



HARVESTING THEME UPDATE

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Summary

This update previews the 2012/13 Research Work Programme that commenced on 1st July 2012. This Research Plan was approved at the FFR Board meeting on 29th May, 2012. Progress with current research projects in the PGP “Innovative Harvesting Solutions” programme and a list of reports published during the last two Quarters is also summarised. A full review of the highlights of the year’s research outputs will be given at the Member’s Meeting in Rotorua on Tuesday 14th August, 2012.

2012/13 RESEARCH PROGRAMME

At the FFR Members Meeting in Gisborne in March 2012 a draft 2012/13 Research Plan was presented to Harvesting Theme members. The purpose of this meeting was to discuss and further develop the proposed research work programme commencing 1 July 2012. All theme members had the opportunity to have input to the programme, to propose new research projects (subject to additional budget) and to prioritise projects. After this meeting the programme was further developed, adding project milestones and budgets.

Once all the projects had been developed the Research Plan was finalised and discussed at the Harvesting Theme Technical Steering Team meeting in April, 2012. The Research Plan was then presented and approved at the FFR Board Meeting in May, 2012.

The total budget for the 2012/13 PGP Harvesting programme is \$1,025,000 split into three intermediate outcomes:

- Mechanisation on Steep Terrain: \$503,830
- Increased Productivity of Cable Extraction: \$412,860
- Development of Operational Efficiencies: \$108,310

This Theme Update previews the 2012/13 Research Plan which covers seven 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 machine.
- Task 1.2 Teleoperated Felling Machine: Construction of a development platform for teleoperated excavator (Task A) and development of a prototype mobility concept (Task B).
- Task 2.1 Advanced Hauler Vision System: commercialisation of the camera system with options for cameras on the grapple, hauler tower, tail hold or in the cutover.
- Task 2.2 Improved Grapple Control System: production studies of the Alpine grapple carriage (developed by Alpine Logging of South Africa) and the Falcon Forestry Claw (developed by Moutere Logging Ltd of Nelson).
- Task 2.3 Innovative Yarding System. Commencement of this project to develop a new concept yarding system.
- Task 3.1 Delimbing and Cut-to-Length Systems on Slopes: Feasibility analyses.
- Task 3.2 New Hauler Technology and International Monitoring: Continuation of the Harvesting Technology Watch programme and extension of the Benchmarking Harvesting Cost and Productivity database to the third year of data collection.



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RESEARCH REVIEW: 2011/12

FFR Harvesting Theme has now completed Year 2 of this six-year programme. In the first year of the programme (2010/11) FFR put project teams together and commenced the H1 (short horizon) projects in steep slope feller buncher development, hauler vision systems and improved grapple control. Feasibility studies were undertaken which showed that all three of these projects had potential to reduce steep country harvesting costs by a total of \$5.00 per cubic metre of wood produced.

In Year 2 outputs have focussed on increased mechanisation on steep land (completing the initial H1 projects) and commencing the H2 projects in Teleoperation and Innovative Yarding Systems.

A full review of the highlights of the year's research outputs will be given at the Member's Meeting in Rotorua on Tuesday 14th August, 2012.

Mechanisation on Steep Terrain – Steep Slope Feller Buncher

The construction of the beta prototype steep slope feller buncher (the ClimbMax steep slope harvester, pictured) was completed by Trinder Engineers of Nelson during the Quarter and the machine is now operating in the Nelson forests.



Figure 1: The ClimbMax steep slope harvester

The technical and economic feasibility analysis has been published detailing costs and benefits of the steep slope feller buncher (Report H007).

A Decision Support System based on LiDAR-derived DTM's to provide operators of steep slope machinery with real-time information to determine high and low stability areas in each harvest block has been developed. A Technical Note titled On-board Machine Stability Information System is in preparation.

A review of the availability of steep slope mechanisation and costs and benefits has been published (HTN04-07) has also been published. The ClimbMax harvester is scheduled for a series of field trials commencing in Nelson in August.

Mechanisation on Steep Terrain – Teleoperated Felling Machine

A report on options for the direction of the teleoperation project discussed at the TST meeting in Feb. Initially the project proposed to purchase an "off-the-shelf" remote control system for installation in an excavator for teleoperation of steep country harvesting. This option has the advantages of reducing technical risk and being lower cost, but would also limit further development and integration of other developments such as haptic feedback and semi-automation.

When the first PhD student at the Mechatronics Programme at University of Canterbury (Mr Bart Milne) joined the project in early 2012, a new approach was proposed. This involved a lower cost option to build a single teleoperated hydraulic circuit as a development platform for teleoperation. This proposal was developed in a modified Alpha Prototype Development Plan and circulated to the TST for approval in May. It was decided to proceed on this basis as it would provide a closer collaboration between Scion and UC Mechatronics.

The concept report outlining the proposed progression of the use of teleoperation in steep



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slope harvesting which was completed earlier in the year was updated and combined with the technical and economic feasibility study of the teleoperated felling machine. This report is in the process of publication (Report H008).

A literature review of the state of the art in teleoperation has also been completed (HTN04-09) and will be published shortly.

Increased Productivity of Cable Extraction – Hauler Vision System

Trinder Engineers have completed their development of a grapple camera system using an Ag-Cam camera mounted on the grapple of a cable hauler. This has been trialled in Kelly Logging Ltd's operations in the Nelson area.

Positive responses from the operator have been received regarding issues such as operator depth of field, operation in poor light conditions, and ease of battery charging. The system includes a repeater at the tail hold for better reception of the camera signal at the hauler.

