



# HARVESTING PROGRAMME UPDATE

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Programme Manager: Keith Raymond

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## Summary

An industry-wide harvesting research workshop is scheduled for Wed 26<sup>th</sup> November in Rotorua to determine industry priorities for new harvesting and logistics research. This programme update reviews progress in the PGP steep land harvesting programme to end of Quarter 1, 2014/15. The focus has been on extension to the wider forest industry of the outputs of the programme to date, notably the HarvestNav software application, the CutoverCam hauler vision system, the Alpine grapple and the testing of the remote control system on the John Deere 909 feller buncher.

## HARVESTING RESEARCH WORKSHOP

With the current PGP Steep Land Harvesting programme coming to an end in less than two years' time (June 2016) it is timely to begin the discussion on what happens beyond the end of this programme.

If the industry wants to continue its harvesting research programme past mid-2016 then it is important that the process to identify what the priorities are and how they can be funded needs to begin now.

Two wider forestry reviews, the Independent Forestry Safety Review (IFSR) and the review of the NZ Forestry Science and Innovation Plan have recently been completed and these will help to identify potential areas for further research in the harvesting and logistics area.

A strategic workshop forum has been scheduled to discuss:

- Current Industry Issues and Future Trends
- Industry Needs and Gaps
- Future Research Ideas
- Research Priorities

The strategic forum is planned for **Wednesday, 26th November 2014 in Rotorua**. All members should keep this date free as we need your input to this workshop.

For further information on the Harvesting Research Workshop please go to [FFR website](#)

([www.ffr.co.nz](http://www.ffr.co.nz)) and click on Event Calendar, or contact Keith Raymond by email at [keith.raymond@ffr.co.nz](mailto:keith.raymond@ffr.co.nz) or phone 027 4385233.

## INDEPENDENT REVIEW OF FFR PROGRAMME

As part of the process of reviewing all PGP Programmes an independent review of the FFR Steep Land Harvesting Programme was completed during the quarter by Rob van Rossen (Rob van Rossen Consulting Ltd) and Mark Brown (University of Sunshine Coast, Queensland).

The key objectives of the review were to:

1. review progress made to date in each of the programme work streams;
2. assess progress made against the intended programme outcomes set out in the business plan;
3. check progress and direction of the programme against international science/technology/industry trends;
4. review internal and external factors affecting the programme including management and governance;
5. make recommendations for improvements to the programme.

The review report made a number of recommendations that the Technical Steering Team and Programme Steering Group will consider for action. These recommendations include:



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1. Putting greater focus on key measures to track progress against expected outcomes from the programme.
2. Efforts to increase direct contractor participation in the programme to facilitate wider understanding and application of outputs from the programme.
3. Re-prioritisation within work programmes to enhance the prospects of getting more programme outputs to a stage where they are likely to have sufficient momentum to continue development beyond the end of the programme.
4. Consideration of what comes next in the harvesting research space in New Zealand to carry on the momentum achieved by this programme and to provide structure from which the benefits of the current programme can continue to be realised.

A summary report will be made available to all FFR members on the website which will also be available for wider public distribution via the MPI website.

## RESEARCH PROGRESS: Q1 2014/15

FFR's Harvesting Programme has completed the first quarter of the 2014/15 year. Progress in the 2014/15 Research Plan was presented at the Technical Steering Team Meeting on 15<sup>th</sup> October, 2014, in Christchurch.

### Steep Slope Feller Buncher

Implementation of the HarvestNav software application (Figure 1) to six forestry companies during the quarter has been supported and extension to the wider forest industry was made through various media releases (see list at the back of this update).

Version 1.5 is now available as a free download from the Interpine Forestry website or click here to download: <http://www.interpine.co.nz>.



Figure 1: HarvestNav on-board navigation system

Planned enhancements include: integration with mobile in-field communications; ability to handle external GPS sensors to monitor all machines and crew positions on-screen; and integration of external tilt sensors for self-levelling machines.

