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HARVESTING THEME UPDATE

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Summary

FFR Harvesting Theme has completed Year 3 of the six-year PGP Harvesting Programme. Details of the results of the research programmes were presented and discussed at the FFR Members Meetings in Blenheim in September 2013. Presentations are available on the FFR website. This year work has focussed on technology transfer in the steep slope feller buncher, hauler vision systems and improved grapple control projects, and further progress in the longer term projects of teleoperation and innovative yarding systems. This update reviews the projects in the 2012/13 "Innovative Harvesting Solutions" programme and an overview of the 2013/14 Annual Research Plan is also presented.

RESEARCH PROGRESS: 2012/13

FFR Harvesting Theme has completed Year 3 of the PGP Harvesting Programme. Highlights for the year were presented at the FFR Members Meeting in Blenheim on 10th September.

ClimbMAX Steep Slope Harvester

The construction and commissioning of the second ClimbMAX steep slope harvester (dubbed ClimbMAX2) was completed in late 2012. This machine was subsequently delivered to John Burt Logging in Hawkes Bay in January, 2013.

Scion staff spent five days studying the ClimbMAX2 steep slope harvester in action prior to delivery in the forests around Nelson during January, 2013. The trial focussed on the ClimbMAX felling and bunching trees on slopes in excess of 35 degrees in Ngaruru Forest in the Wairau Valley. A Technical Note (HTN05-07) was completed on the first study of the ClimbMAX2 Steep Slope Harvester.

A second study of this machine was subsequently undertaken in a Hawkes Bay forest in August. Once the field trials of the ClimbMAX steep slope harvester have been completed, Task 1.1 Steep Slope Feller Buncher project is effectively completed. The ClimbMAX Steep Slope Harvester developed by Trinder Engineering and Kelly Logging Ltd and partially funded by FFR Members fees and Government

funding through the Primary Growth Partnership is now fully commercialised and is available for purchase from ClimbMAX Equipment Ltd in Nelson.

An Open Day will be held later in 2013 to demonstrate the value that this project has delivered to FFR stakeholders.

The on-board decision support system designed to provide the operator of the steep slope machine with information on harvest area terrain has been developed. This system uses a digital terrain model based on LiDAR terrain data to provide information in real-time on the forward track of the machine such as slope and micro terrain features of the harvest block.

A Technical Note titled On-board Machine Stability Information System has been published (HTN05-01). Two related projects undertaken by University of Canterbury School of Forestry measuring machine slope of common forestry machines (Technical Note HTN05-02) and a project measuring tensions of a cable-assisted felling machine have also been completed (Technical Note HTN05-11).

Teleoperated Felling Machine

Last year a report describing the design of the lab-based teleoperated hydraulic circuit as a development platform for teleoperation was published (HTN04-11). The construction of the development platform for teleoperation by both



HARVESTING THEME UPDATE

Scion and UC Mechatronics has now been completed.

Work is also proceeding well on the development of the Task B prototype mobility concept called the Biped Felling Machine and dubbed the “stick insect”. A technical report has been completed on the design of this robotic felling machine (Report H011).

Advanced Hauler Vision System

Commercialisation of the grapple camera system has been completed by Trinder Engineers. This system is now available for purchase from Trinder Engineers in Richmond, Nelson. One camera system has been mounted on the Alpine Grapple and was the subject of trials earlier in the year (Technical Note HTN05-03).

The Cutover Camera System, with options for cameras located in the cutover or on the hauler tower or tail hold has been completed and was launched at the Members Meeting in September. It was also presented at the PGP Expo in Wellington on 30th September.

Improved Grapple Control

Studies of two new hydraulically-powered grapple carriages have been undertaken.

The first is of a prototype of the Alpine Grapple, developed by Alpine Logging of South Africa. This grapple was demonstrated at an Open Day in the Bay of Plenty in October 2012. Subsequent to this the Alpine Grapple has been trialled in a number of hauler operations in Bay of Plenty and Gisborne. A Technical Note of the first trial in the Bay of Plenty has been published (HTN05-08).

The second production study was of the Falcon Forestry Claw (developed by Moutere Logging Ltd of Nelson). This study was completed by the University of Canterbury School of Forestry and two reports have been completed (Report H009 and Technical Note HTN05-06).

Further work in the project on measuring the efficiency of different rigging configurations has been undertaken by Hunter Harrill of the University of Canterbury, School of Forestry. A Technical Note was completed on simulating the skyline tensions of different rigging configurations using a model yarder (Technical Note HTN05-12).

Innovative Yarding Systems

This is a major project of the PGP Harvesting Programme with the objective of developing an alternative new extraction system that has the potential to provide a 30% productivity improvement over current systems.

In 2012 the Harvesting Technical Steering Team approved the commencement of the first project in this programme, to develop a new mobility platform for cable yarding – The Hill Country Harvester. This machine will have a low centre of gravity and be capable of traversing extreme terrain. It is designed to be a platform for a boom mounted tower and grapple to fell and bunch trees, rig intermediate supports and run a set of winches for yarding.

The second part of the 2012/13 Research Plan involved a series of Innovative Yarding System workshops held at different locations around the country in October and November, 2012. These workshops involved 45 industry members and generated over 70 ideas for the development of an innovative yarding system. These ideas were then discussed, analysed and prioritised by an industry expert panel.

Technical Notes on the Concept Generation (Technical Note HTN05-09) and the analysis of ideas (Technical Note HTN05-10) have been completed.