Scion continued development of an alpha prototype camera system, comprising three network surveillance cameras designed for three different locations or combinations (such as in the cutover, on the hauler and on the tail hold machine). A trial of this system has been completed and a Technical Note is in preparation.

The report on the technical and economic feasibility of the improved hauler vision system has been published (Report H006). The analysis showed that even at low usage (40%) and the high end of the capital cost range (\$25,000) the system will yield savings of around \$1.00 per tonne on the cable logging rate.

Increased Productivity of Cable Extraction – Improved Grapple Control System

The report on the technical and economic feasibility of an improved grapple/carriage

control system has been published (Report H005).

The low-cost Grapple Restraint system that was released to members at the FFR Members Meeting in Gisborne in March has been trialled in a cable logging operation and a Technical Note completed (HTN04-10).

Further work in the project on rigging configurations has been completed by the University of Canterbury. A Technical Note on the suitability of different cable systems for different conditions has been published (HTN04-06). This work is now being extended to the industry in a series of workshops in conjunction with FICA. The first workshop was run in Nelson and a second workshop is planned for Tokoroa later in July.

A new project has now commenced to investigate two hydraulic grapple carriages. One is the Alpine Grapple, developed in South Africa by Alpine Logging (Figure 2).



Figure 2: Alpine hydraulic clamping grapple



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The other study is of the Falcon Forestry Claw, a motorised hydraulic grapple developed by Moutere Logging Ltd in Nelson (Figure 3).



Figure 3: Falcon Forestry Claw developed by Moutere Logging Ltd.

Increased Productivity of Cable Extraction – Innovative Yarding System

The Technical Steering Team approved the commencement of the first project in this Innovative Yarding System programme. This involves a proposal 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 walking down the steepest slopes. It is designed to be a platform for either a boom and grapple to bunch trees or for a yarder tower and winches for short range cable hauling.

The concept design is currently being developed and once this is completed a feasibility study of the concept will be undertaken.

Development of Operational Efficiencies – Harvesting Technology Watch

Harvesting Technology Watch HTW-009 was completed during Quarter 2 and published in early January. This review of new technology potentially relevant to the logging sector included the Telecarrier excavator-based cable yarding system from Teleforest Inc.; new personal protective clothing from BAE Systems and UC3M; the Radiata Theme project in tree counting; and information about METLA the Finnish Forest Research Institute.

The LIRA/LIRO Conference Proceedings dating from 1980 to 1999 have been scanned by the University of Canterbury School of Forestry, with assistance from the staff of the National Forestry Library at Scion. This valuable resource of logging information will be loaded onto the FFR website available to members.

Harvesting Technology Watch HTW-010 was completed during Quarter 4 and is in publication. This review focussed on three items of new technology potentially relevant to the logging sector: the Highlander clambunk-harvester; the Alpine Shovel Yarder and the All-Terrain Platform (ATP) developed by MTEL in Katikati. An FFR project in the Environmental Theme valuing avoided erosion and a summary of research from the Centre for Forest Business at the University of Georgia is also featured.

Development of Operational Efficiencies – Forest Industry Harvesting Cost and Productivity Benchmarking

Analysis of the Benchmarking Costs and Productivity database covering all the data collected from 2009 up to June 2012 (over 500 entries) is in preparation.



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A Technical Note (HTN04-08) on the results of this analysis is scheduled for completion by end-July 2012 and will be published shortly.

SUMMARY OF 2011/12 YEAR

When it commenced in 2008, one of FFR's goals was to have all New Zealand forestry companies and the Government as partners in its harvesting research programme.

FFR Harvesting Theme has increased its membership from 18 industry members contributing \$350,000 of funding in 2010/11, to 25 members with \$450,000 of industry funds in 2011/12. In terms of volume produced, the FFR Harvesting members harvested 12 million cubic metres of wood in the year to June 2012, about 47% of the national annual harvest.

With the growth in industry members and the successful partnership with the Government through the PGP, FFR is expanding our collaboration with New Zealand forestry machinery manufacturers to develop improved equipment. This innovative technology and systems development will increase productivity of steep terrain harvesting, further reduce harvest costs, make cable logging work easier and safer, and through machine sales to logging contractors, grow the manufacturing sector to future-proof the forest industry.

RESEARCH OUTPUTS 2011/12

The following reports have been completed since the last Theme Update:

- Technical Note HTN04-06: Matching Rigging Configurations to Harvesting Conditions (published July 2012).
- Technical Note HTN04-07: Mechanisation on Steep Slopes in New Zealand (published July 2012).

- Technical Note HTN04-08: 2011 Benchmarking Harvesting Cost and Productivity (in preparation).
- Technical Note HTN04-09: Teleoperation for Steep Country Harvesting: A Literature Review of the State of the Art (in preparation).
- Technical Note HTN04-10: Improved Grapple Control using a Grapple Restraint (in preparation).
- Technical Note HTN04-11: Design of a Lab-based Development Platform for Teleoperation (in preparation).
- Harvesting Technology Watch HTW-009 (Published January 2012).
- Harvesting Technology Watch HTW-010 (Completed June 2012).
- Report H005: Development of an Improved Grapple / Carriage Control System: A Feasibility Study (Published July 2012).
- Report H006: Advanced Hauler Vision System: A Feasibility Study (Published July 2012).
- Report H007: Steep Slope Feller Buncher: A Feasibility Study (Published July 2012).
- Report H008: Introduction of Teleoperation to Steep Slope Harvesting: A Concept Design and Economic Feasibility Study (Published July 2012).

These reports are 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