, assembly and workshop testing of the Doherty Quick Coupler has been completed by Doherty Engineered Attachments Ltd of Mount Maunganui. Forest Owner Marketing Services Ltd (FOMS) is the first adopter.

The next stage of the project is to install the automatic quick coupler into the base machine of the first adopter (scheduled for end-May). The system will then be demonstrated at the Harvest Tech Field Day in June.

The commercialisation team will also assist Doherty Engineered Attachments Ltd with preparation of a Commercialisation Plan for the Doherty Quick Coupler.

3.2 Benchmarking Harvesting Costs and Productivity

Collection of 2016 data for the Benchmarking database of harvesting costs and productivity has been completed and a Technical Note will be published in June.

RESEARCH OUTPUTS TO MARCH 2017:

The following research reports were completed during the last Quarter:

Harvesting Technical Notes

- Harvesting Technical Note HTN09-04: Productivity of the Koller K602H Yarder in Radiata Pine – Tony Evanson, Thornton Campbell, Spencer Hill and Rien Visser (in press)
- Harvesting Technical Note HTN09-05: End Connectors for Winch-assist Machines – Hunter Harrill & Rien Visser (in press).

These reports will soon be available on the new FGR website: www.fgr.nz



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Upcoming Events:

- FFR Field Demonstration: Monday 19 June, 2017 in conjunction with Harvest Tech Conference
- Harvest Tech Conference, 20-21 June in Rotorua
- FFR Field Demonstration at Wood Contracting Ltd, Nelson in late-July 2017 (date TBA)
- Steep Terrain Harvesting Field Trip, Germany, Austria & Italy: 10th – 15th September, 2017.
- NZFOA Forest Growers Research Conference 2017: Christchurch, 17th – 19th October, 2017.