South Island Research Forum: Future Opportunities in Harvesting and Logistics Research

INTRODUCTION

The current PGP-industry funded Steep Land Harvesting research programme finishes in mid-2016 and it is timely to begin discussion across the industry on what happens beyond the end of this programme. It is vital that the industry maintains the momentum built up over the last few years in harvesting innovation. Following on from a North Island Research Forum held in Rotorua in November 2014, a strategic research forum was scheduled for South Island industry stakeholders to discuss current industry issues and develop future research ideas in harvesting and logistics. The strategic forum was held in Balclutha on 18 March 2015. This report summarises the outputs of the forum.

OBJECTIVES OF THE HARVESTING AND LOGISTICS FORUM

1. To identify industry issues, needs and gaps.

2. To generate potential research projects to address the industry needs and gaps.

3. To determine industry priorities for the proposed research projects.

Programme funding was not the focus of this forum. Depending on the level of support, later work will determine project resources – co-funding, research providers, timing etc. A funding bid will be developed through the appropriate channels of the FOA Research Committee or a coalition of willing investors.

Scope for Potential New Research

The scope for a potential new research programme is harvesting and logistics operations within the forest industry in New Zealand. The research will consider the total value chain from felling to log delivery at mill or port.

METHOD

Workshop 1: Identifying Industry Needs and Gaps

What are the Industry drivers? What are the future trends? Each group discussed each identified industry need and predicted the future trends for these needs. These were documented by each group.

Workshop 2: Future Research Opportunities

What are the research projects to address Industry needs? For each identified industry need each group discussed ideas and proposed research projects to develop the industry's best response to these needs and future trends. To ensure each idea was adequately developed a maximum of 4 Research Projects per group was set. Each proposed research project was documented in the following format:

- Objectives / Benefits

- Methods
- Results / Outcomes

Workshop 3: Determining Research Priorities

Once each project that met an identified industry need was developed and was considered within scope for a new programme of Harvesting and Logistics research, the project ideas were displayed for each participant to examine. Individual priorities were determined by voting, whereby each participant had 5 votes to apply to as many projects as they wished. Votes were attached to each Research Project poster for other participants to view.

RESULTS

Industry Representation

A summary of forum attendees is given in Table 1.

Table 1: Forum Attendees

17	Forest Owners
2	Local Government
6	Researcher/Industry Manager
4	Farm Forester/Contractor
1	Log Trader/Marketing
6	Wood Processor
36	TOTAL

There was wide industry representation at the forum, with 36 participants representing forest owners, local Government, research management, harvesting and transport contractors and wood processors. The workshop participants worked in 8 groups. Results of Workshop 1: Identifying Industry Needs are presented first. Then results of Workshop 2: Research Opportunities are presented.

A. INDUSTRY NEEDS

The workshop groups identified the following industry needs and gaps:

1. Need to improve skills available and attract more workers into forestry (People / Skills / Career)
2. Imperative to improve safety (Health & Safety)
3. Need for reduced costs and improved efficiency (Technology / Productivity)
4. Enable further expansion of the forest industry (Expansion of non-corporate harvesting)
5. Need for increased efficiency across the supply chain (Supply Chain Logistics)
6. Need to reduce the impact of harvesting and improve environmental performance (Environmental Management)

1. Industry Need – People / Skills / Career

Subject Area	Industry Needs and Gaps	Group
People / Skills / Career	Improved industry training to improve skills of workforce. Training for increased production and safety. Issues with aging workforce. Need to improve management training. Improve cost effectiveness of training. Number and quality of trainers. Skills training for increased small block harvesting.	3, 4, 5, 6, 8
	Labour shortage. Need to attract people into forestry. Relax immigration laws. Recruitment of young people into forestry. Lack of career pathways, clarity and visibility. Improve retention of workforce. Difficult to get new recruits for some operations (e.g. thinning to waste)	1, 6, 7, 8
	Need to develop workforce skills and availability to operate new equipment. Vision is remotely operated machinery off-site. Design training courses that will deliver skills required. Improved training to deal with the new environment of mechanisation. Use simulator (supported by industry). Apply selection criteria (simulator) to training.	7
	Maintaining skilled manual operators. Risk losing manual skill base with increasing mechanisation. What will be the physical, educational and technical needs of future workers (both manual and machine operators)? There will always be a need for manual tree fallers where machines cannot get access.	2, 8