### Teleoperated Felling Machine

In Task A of the teleoperation project, initial tests by Scion of remote control of basic machine functions for tree felling were undertaken in early July, 2014. Remote control of a John Deere 909 feller buncher owned by Ross Wood of Wood Contracting Nelson Limited was successfully tested (Figure 2).



Figure 2: Ben Lewis of Wood Contracting (Nelson) Ltd operating the John Deere 909 by remote control



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This testing of remote control of a tracked feller buncher felling trees on steep country is believed to be a world first. Previously remote control of harvesters had been limited to a wheeled harvester on flat terrain (the Besten in Sweden).

Stage 1 of this part of the teleoperation project, to trial the remote control system has been achieved. The next stage of the project is to introduce video and audio feedback to the operator, and the final phase is to operate the machine from a distance, such as an operator cab on the landing. This is an exciting development for the programme and has attracted a lot of media interest.

In the other parts to the teleoperation project, University of Canterbury Mechatronics researcher Bart Milne will be retrofitting a teleoperation control system to a converted excavator loader (Volvo EC290).

In Task B of the teleoperation project, Scion researcher Dr Richard Parker is working with UC Mechatronics researcher Chris Meaclem in the further development of the prototype lightweight semi-autonomous felling machine (“Stick Insect”). In the forest environment the prototype “Stick Insect” will fell trees while traversing from tree-to-tree using its grapples. Current work is focussed on developing joystick control for the machine and addressing the scale-up issues prior to development of a larger “working model”.

## Advanced Hauler Vision System

A Technical Note on the application of a grapple camera system to a hauler operation to enable “after dark” logging operations was completed during the Quarter (HTN07-02). The study found very little difference in productivity between the day time operation and the night shift.

Extension of the CutoverCam hauler vision system (Figure 3) to the forest industry was also made through various media releases during the Quarter (see list overleaf).

CutoverCam is now commercially available from Cutover Systems Limited in Rotorua. To contact click here: <http://cutoversystems.com>.



Figure 3: CutoverCam in action

## Improved Grapple Control

Further development work has continued on the alpha prototype Scorpion Grapple (Figure 4).



Figure 4: Prototype Scorpion grapple carriage during construction



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The dual-arm grapple, carriage and control system has been built and an independent appraisal of the concept was made by a consultant engineer (Jan Snyman of Index Engineering Ltd, Rotorua). This appraisal of the design and initial development of the Scorpion grapple carriage has been documented as Technical Report H016. When the alpha prototype is completed a series of field trials will be undertaken early next year.

In the Felling Wedge project a new improved felling wedge is under development. This project is aimed at improving directional felling of manually-felled trees for grapple extraction. The alpha prototype of this felling wedge, developed by loggers in Northland, has been tested during initial field trials and a report is in preparation.

## Innovative Yarding System

The new design for the Innovative Yarding System has been completed. It comprises three innovative yarding carriages (a mobile tail hold carriage, a self-propelled grapple carriage, and a lateral yarding carriage) all controlled by a remote control system.

In May a simulation model of the system was demonstrated to the “expert panel” guiding direction in this project. Since then extensive testing of the drive system for the self-propelled grapple carriage and the winch system for the mobile tail hold carriage has been completed. A technical and economic feasibility analysis showed that the alternative extraction system has the potential to provide a 23% improvement in productivity over current tower hauler systems (Technical Note HTN07-01).

The next stage of the project is the construction of 1/8 scale working models of the mobile tail hold carriage, and self-propelled grapple carriage. Due to the recommendation from the external review to prioritise projects to enhance the prospects of getting outputs to a commercial stage, the Development Plan has been revised to prioritise work on these two carriages.

## Benchmarking Cost and Productivity

The 2013 Benchmarking report analysing the 742 harvest areas currently in the database has been published (Technical Note HTN06-06) and work has commenced on 2014 data collection.

