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HARVESTING PROGRAMME UPDATE

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Summary

This update summarises progress in the first quarter of the one-year extension to the FFR Primary Growth Partnership Steep Land Harvesting Programme. Commencing the commercialisation of the products arising from the programme has been a key focus over the last quarter. The Commercialisation team, led by Geoff Todd, Managing Director of Viclink, met in September and October and has started to provide support for the various technology developers in each project. Significant progress has been made in all the projects during the quarter.

RESEARCH PROGRESS: Q1 2016/17

Quarter 1 of the 2016/17 Annual Research Plan was completed on 30 September 2016. Progress in all the projects was reviewed at the Technical Steering Team Meeting on Wed 19th October in Rotorua.

1.0 Business Environment Review

The programme extension focusses on commercialisation of the following technology products arising from the programme:

- HarvestNav on-board navigation system
- Teleoperation control system
- CutoverCam hauler vision system
- Remote-controlled felling wedge
- Awdon Skyshifter tail hold carriage
- Doherty quick coupler attachment

The programme has engaged the following business development experts to support the various technology developers in each project and finalise commercialisation plans for the projects:

- Geoff Todd, Managing Director of Viclink
- Dave Cochrane, founder of Waratah Group and consultant to Southstar Equipment Ltd
- Dr Sunil Vather, ex-IRL Ltd and consultant to Kiwinet

The Commercialisation team met in September and October and has visited all projects, talked to all the developers and reports on each product are in preparation. A bid for further

commercialisation support from Kiwinet, the Kiwi Innovation Network, is also in preparation.

1.1 Steep Slope Feller Buncher

Eleven units of the ClimbMAX Steep Slope Harvester have now been sold – 3 to New Zealand, 7 to Canada, and one to the U.S. ClimbMAX Equipment Ltd has reached agreement with Caterpillar Original Equipment Manufacturing (Cat OEM) division which will offer significant benefits and value for money over the previous units built. ClimbMAX #10, the first Cat-based machine, is scheduled for shipping to the U.S. in late-November. ClimbMAX #11, the first unit sold through Caterpillar Original Equipment Manufacturers, will be shipped to Vancouver Island, B.C. in mid-2017.

Further commercialisation of the HarvestNav on-board navigation system to provide a full “out of the box” system is part of the 2016/17 Annual Plan.

In the tension monitoring of cable-assisted machines project, the objective is to test the three other main NZ manufactured winch-assist machines (DC Equipment’s Falcon, the EMS TractionLine and Rosewarne and May’s ROB).

A report on the winch rope tensions measured over a range of conditions will be prepared by School of Forestry, University of Canterbury, once the operational studies are completed.



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1.2 Teleoperated Felling Machine

A successful demonstration of the teleoperation control system for the John Deere 909 feller buncher and the remote control unit for the Volvo 290 mobile tail hold anchor was held in July in Nelson, attended by 31 forest industry people.



The operator, Andy Waters, drove the John Deere 909 feller buncher from the operator cabin about 150m away from the machine at Ross Wood's operation in Moutere Forest.

The remote control system for the Volvo EC290 mobile tail hold machine was then demonstrated by the yarder operator as he shifted the tail hold machine from the cab of the yarder.

A few minor modifications are required to the wireless link for the teleoperation control system to ensure good reception outside of line-of-sight. Solutions to the electromagnetic interference (from cell phones) are still being sought. Further commercialisation of the teleoperation control system is continuing as part of the 2016/17 Annual Plan.

Development and field testing of the robotic tree-to-tree felling machine was completed and a report is in preparation (Technical Report H030). A field demonstration of the robotic tree-to-tree

felling machine was held on 27th September 2016 at Bottle Lake Forest Park in Christchurch.

Further development of the robotic tree-to-tree felling machine is required to design and build the second (beta) prototype, if and when further investment is available. This is included in the new PGP proposal (Automation and Robotics in Forestry).