2. Industry Need – Health and Safety

Subject Area	Industry Needs and Gaps	Group
Health & Safety	Improve legal compliance. Ongoing need to improve safety of operations. Reduce cost of compliance. Enforce greater accountability for poor performance.	2, 3
	Safety of manual tree felling. Motor-manual felling is getting more dangerous as harvesting moves into more difficult areas. Mechanised felling is often allocated the best resource, leaving roughest areas to manual felling.	6
	Need intercompany information sharing. Simplify safety standards, operating rules and safety procedures. Streamline company systems.	6
	Get operators into cabs or operate remotely. Create more remote control mechanisms.	5, 7
	Improve safety of log truck operators. Is there a better way for manual chaining up? Load security - to stop logs falling off trucks.	2, 7
	Contractor certification/accreditation.	2
	Improving health and safety in the private forest resource.	2
	Improve safety of thinning to waste operations on steep country. Many serious harm accidents and near miss incidents. Substantial area of steep country thinning to waste with high hindrance, resulting in high workload operations and substantial exposure to accidents.	1
	Reducing logging truck accidents and deaths.	5

3. Industry Need – Technology / Productivity

Subject Area	Industry Needs and Gaps	Group
Technology / Productivity	Increase profitability of sector. Reduce operating costs (fuel, wages). Need to improve efficiencies due to low margins.	3, 6,
	Minimise log waste. Increase merchantable volume per hectare. In-field debarking/chipping. Resource for bioenergy.	3
	Need to improve wood handling through landing (bottleneck). Need to reduce multiple log handling at a site to load a truck.	3
	Log value too low. Value of resource vs cost to market. Drives low contractor investment and short contract term. Need to increase end use value of wood.	7
	Maximise returns to log purchaser/contractor. Precision cutting to length in the forest.	8
	Innovators need forest owner support and to be rewarded for innovation.	7
	Operate with less labour to reduce cost and safety issues. Examples include automation, multi-function machines, and applications of UAV's for reducing labour.	1, 3
	Improve international competitiveness. New technology in value chain. Combat disadvantages of high cost and difficult terrain. Need effective communication on what is happening in harvesting innovation worldwide.	3, 7
	Continue hauler productivity research (Steep slope harvesting).	2
	Continued development of steep country tree felling machines to replace manual operations. A more productive felling machine (saw on grapple, "stick insect" etc.) Machine assisted felling (grappling trees) - recognised best practise.	1, 7, 8

4. Industry Need – Expansion of non-corporate harvesting

Subject Area	Industry Needs and Gaps	Group
Industry Expansion	Need to address needs of large number of owners of small forests. Increasing harvest of 1990's wood coming on stream from 2020. Demands on infrastructure (contractors, roading and transportation). Need for capital investment in new plant and equipment and continued viability. Collaborative approach needed.	1, 4, 5, 6
	Improve seasonal nature of woodlot harvesting. Difficulty in planning and coordinating small block harvesting (price driven). Need to coordinate timing of harvest and marketing. Low margins. Challenges of high roading costs, moving machinery in and shifting costs results in poor economics. Current short term view creates "one-off" high cost operations vs continuous work for large forest owners. Need to be able to deal with market downturns (demand/price) or lose labour force.	1, 2, 4, 5, 6
	Mechanisation of small low volume crews to improve productivity and safety economically. Need for efficient machinery to work off small sites with minimal infrastructure while meeting environmental constraints. Showcase potential options.	1, 2
	Improve contractor availability (related to access to finance, cost of machinery, risk).	3