The budget for the Innovative Yarding System in 2013/14 is \$462,000, which will be spent in construction of a working model of the Hill Country Harvester and further development of the innovative yarding system.



HARVESTING THEME UPDATE

Benchmarking of Forest Industry Harvesting Cost and Productivity

Analysis of the Benchmarking Costs and Productivity database covering all the data collected from 2009 up to 2012 (over 500 entries) was completed. A Technical Note on the results of this analysis is scheduled for publication shortly (Technical Note HTN05-13).

Development of Operational Efficiencies – Harvesting Technology Watch

A Technical Note on the potential demand for haulers over the next ten years was completed by Interpine Forestry Limited (Technical Note HTN05-04).

A Technical Note documenting the investigation of installing a wood chipper on a hauler was also completed during the year (Technical Note HTN05-05).

Two Harvesting Technology Watch reports were completed during the year. The first is a review of technology for stream cleaning: a Heli-Claw and mini-yarders (HTW-011). The second Harvesting Technology Watch completed during the year focussed on new technology relevant to the New Zealand logging sector that was demonstrated at Elmia Wood in Sweden in June 2013 (HTW-012).

RESEARCH OUTPUTS 2012/13

Technical Reports:

- Report H009: Falcon Forestry Claw Motorised Grapple Carriage: Solving Performance Limitations – S. Milne.
- Report H010: Development of an Improved Felling Wedge for Directional Felling - Initial Trials – B. Vincent.
- Report H011: Design of the Robotic Tree Felling Machine – R. Parker and P. Milliken.
- Report H012: Feasibility of Mechanised Delimiting on Steep Slopes – T. Evanson and R. Parker.

Harvesting Technical Notes:

- Technical Note HTN05-01: An On-board Machine Stability Information System – H. Marshall.
- Technical Note HTN05-02: Measuring Slope of Forestry Machines on Steep Terrain – H. Berkett and R. Visser.
- Technical Note HTN05-03: Hauler Vision System: Testing of Cutover Camera – T. Evanson and P. Milliken.
- Technical Note HTN05-04: Potential Demand for Haulers over the Next Ten Years – A. Clarke.
- Technical Note HTN05-05: Using Hauler Engine Power to Drive a Wood Chipper – D. Amishev.
- Technical Note HTN05-06: Falcon Forestry Claw Grapple: Productivity and Ergonomics – S. McFadzean and R. Visser.
- Technical Note HTN05-07: ClimbMAX2 Steep Slope Harvester – T. Evanson and D. Amishev.
- Technical Note HTN05-08: Improved Grapple Control - The Alpine Grapple – T. Evanson.
- Technical Note HTN05-09: Innovative Yarding Systems - Concept Generation – S. Hill & R. Parker.
- Technical Note HTN05-10: Innovative Yarding - Analysis of Ideas – S. Hill & R. Parker.
- Technical Note HTN05-11: Tension Monitoring of a Cable Assisted Machine – R. Visser.



HARVESTING THEME UPDATE

- Technical Note HTN05-12: Simulating Skyline Tensions of Rigging Configurations – H. Harrill and R. Visser.
- Technical Note HTN05-13: Benchmarking to Improve Harvesting Cost and Productivity: 2012 Update – R. Visser.

Harvesting Technology Watch

- Harvesting Technology Watch HTW-011: Slash Removal from Streams – D. Amishev.
- Harvesting Technology Watch HTW-012: Elmia Wood 2013 – K. Raymond.

All these reports will shortly be available to 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

2013/14 RESEARCH PROGRAMME

The FFR Harvesting Theme has increased its membership to 30 industry members contributing \$470,000 of funding in 2013/14.

In terms of volume produced, Harvesting Theme members harvested about 11.5 million cubic metres of wood in the year to June 2013, about 45% of the national annual harvest.

All theme members had input to the development of the research programme in terms of prioritising projects and proposing new research projects (subject to budget).

The 2013/14 Research Plan was approved by the FFR Board in May and approved by PGP in August 2013. A summary of this Plan was presented to FFR Members at the annual Members Meeting.

The total budget for the 2013/14 PGP Harvesting programme is \$1,474,000 split into three intermediate outcomes:

- Mechanisation on Steep Terrain: \$417,573 (28%)
- Increased Productivity of Cable Extraction: \$777,100 (53%)
- Development of Operational Efficiencies: \$195,700 (13%)

The 2013/14 Research Plan covers six projects for the year aimed at continuation of the “Innovative Harvesting Solutions” programme in steep country harvesting:

- Task 1.1 Steep Slope Feller Buncher: Completion of the field trials of the ClimbMAX Steep Slope Harvester and commercialisation of the HarvestNav on-board navigation system.
- Task 1.2 Teleoperated Felling Machine: Completion of the test bed development platform and employing teleoperation system to a harvesting machine (Task A) and further development of the prototype mobility concept (Task B).
- Task 2.1 Advanced Hauler Vision System: commercialisation of the camera system with options for cameras in the cutover, on the hauler tower, or mobile tail hold. Field demos of the system are also planned
- Task 2.2 Improved Grapple Control System: Commercialisation of the Alpine grapple carriage (developed by Alpine Logging of South Africa); development of the Scorpion grapple and completion of the Hauler Efficiency project.
- Task 2.3 Innovative Yarding System. Construction of the Hill Country Harvester extreme terrain platform and further development of the new concept yarding system.
- Task 3.2 New Hauler Technology and International Monitoring: Continuation of the Harvesting Technology Watch programme and the Benchmarking Harvesting Cost and Productivity database.