The Tree-to-Tree machine also featured at the PGP Expo in Wellington on 1 November. Over 200 people attended the PGP Expo and Conference, and interest in the FFR display stand was high.





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2.1 CutoverCam Hauler Vision System

Further commercialisation of the CutoverCam hauler vision system is part of the 2016/17 Annual Plan.

CutoverCam streams high resolution live video of the breaking out and log extraction operation into the hauler cab. This system provides great visibility of ground operations for the hauler operator who no longer needs to rely on radio and other audio signals. This product has a very direct safety focus and has the potential to improve the productivity of cable harvesting by reducing delays in positioning cable rigging.

Three CutoverCam units have been sold to forestry contractors and companies to date and further work is aimed at redesigning the unit to offer a significant quality and price improvement to earlier models.

A Commercialisation Plan will be completed for the CutoverCam, including economic analysis of costs and benefits, market potential, commercial arrangements, marketing plans and manufacturing/scale up considerations.

2.2 Grapple Related Projects

Development of the prototype tension monitoring 'app' continued during the Quarter, with researchers working with cable-assist machinery manufacturers to enable tension data to be live-streamed from the tension monitor to the 'app'.



A report on the development of the tension monitoring 'app' has been published (Harvesting Technical Note HTN09-01).

Further commercialisation of the 'app', including release to the forest industry, is part of the 2016/17 Annual Plan.

In the Felling Wedge project, construction of the second (beta) prototype of the remote-controlled powered felling wedge was completed. The prototype has been field tested and has failed to meet the project objectives.

One of the key objectives of the powered wedge was that it could be operated remotely after the faller has moved out of the hazard zone around the tree. As the felling wedge still requires use of conventional plastic wedges this project objective has not been met. The unit needs to be redesigned. Technical problems and commercial pricing issues have forced a deferment of further development of the remote controlled powered felling wedge.

2.3 Skyshifter Tail Hold Carriage



Production field trials of the prototype Awdon Skyshifter twin winch tail hold carriage commenced in Kererutahi Forest in the eastern BOP in July.

Further modifications of the carriage are required before the field trials can be completed in the following areas:

- Carriage setup
- Operational productivity
- Winch rope tensions



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- Winch rope wear
- Line shifting
- Down rigging

Once trials are complete, commercialisation of the Skyshifter carriage will continue as part of the 2016/17 Annual Plan.

3.2 Harvesting Technology Watch

In the Quick Coupler Attachment project, Doherty Engineered Attachments Ltd of Mount Maunganui has almost completed construction of the remote controlled automatic quick coupler.

Workshop testing continues and full commercialisation of the Doherty Quick Coupler is part of the 2016/17 Annual Plan.

Once testing of the Doherty automatic quick coupler is completed the first unit will be delivered to the first adopter contractor and field trials commenced.



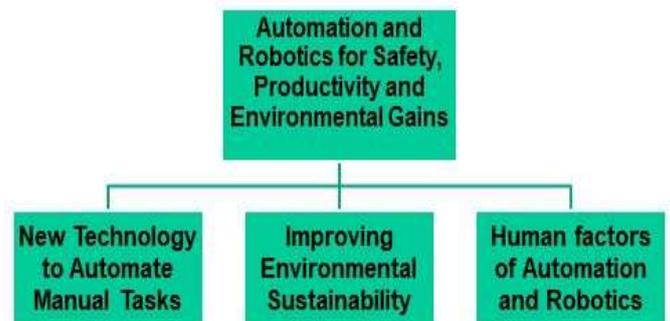
Data analysis of the 2015 Benchmarking database of harvesting costs and productivity has been completed. About 177 database entries for 2015 have been received. A Technical Note on the 2015 Benchmarking results is in preparation.

NEW PGP PROGRAMME

A new Primary Growth Partnership (PGP) programme proposal was submitted to MPI in March, for consideration by the PGP Investment Advisory Panel in April.