5. Industry Need – Supply Chain Logistics

Subject Area	Industry Needs and Gaps	Group
Supply Chain Logistics	Identify and address fundamental supply chain issues such as variability in resource, supply chain variability (production and delays in moving product) and changes in orders. If industry can address these issues, will be able to improve supply chain performance. Can industry better collaborate to reduce supply chain variability?	1
	Improve Port Operations. Increase size of wharf storage space to deal with surging of supply around shipments. Increase height of log stacks. Reclaim more land.	1, 6
	Log Measurement / JAS Scaling issues. Better method of calculating volume. Current method too variable. Poor fit of JAS scale to current NZ resource. Need to automate measurement. Potential to develop photo methods of log scaling.	1, 2, 6
	Supply chain inefficiencies in relation to increasing wood flow. Increased collaboration needed across industry and with overseas.	4
	Improve trucking logistics. Too many bottlenecks at key locations (at crews / mill/ port). Improve port logistics especially truck turnaround times.	2, 6
	Multi-function machinery. Forwarders with capability to lift trailers. Maximise machinery utilisation on-site.	8
	Improve logistics efficiency on landing. Too many export log grades. Do current log specs realise best value? Need to standardise / rationalise log grades.	3, 6

6. Industry Need – Environmental Management

Subject Area	Industry Needs and Gaps	Group
Environmental Management	Need to improve environmental impacts of harvesting. Reduce soil disturbance. Minimise roading. Need to reduce earthworks in logging. Engineering options to minimise soil disturbance.	3, 6
	Improve legal compliance. Increasing legislative framework providing economic challenges.	3, 4
	Potential for disease/pests and effects of chemicals on the environment.	5
	Community perception of forestry/harvesting.	4
	Environmental challenges for small woodlot owners. Especially meeting new water quality requirements (no change in visual clarity) and riparian zone requirements (5m strips with streams <3m).	1, 4, 5

B. RESEARCH OPPORTUNITIES

A total of 24 project ideas were generated during the Workshop. Each project generated was assigned a number designating the group and project number. For example, the three projects in Group 1 were numbered 1.1, 1.2, 1.3 etc. Projects were then grouped into common research areas. A summary of each group's projects consolidated into research areas is given in Table 2.

Table 2: Summary of Group Projects by Research Area

Group	No. Projects	Supply Chain Logistics	People / Skills	Technology / Productivity	Industry Expansion	Health and Safety	Environmental Management
1	4	1	0	0	1	2	0
2	4	2	1	0	1	0	0
3	2	2	0	0	0	0	0
4	2	1	0	0	1	0	0
5	3	0	2	0	0	0	1
6	3	1	1	0	1	0	0
7	4	1	0	3	0	0	0
8	2	0	1	1	0	0	0
TOTAL	**24**	**8**	**5**	**4**	**4**	**2**	**1**

C. RESEARCH PROJECTS

Summary of Research Projects

All the research project ideas were grouped into six main research areas (Table 3). Research projects were ranked in order of priority according to the number of votes received from workshop participants. It is clear that that most project ideas proposed were in the supply chain logistics area with 8 projects gaining 45% of total votes.

Table 3: SUMMARY OF RESEARCH AREAS IN PRIORITY ORDER

Research Area	Subject	No. Projects	No. Votes	% of Total
1. Supply Chain Logistics	Port Operations	2	17	14%
	Log Transport	3	16	13%
	Measurement / Data / Information	1	12	10%
	Efficiency / Processing	2	10	8%
	Sub-Total	**8**	**55**	**45%**
2. People / Skills	Developing Skills / Training	2	13	11%
	Addressing Labour Shortage	2	13	11%
	Sub-Total	**4**	**26**	**22%**
3. Industry Expansion	Improved Operations	5	23	19%
	Sub-Total	**5**	**23**	**19%**
4. Health & Safety	New Technology	2	10	8%
	Sub-Total	**2**	**10**	**8%**
5. Environmental Management	Engineering Operations	1	5	4%
	Sub-Total	**1**	**5**	**4%**
6. Technology / Productivity	New Technology and Systems	3	3	2%
	International Monitoring	1	0	0%
	Sub-Total	**4**	**3**	**2%**
	TOTAL	**24**	**122**	**100%**

