



HARVESTING PROGRAMME UPDATE

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Summary

This programme update summarises progress in the PGP Steep Land Harvesting Programme in Quarter 1 of the 2015/16 research year. The programme focus has been on the demonstrations of the remote control system installed in the John Deere 909 feller buncher and commencement of construction of the twin winch tail hold carriage in the innovative yarding system project. Industry priorities for projects in the new harvesting and logistics research programme have been received and are being analysed.

RESEARCH PROGRESS: Q1 2015/16

The first quarter of the final year of the FFR Primary Growth Partnership Harvesting Programme has been completed. Progress in the Research Plan to 30 September 2015 was reviewed at the Technical Steering Team Meeting on Wed 28th October, 2015.

1.1 Steep Slope Feller Buncher

In the Tension Monitoring of Cable-Assisted Machines project, the methodology and test equipment to successfully capture continuous cable tension has been completed. Data capture has commenced for three different cable-assisted machine operations under a range of conditions covering slopes and tasks such as moving, felling and shovelling. Results will be analysed and reported with a view to identifying risks of overloading the winch cable. A set of guidelines for operators and planners to eliminate risks associated with overloading the winch cable will be developed.

1.2 Teleoperated Felling Machine

In Task A, Stage 3 of the installation of the remote control system into the John Deere 909 feller buncher, owned by Ross Wood of Wood Contracting Nelson 2014 Limited, has been completed. This involved implementing live video feed from a camera mounted in the operator cab of the machine to the touchscreen of the remote control unit. This system was demonstrated to the TST in July 2015.



A full demonstration of the system to the Programme Steering Group, staff of MPI and the Minister for Primary Industries was undertaken in September 2015. A field trip to this operation was also a highlight of the Forest Growers Research Conference in October. The next stage of the project, Stage 4, is to implement full teleoperation from a remote operator console. A concept design for this work has been completed and a Technical Report has been published (H024).



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In Task B of the teleoperation project, a Technical Report (H023) has been completed detailing the design of the prototype lightweight tree-to-tree felling machine (“Stick Insect”) and technical and economic feasibility analysis.

Scion researcher Dr Richard Parker and UC Mechatronics researcher Chris Meaclem ran a demonstration of the tree-to-tree robot at the Forest Growers Conference in Nelson in October.



The University of Canterbury Mechatronics Programme team of Professor XiaoQi Chen and PhD students Bart Milne and Chris Meaclem received the 2015 Forest Growers Research Award for Innovation that Enhances Sector Value. This award recognised their work over the last three years in developing teleoperation, guidance systems and semi-autonomy in harvesting machines.

2.2 Improved Grapple Control

In the Cable Rigging Efficiency project, Dr Hunter Harrill has commenced work in three projects this year addressing issues around use of grapple systems: skyline tension monitoring to optimise yarding operations; developing a tension monitoring ‘app’; and investigating new wire rope technology for grapple carriages.

In the Felling Wedge project, aimed at improving directional felling of manually-felled trees for better grapple extraction, further work has continued in designing a remote-controlled felling wedge, in conjunction with Koller Foresttechnik of Austria.

A technical evaluation of a skyline-suspended felling grapple has been undertaken by University of Canterbury School of Forestry. This concept was proposed to FFR for financial support by Storm Logging Ltd of Gisborne. Prior to making any financial investment in this development an independent evaluation of the concept was recommended by the Technical Steering Team. A work plan for this evaluation was prepared (HDP-031) and a report for the TST has been completed (unpublished).

2.3 Innovative Yarding System

The development of the beta prototype mobile tail hold carriage (full scale working version) has continued during the Quarter. The independent evaluation of the Twin Winch Tail Hold Carriage by engineering consultant Dr Shayne Gooch of Hales and Gooch Ltd was completed in July (HDP-032) and the Technical Steering Team approved commencement of construction of the beta prototype carriage.

The design of the full sized version of the tail hold carriage has been completed and a Technical Report (H025) is in preparation. Approval for construction of the carriage was gained from the TST at the Q4 TST meeting in July.

3.2 Harvesting Technology Watch

A Technical Note on the production study of the remote controlled Koller K602H yarder operating in Mangatu Forest has been published (HTN08-01).

A review of international training programmes systems in steep terrain harvesting has been published (HTN08-02). This review focussed on programmes in the Pacific Northwest and central Europe. A lot of the training resources would be relevant to New Zealand.

At the University of Canterbury, School of Forestry, the project on capture and analysis of data from GNSS/GPS-enabled harvester on-board computers has been completed. A Technical Note has been published (HTN08-03).



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The project to develop a quick coupler attachment to rapidly switch between a processor head and a loading grapple changed direction this Quarter. Southstar Equipment Ltd will pursue their own design of a quick coupler for Southstar processors and felling heads. Another manufacturing partner has been identified to continue development of a quick coupler for a processor head and a grapple. A Technical Note summarising the economic viability of the quick coupler mechanism has been completed (HTN08-04).

NEW HARVESTING RESEARCH PROGRAMME

A report summarising the outputs from the two Harvesting and Logistics Research workshops held over the last year was circulated across the forest industry in early September inviting feedback on industry priorities.

The ideas for new harvesting and logistics research projects were grouped into six research themes:

- Imperative to improve safety (Health and Safety/Human Factors)
- Improve skills and attract people to industry (People/Training)
- Enabling industry expansion (Small Forest Growers)
- Reduce cost and improve profitability (Technology/Productivity)
- Increase efficiency across supply chain (Supply Chain Logistics)
- Reduce impact of harvesting (Environmental Management)

The responses from this wider industry input are now being analysed to determine industry alignment on priorities for research. Further consultation will be undertaken prior to development of a new harvesting and logistics research funding application.

RESEARCH OUTPUTS TO Q1

The following research reports were completed this Quarter:

Technical Reports:

- Report H023: Design of the Tree-to-Tree Robot: Technical and Economic Feasibility Analysis – R. Parker, C. Meaclem, S. Gutschmidt, G. Rogers and X. Chen.
- Report H024: Concept Design for Teleoperation of a John Deere 909 Feller Buncher – P. Milliken, D. Lamborn and A. Keast.
- Report H025: Innovative Yarding System - Design and Economic Analysis – D. Scott and S. Hill.

Harvesting Technical Notes:

- Harvesting Technical Note HTN08-01: The Koller K602H Yarding System – T. Evanson.
- Harvesting Technical Note HTN08-02: International Steep Terrain Training Programmes – H. Harrill and R. Visser.
- Harvesting Technical Note HTN08-03: Data Capture from Harvester On-Board Computers – A. Olivera and R. Visser.
- Harvesting Technical Note HTN08-04: Economic Assessment of a Quick Coupler Mechanism – S. Hill

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

Harvesting Development Plans:

- HDP-031: Technical Evaluation of a Skyline Suspended Felling Head / Grapple Extraction System – R. Visser and H. Harrill (Unpublished).
- HDP-032: Review of Innovative Yarding System (Twin Winch Tail Hold Carriage) – S. Gooch (Unpublished).