In the Precision Forestry project the integration of GPS information with grapple harvester data to provide productivity maps is underway. If you are using the production maps data from a grapple harvester and want more information on this project please contact Alejandro Olivera Farias at University of Canterbury School of Forestry: [alejandro.oliverafarias@pg.canterbury.ac.nz](mailto:alejandro.oliverafarias@pg.canterbury.ac.nz)

Paul Oyier, a Master of Forestry Science student at the University of Canterbury School of Forestry, is conducting a project on Fuel Use in New Zealand harvesting operations. Fuel is a major cost in logging operations. Actual fuel costs are governed by international oil price changes and other factors that are beyond the control of logging managers and contractors. However, knowing actual fuel use rates and understanding what drives differences in fuel use rates for given harvesting machines and systems can help to make operations more cost effective.

If you or any of your logging contractors would like to be part of this fuel use study, please contact Paul at [paul.oyier@pg.canterbury.ac.nz](mailto:paul.oyier@pg.canterbury.ac.nz) for more information. All fuel use data provided by logging contractors will be kept confidential, and all participants will be updated on study progress and key findings.

## COMMUNICATIONS

Extension to the forest industry of the work arising from the FFR programme has been made during the Quarter through the following media:

**Friday Offcuts 18<sup>th</sup> July, 2014:**  
“HarvestNav app released to the forest industry”.

**WoodWeek 23<sup>rd</sup> July 2014**  
“New forest industry app – HarvestNav”.



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## **New Zealand Logger, September 2014:**

“Free harvest navigation tool launched”, NZ Logger, September 2014, p13.

“World-first for remote control steep country harvesting”, NZ Logger, September 2014, p14.

## **NZ Journal of Forestry, Volume 59, No.3, November 2014:**

Visser, R., K. Raymond and H.Harrill. “Mechanising steep terrain harvesting operations”, N.Z.J.For. 59(3): 3-8.

Raymond, K. “Safety Benefits of a Harvesting Research Programme”, N.Z.J.For. 59(3): 9-13.

Dale, R. “Organisation of steep land harvesting research in New Zealand: Where to from here?” N.Z.J.For. 59(3): 21-24.

Hill, S. “High performance work systems – helping improve productivity for the logging industry” N.Z.J.For. 59(3): 25-30.

## **New Zealand Tree Grower, Volume 35, No.4, November 2014:**

Raymond, K. “New Harvesting Technology for a Safer Future – Challenges of harvesting steep land” pp3-6”.

Milliken, P. “The CutoverCam hauler”, pp7-9.

## **RESEARCH OUTPUTS TO DATE**

The following is a list of research reports published since the last publication list in March 2014 (Harvesting Update 17):

### **Technical Reports:**

- Report H014: High Performance Work Systems for the Logging Industry – S. Hill and K. Raymond. February 2014.
- Report H015: Improved Hauler Control Systems for Grapple Yarding – T. Evanson and B. Henderson. March 2014.

- Report H016: Scorpion Grapple Carriage: Concept Appraisal – J. Snyman, Index Engineering Ltd. June 2014.

### **Harvesting Technical Notes:**

- Harvesting Technical Note HTN06-06: Harvesting Cost and Productivity Benchmarking: 2013 Update – R. Visser.
- Harvesting Technical Note HTN06-07: Innovative Yarding Systems: A Review of Literature – S. Hill.
- Harvesting Technical Note HTN06-08: Outhaul Distance Measurement – T. Evanson.
- Harvesting Technical Note HTN06-09: Alpine Grapple Carriage – From Prototype to Production – T. Evanson.
- Harvesting Technical Note HTN07-01: Innovative Yarding System: Technical and Economic Feasibility – S. Hill.
- Harvesting Technical Note HTN07-02: Logging after dark with an Alpine Grapple Carriage fitted with lights – S. Hill.

### **Harvesting Technology Watch:**

- Harvesting Technology Watch HTW-013: Optimisation in Harvest Planning – S. Hill. June 2014.
- Harvesting Technology Watch HTW-014: Tower Guy Rope Sheave/Roller System Modification – S. Hill. July 2014.

All these reports are available to harvesting theme members on the FFR website: <http://www.ffr.co.nz/>. If you do not have a login, please contact Veronica Bennett at [veronica.bennett@ffr.co.nz](mailto:veronica.bennett@ffr.co.nz).