List of Research Projects

1. Research Area: Supply Chain Logistics

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Port Operations	2.2 Port Logistics	Improve truck turnaround times and truck utilisation	Investigate alternative log measurement methods such as photoscaling systems, investigate alternative log scaling locations.	Reduced truck waiting delays, improve truck utilisation, reduce cartage costs and reduced truck fleet.	12	**9.8%**
	6.2 Improved Export Logistics	Efficiencies in costs and truck utilisation through improved wharf logistics	Innovative log scaling methods (electronic log tracking); simplify export log grades resulting in fewer row starts at wharf; investigate creation of a log hub to add value.	Improved truck turnaround times and on-wharf log storage resulting in log transport and port cost efficiencies	5	**4.1%**

1. Research Area: Supply Chain Logistics (continued)

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Log Transport	3.1 Reducing Truck Waiting Times	Reduce truck waiting delays during load/weigh/scale/docket writing process.	Investigate and develop alternative technologies to reduce truck wait times such as mass loading, load securing, auto-scaling, eliminating weighing.	Reduced truck waiting delays, improve truck utilisation, reduce cartage costs and reduced truck fleet.	11	**9.0%**
	2.3 Improved Truck Load Security	Eliminate logs falling off trucks	Investigate alternative load securing systems such as strapping, mechanical devices and log containment curtains.	Better log truck public image (licence to operate) and improved road safety.	3	**2.5%**
	7.1 Automated Log Truck Load Security	Eliminate truck driver injury and reduce interaction delays with other landing operations	Develop a non-manual method for chaining up logging truck loads	Cost effective fast load securing method for reduced injury risk to drivers and improved road safety.	2	**1.6%**

1. Research Area: Supply Chain Logistics (continued)

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Measurement / Data / Information	1.3 Automate JAS Log scaling method	Develop an automated log measurement method for calculating log volume that better fits the current NZ resource than the JAS scale.	Automate JAS log scaling method. Investigate alternative log scaling methods such as photogrammetry.	Reduced cost with better precision of log volume calculation and a good fit of volume to the current NZ resource.	12	**9.8%**
Efficiency / Processing	3.2 Reducing Landing Inefficiency	Reduce costs of moving wood across a log landing.	1. Develop multi-function machines to allow production on small landings (roadside). 2. Auto-chipping of log residues to solve space issues on small landings and increase utilisation of volume. 3. Remove sorting and QC functions away from in-forest landings.	Operation on smaller landings, reduced congestion from residues, and manual functions	7	**5.7%**
	4.2 Improved Value Chain Logistics	Improve harvesting / transport / port operations logistics.	1. Build collaboration and coordination across the value chain. 2. Take a regional approach to identify bottlenecks and quantify financial impact of changes. 3. Assess scenarios to design solutions.	More efficient and profitable harvesting supply chain.	3	**2.5%**

2. Research Area: People / Skills / Career

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Developing Skills / Training	5.1 Achieving Well Trained Staff	Improve training for workforce	Identify skill sets required and shortfalls, identify best practice training methods and make recommendations for NZ conditions	Better health and safety, reduced costs, increased profit and improved security	7	**5.7%**
	2.4 Maintaining Skilled Manual Labour Skill Base.	Reduce the risk of losing manual chainsaw skill base with increasing mechanisation through a skill retention and development programme for manual chainsaw workforce.	Determine what the physical, educational and technical needs of future workers (both manual and machine operators) will be. Despite increasing mechanisation there will always be a need for manual tree fallers where machines cannot get access. Define labour requirement / Monitor workforce skill base / Determine skills gap / Maintain manual training.	Industry has supply of well-trained manual chainsaw workers	6	**4.9%**

2. Research Area: People / Skills / Career (continued)

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Shortage of Labour	6.1 Addressing Workforce Issues	Develop a sustainable workforce and provide more skilled workers	Positive promotion of industry, lifting forestry profile/public perception; understand future skills required; attract the right workers (schools); investigate training options (possibly using outside assistance to diagnose problem and propose solutions.	Improved career path, sustainable workforce, productive motivated safe workforce	10	**8.2%**
	8.1 Addressing labour shortage and retention	Attract people to work in forest industry	Develop career paths for workers, investigate monetary incentives (parity with comparable industries); improve marketing (improved product returns); Improve industry image (promotion)	Improved safety, production efficiency, reduced stress for contractor and company, reduced training cost	3	**2.5%**

