Precision Silviculture Programme

Forest Growers Research
Sustainable Food & Fibre Futures

Precision Silviculture
SFFF – 21062

Quarter 1 Public Summary for the Period:
1 July 2024 to 30 September 2024

Prepared for the Programme Governance Group
by
Forest Growers Research Ltd

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FOREST GROWERS RESEARCH

Funded by:
Ministry for Primary Industries
Manatū Ahu Matua
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PUBLIC SUMMARY OF PROGRESS

Precision Silviculture

The Precision Silviculture Programme (PSP), funded by Forest Growers Research (FGR), forestry companies and the Ministry for Primary Industries (MPI) aims to transform tree production in forest nurseries and forest management practices by capitalising on advances in mechanisation, automation, and digital technologies. By doing so, the Programme addresses labour shortages, the need to improve safety in all forestry operations, reduce forestry value chain costs, maintain a pruned log supply, enhance productivity, and maintain licence to operate through sustainable practices including reduced chemical inputs. It also supports the transition towards a bioeconomy through developing more effective methods for delivering biomass waste streams for conversion into bioenergy or other uses.

Summary of Progress

Key highlights and achievements

The main achievements in the PSP during Q1 (1 July to 30 September 2024) have been:

- A team of University of Canterbury students conducted field testing of a mechanical bareroot lifting system with bunching and trimming at Rangiora Nursery. They gathered significant insights and identified important amendments, with invaluable insights provided from both Rangiora and Woodville Nurseries.
- The PlantIT tree and box tracking app now features single-pass QR code scanning and supports both centralised and decentralised user types. It was well received at the FGR conference, with future potential for integration with payment management systems highlighted as a significant advantage.
- The Seedling AI grading project is in the final stage of development on an in-shed prototype with a conveyor belt, cameras, and lighting. The next step is to run seedlings through the system quickly to improve data collection and strengthen the model.
- Following Forme Consultants' report on the value of individual tree data using complex geospatial information, Cucumber has interviewed industry experts to define a Platform as a Service (PaaS) for data facilitation, including its functionalities and features. The team is now moving to phase two: designing the platform's technical architecture.
- A successful field day was held at Oji Forests in Kinleith on the 12th September with TST members, John Deere (Brandt Equipment), TigerCat, Komatsu Forest and other local engineering providers to view the PlantMax in action and determine if we can find an appropriate partner for the base adaption project. The future of this machine in NZ hangs in the balance as interest shown by wider industry in trialling the machine remains limited.
- A follow-up workshop on adapting the PlantMax to a new base machine was held on 30th October with engineering companies, Callaghan Innovation, and Pan Pac

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Forests. Brandt Equipment, Alpine Logging Equipment, and AP Plant and Machinery attended and discussed alternative base machines for the planting unit. The next step is developing concept designs with interested parties. The PSP has leased the PlantMax while deciding if an adaptation plan will improve its suitability for NZ terrain.

- Forme Consultants have been working with Pan Pac Forest Products to conduct an assessment of the productivity of the Plantmax, using a combination of real-time imagery and GPS data as well as digital terrain maps and aerial imagery. This is to better capture the operation of the machine and factors limiting effective performance.
- Led by Mitch White of Aspect Forestry, the M-Planter trials in the Top of the South Island have been completed in collaboration with three companies (PF Olsen, M&R Forest Management and Tasman Pine). Several amendments were made to the machine to adapt it to the planting conditions of firstly the flat sands at Rabbit Island (PF Olsen) and then the steeper gravelly slopes in Marlborough (M & R Forest Management) to enhance productivity and also ensure compliance for operation on the steeper slopes. A lot of learnings were made by the team over the course of the last month, not the least that we need more purpose-built machines for NZ complex terrain.
- Mitch White, Aspect Forestry, undertook a visit to Australia to visit with Paul Wood at HVP Plantations and Ian Last at HQP Plantations to view the Bracke P12 and Risutech planting heads, respectively. The purpose of the PSP funded trip was to build capability in understanding the potential of different mechanised planting systems and their applications to the New Zealand planting environment.
- SPS Automation completed the risk studies for the bespoke forestry spot spraying drone. As this risk study is a STOP/GO milestone, it is SPS Automation's recommendation that the project proceeds and we are endorsing this.
- The GPS enabled spade from TeraLabs Australia was trialled and found to have issues with GPS accuracy. Successful engagement with the manufacturer has led to an updated version due to be received end of November which will be followed-up with additional testing
- The PSP team met with the Resilient Forests Programme team to collaborate on the Precision Nutrition project. They decided to host a joint meeting with TST or industry members to review past work and identify future needs. This will ensure the work aligns with the industry's top priorities in nutrition and productivity.
- The controlled hydrogel studies have indicated that application of natural and synthetic gels, and water, extend planting stock survival well beyond that where nothing is applied. The second trial in this series has just been initiated.
- The Lincoln University study showed that Trichoderma spores can survive in nanocellulose hydrogel, offering a potential solution for out-of-season growth enhancers. No further trials have been planned until we have a clearer understanding of the viability of mechanised planting in NZ.
- Interpine have commenced next phase of the TreeTools thinning pre-selection project which enables streamlined pre, post and live assessment of the forest from drone