The programme focusses on Automation and Robotics in the forest industry, based on the highest priority projects identified as a result of the extensive industry consultation undertaken in 2014/15:

- Development of the remote-controlled tree-to-tree harvesting machine
- Totally new felling technologies
- Log identification during processing
- Automating the log scaling method



The PGP Investment Panel requested significant changes to the structure of the new PGP proposal. FFR is currently working on addressing these issues prior to resubmitting the proposal.

RESEARCH OUTPUTS TO OCTOBER 2016

The following research reports were published during the last Quarter:

Technical Reports:

- Report H030: Further Development and Field Testing of the Robotic Tree-to-Tree Felling Machine – Richard Parker, Tim Lamborn & Karen Bayne.

Harvesting Technical Notes:

- Harvesting Technical Note HTN09-01: Development of a Tension Monitoring 'App' – Rien Visser, Hunter Harrill and Amy Martin.
- Harvesting Technical Note HTN09-02: Improving Yarding Productivity using Tension Monitors – H. Harrill.



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These reports are now available to FFR members on the FFR website: <http://www.ffr.co.nz/> (requires login and password).

Given that the 2016/17 programme is substantially funded by FGLT funds, the following FFR reports completed from Dec 2013 up to June 2015 have been released to the NZFOA research website:

- 9 Technical Reports – Reports No. H014 to H022
- 7 Technical Notes – Reports No. HTN06-07 to HTN07-04
- 15 Technology Watch reports – Reports No. HTW001 to HTW015.

These reports are now available to the public domain on the NZFOA research website:

<http://www.ffr.co.nz/documents/5589>

Other communications during the period:

- Wood Matters: The teleoperated felling machine demonstration in Nelson in July featured in the PF Olsen Ltd Wood Matters newsletter in August.
<https://nz.pfolsen.com/market-info-news/wood-matters/2016/october/robotic-tree-to-tree-felling-machine/>
- MPI Agri-Gate Newsletter: PGP Steepland Harvesting Programme featured in the MPI Agri-Gate Newsletter Issue 32 in September:
<http://www.mpi.govt.nz/funding-and-programmes/primary-growth-partnership/overview/news/>
- Industrial Safety News: Article about Steepland Harvesting was published in Industrial Safety News on 4 October:
<http://www.isn.co.nz/content/taking-technology-to-trees/>
- Forest Growers Conference: PGP Steepland Harvesting Programme was presented to the annual Forest Growers Conference in Napier in October. The conference was well attended by about 100 industry and science people with a high level of interaction during the conference breaks, the poster/interactive sessions, and the field trip the following day.

- FOA Science Awards: PGP Steepland Harvesting Programme Leader, Keith Raymond, won the award for Contribution to a Science Team. A media release on the annual FOA Science Awards was picked up by the industry newsletter Friday Offcuts on 14 October.
- Wood Matters: The tree-to-tree robotic felling machine featured in the PF Olsen Ltd Wood Matters newsletter in October.
<https://nz.pfolsen.com/market-info-news/wood-matters/2016/october/robotic-tree-to-tree-felling-machine/>
- Wood Week: The field demonstration of the tree-to-tree robotic felling machine in Christchurch in September featured in the industry newsletter Wood Week on 19 October.
- FTD Supply Chain Management: Article about PGP Steepland Harvesting project in remote control in the Oct/Nov issue of the FTD Supply Chain Management magazine.
- Friday Offcuts: The field demonstration of the tree-to-tree robotic felling machine in Christchurch in September featured in the industry newsletter Friday Offcuts on 28 October.
- NZ Logger magazine: The November issue of the NZ Logger magazine featured the presentation on the PGP Steepland Harvesting Programme to the Forest Growers Conference in October, and the FOA Science Awards, where Harvesting Programme Leader, Keith Raymond won the award for Contribution to a Science Team.
- NZX AgriHQ Pulse: Article about PGP Steepland Harvesting “Forestry projects lead to efficiency, innovation and save lives” published in NZX AgriHQ Pulse, an agri-business news service on 5 Nov.