3. Research Area: Industry Expansion

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Improved Operations	1.4 Efficient Small Scale Harvesting Systems	Investigate efficient harvesting systems for small woodlots	Determine effect of woodlot size, no. of log sorts, reduced infrastructure, capital cost, and labour issues.	Reduced cost of logging and labour issues addressed.	15	**12.3%**
	4.1 Continuing development of small block harvesting technologies	Target improvement of small scale logging contractors	Developing appropriate machinery, investigating structures to better coordinate harvesting of smaller forests and woodlots within a region.	Reduced costs and maximised returns for the small grower and continuity of work for small scale / low volume logging contractors	6	**4.9%**
	2.1 Improved Small / Low volume logging operations	Target improvement of small scale logging contractors	Improve H&S, productivity, skill levels and reduce unit costs	Improved performance of small scale / low volume logging contractor operations	1	**0.8%**
	5.3 Dealing with 2023	Address the issues relating to the forestry supply peak in 2023	Identify all the issues constraining expansion (including contractors, health and safety, training, port capacity, markets and log prices). Determine effects of changes (such as coordination of supply, log sorts, improved infrastructure, addressing labour issues). Make recommendations to industry.	Improved value for forest owners, improved economics of forestry, supply of contractors and other issues addressed.	1	**0.8%**

3. Research Area: Industry Expansion (continued)

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Improved Operations	6.3 Improve efficiency of Non-corporate Harvesting Operations	Create reliability of supply from small growers; reduce costs and improve efficiency and environmental performance of small scale harvesting operations.	Determine nature of small scale resource (woodlot size, age harvesting intentions). Investigate supply scheduling methods for non-corporate forest resource. Coordinate through partnering arrangements.	Coordinated supply from small scale resource; reduced cost of operations and improved environmental performance.	0	**0.0%**

4. Research Area: Health and Safety

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Health and Safety	1.2 Automated steep country thinning to waste	Improve safety of thinning to waste operations on steep country. Many serious harm accidents and near miss incidents. Substantial area of steep country thinning to waste with high hindrance, resulting in high workload operations and substantial hazard exposure.	Further develop the remote-controlled or teleoperated tree-to-tree felling machine to thin-to-waste.	Improve safety of thinning to waste operations, increased productivity, and reduced cost.	8	**6.6%**
	1.1 Improved Self-Loading Truck Operator Safety	Protect self-loading truck operators from hazards and weather without adding any payload to the truck.	Leverage off other remote control technology to develop operator remote control to take loader operator out of crane/cab hazard zone.	Improved safety for self-loading trucks	2	**1.6%**

5. Research Area: Environmental Management / Planning

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
Engineering Operations	5.2 Improved water quality	Improve water quality and reduce sedimentation from harvesting operations	Measure impacts of harvesting operations on water quality. Identify causes of poor performance or breach of rules. Identify best practice world-wide and recommend changes to practices.	Better informed decisions / fewer unintended consequences / improved water quality / Avoidance of fines	5	**4.1%**

6. Research Area: Technology / Productivity

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
New Technology and Systems	7.2 Remote control steep slope harvesting	Eliminate manual tree felling on steep slopes	Develop remote control steep slope harvesting machine ("Stick Insect")	Reduce safety risk with manual felling / Reduce manual tree felling workload / Improve productivity (24-7 operation)	2	**1.6%**
	7.3 Remote Control / Teleoperation / Automation	Continue momentum in projects to remove worker from danger ("No worker on the slope").	Develop systems to enable harvesting phase to be either remote-controlled or teleoperated (all operators off-site). Use cameras to give aerial view of operations.	Minimise travel to site, H&S risk eliminated or operators isolated from risk. Systems developed are operator friendly.	0	**0.0%**