capture. This phase will focus on enhancing the model with more examples of forests pre and post thinning.

- The virtual reality thinning training tool has received excellent feedback from industry. The interface is being customised to allow for greater defect variation and gamification through introduction of user leaderboards.
- The programme has supported Scion and Rayonier Matariki's new proposal to use hyperspectral imagery for early detection of plant stress.

Other

- Discussions with Linnea Hansen from SkogForsk and Erik Arvidsson and Magnus Karlberg from Lulea University of Technology have progressed on a machine terrain-following simulation tool that could boost mechanised planting efficiency in New Zealand.

Upcoming

The focus for Q2 of the new financial year 24/25 will be:

- Testing the BioScout AI sensor in nurseries to assess effectiveness on providing early warning on airborne pathogens presence, focusing first on terminal crook.
- Consider a new cross-programme proposal with Scion on fundamental impacts of Chemical Thinning, including root grafting, growth effects on crop trees, and pest risks on standing dead.
- Contract new work with Scion on Stool Bed and Mini Plug Optimisation and work with Tissue Culture and Resilient Forest teams to assess the wider 'next gen' nursery proposal from Scion
- Complete final field testing of PlantIT with nursery and forest management company and develop commercialisation plan.
- Proceed with a tender to develop in-concept designs for the PlantMax planting unit adaption project.
- Evaluate the approach for Phase 2 of the ToTS trials with excavator-based planting machines.
- Ramp up activity for new projects across all activities e.g.:
    - Mech planting machine path finding simulation tools with (SkogForst, Sweden)
    - Quantifying the terrain available for mechanised planting (Scion)
    - New trials assessing ways to extend the planting season (Scion)
    - Work with Resilient Forests to find a way forward for nutrition optimisation (FGR/Scion).
    - Evaluating the next generation STALogger (Contempo Labs)
- SPS Automation to complete design (hardware and software) of prototype forestry spot spraying aircraft and commence testing of the generator system. Complete commercialisation plan.
- Commence amendments to the BETA prototype of the Marsh Hudson mechanised pruning unit following critical quality issues from the first BETA test trial.
- Develop a workplan for new robotics work with Scion that will explore a robotic platform that can operate in the forest with multi-using capabilities.

- Contract new work with Scion to evaluate the human factors of training in a virtual reality setting and plan a new project using augmented reality as an alternate training method.
- Plan for University of Canterbury new student projects for 2025, which will include the continuation of the mechanised bareroot lifting project and the robotic pruning arm. Additionally, there may be a new initiative to support manual planting using an augmented reality guidance system.
- Planning for a new project to support measurement of containerised tree stock trials to provide data led insights to the industry while in parallel drafting a new specification for what an ideal container tree looks like.
- Complete pricing drawings for SlopeTor and conduct a tender process to find a partner who can develop the prototype to manufacture.
- Contract Applied Teleoperation (ATL) to work on the operator assistance platform for the teleoperated component of the SlopeTor machine.
- Support Pan Pac on possible trial and adaptions for the Advaligno PATAS tree climbing pruner.

Investment

Investment period	*Industry contribution**	*MPI contribution*	*Total investment*
Quarter 1 2024/25	$479,406	$319,604**	$799,010
Year to date: 30/9/24	$479,406	$319,604	$799,010
Programme to date	$3,485,417	$2,323,611	$5,809,028

* Industry and FGLT contribution are 60% of total expenditure, MPI contribution is 40% of total expenditure.

** To be invoiced as per the MPI invoice schedule in the papers.