6. Research Area: Technology / Productivity (continued)

Subject	Project Name	Objective	Method	Outcome	No. Votes	% Votes
New Technology and Systems	8.2 Precision Cutting to Length	Development of harvester head for improved measurement of length, diameter and volume and precision cutting to length.	1. Validate accuracy/precision of current processing machinery. 2. Develop measuring/cutting system to reduce log trim allowance 3. Measure improvement to value optimisation 4. Investigate potential to reduce Log Quality Control processes	1. Maximise returns to forest owner/log purchaser (value recovery); 2. Improved quality to log customer (mill/export customer); Better log conversions and reduced wastage at sawmill; 3. Improved stowage on log ships.	1	**0.8%**
International Monitoring	7.4 International Harvesting Technology Watch	Encouraging improved information sharing and innovation across the industry	1. Investigate international best practice in harvesting technology; 2. Identify appropriate innovations for NZ industry (economic analysis); 3. Provide a site where information on latest international innovations in harvesting and distribution can be communicated.	Improved information for industry decision-making on harvesting and distribution technology	0	**0.0%**

CONCLUSIONS

During the forum industry stakeholders identified industry needs and gaps, proposed research projects to address those needs, and determined industry priorities for the research projects.

The outputs of the Workshop sessions have been summarised in this report. A wide range of ideas for research projects were generated. There were some commonalities or overlaps between project ideas which indicated clear “hot spots” to meet industry needs.

Some of the ideas are clearly not research projects, such as training and addressing labour shortages in the industry. It will be important to identify the appropriate resources to address these ideas and direct these ideas to the right place to ensure they can be discussed, agreed and actioned (e.g. FFA/FOA committees, Worksafe, Competenz etc.)

Priorities for the research projects were determined by the workshop participants through the use of a voting system. It is clear that the most project ideas proposed were in the supply chain logistics area with 8 projects gaining 45% of total votes.

NEXT STEPS

A wider consultation process will continue to ensure other industry stakeholders have the opportunity to articulate their priorities. We invite your input to this further round of consultation.

Later, FOA/FFR will synthesize the highest priority projects into a series of research programmes, determine the project resources likely to be required (co-funding, research providers, timing etc.). We will seek your further feedback on the programme priorities, and gain broad agreement or consensus prior to developing funding bids through the appropriate channels.

Funding for undertaking these research programmes may be through the Forest Growers Levy (if additional resources are available) or through a coalition of willing investors, matched by PGP or other Government funding. Once funding bids are developed later in 2015 these will be communicated back to the stakeholders in the forest industry.

APPENDIX 1: LIST OF BALCLUTHA FORUM ATTENDEES

First Name	Last Name	Company
Brent	Apthorp	FIEA
Brett	Armour	Craigpine Timber Ltd
Roger	Belton	Southern Clams Ltd
Russell	Blair	Craigpine Timber Ltd
Alec	Cassie	Wenita Forest Products Ltd
Steve	Chandler	Rayonier Matariki Forests
Dave	Cormack	Wenita Forest Products Ltd
Neil	Cullen	NZFFA
Russell	Dale	NZFOA
Phil	De La Mare	Ernslaw One Ltd
Grant	Dodson	City Forests Ltd
Hamish	Fitzgerald	Rayonier Matariki Forests
Shaun	Foster	Southwood Export Ltd
Paul	Greaves	ForestPlus Oils Ltd
Spencer	Hill	Scion
Anne	Horsewood	Wenita Forest Products
Cathy	Jordan	Venture Southland
Russell	Kerr	Ernslaw One Ltd
Greg	Lindsay	Log Marketing NZ Ltd
Tony	Livingston	Ernslaw One
Craig	Maaka	Calder Stewart Ltd
Graeme	Manley	Southwood Export Ltd
Roger	Mariu	Ernslaw One Ltd
Bruce	McDowell	Wenita Forest Products Ltd
James	McEwan	Wenita Forest Products Ltd
Andrew	Murray	Murray Logging Ltd
Peter	Oliver	City Forests Ltd
George	Platts	PF Olsen Ltd
Andrew	Pratt	King One Ltd
Keith	Raymond	Future Forests Research Ltd
David	Rhodes	Forest Levy Trust Secretariat
Brian	Richardson	Scion
Bryan	Scott	Otago Regional Council
Brendan	Slui	Rayonier Matariki Forests
Billy	Tredinnick	Craigpine Timber Ltd