

# Precision Silviculture

Modernising forest management in the digital era

A Sustainable Food and Fibre Futures Programme funded by:

- *Ministry for Primary Industries*
- *Forest Grower's Levy Trust*
- *Individual forestry companies*

*Leadership in forest and environmental management, innovation and research*

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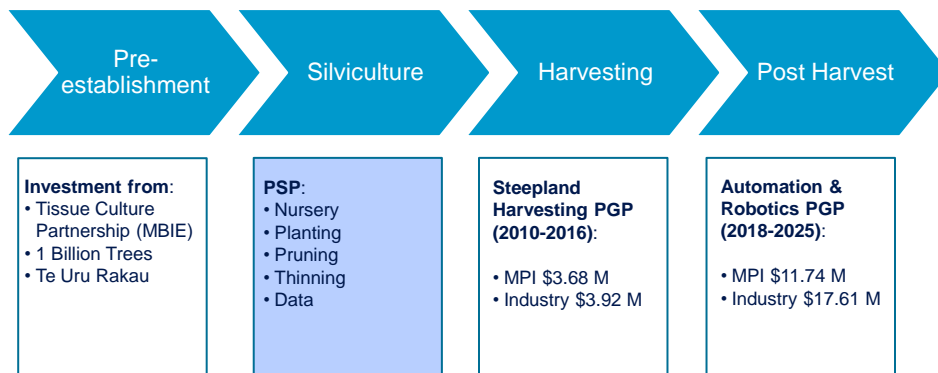
## What is precision silviculture?

- Application of technologies for mechanisation or automation of manual silvicultural practices:
  - Can be simple, e.g. digitised spade
  - Can be highly complicated industrial scale engineering
- Management strategy built on gathering and analysing temporal and spatial data on trees and their environments to improve:
  - profitability and sustainability of forest production;
  - silvicultural decision making;
  - resource use efficiency;
  - productivity and wood quality.



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## Fills gap in forestry research activities



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## The R&D gap?

Pruning: 1960s vs today



Tree planting Kaingaroa: 1920 vs 2019



<https://youtube.com/clip/UgkxkgojcmjDdwrlvY5IXiORPAz1-o2TngL8>

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## Challenges & drivers for change

- Labour shortages and high costs
- Need to improve health and safety
- Maintain / enhance end-product options e.g. pruning for clearwood; thinning for biomass
- Opportunities to leverage:
  - Multiple technological advances e.g. sensors; data capture, storage & processing; A.I.
  - Advances in mechanisation / automation in other sectors and in forestry overseas
  - Other research programmes e.g. Phenotyping; Resilient Forests; company initiatives
- Ensuring management practices are sustainable
  - Maintenance of site quality
  - Reducing herbicide (and other pesticide) use

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## The Prize ...

- Future-proofing New Zealand's forestry sector
  - Mitigate labour risks & create higher-value regional jobs to deliver an NPV of \$324M
  - Improve security of supply for \$160M p.a. in export earnings from high-value wood processing
  - Reduced potential for debris movement
- Support New Zealand's climate change objectives
  - Enabling innovation in afforestation, while reducing seedling and planting cost by 10%, providing a NPV benefit \$359M
  - Delivering new feedstocks for the production of biofuels with an NPV of \$114M
- Create domestic innovation with associated export potential
  - *Locally developed technology for pruning, planting and thinning*
  - Additive opportunity for existing New Zealand technology (tethering), sensing and digital systems etc

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## Programme status

- First presented to MPI in March 2021
- Approved by Minister in early December 2021
- **Signed by MPI on 15 March 2022**
- **Official launch by Minister 6 May 2022**
- Programme Manager commenced 10 May 2022
- Programme runs for 7 years (March 2028)
  - \$25.5 m total funding
    - (\$12.2 M co-investor cash; \$3.1 m co-investor in-kind; \$10.2 M crown)



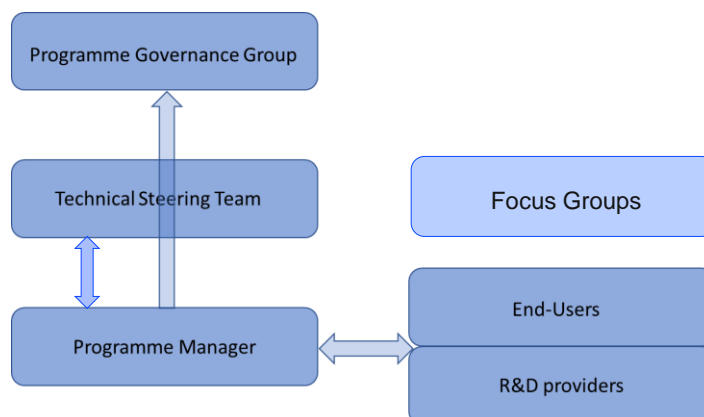
## Precision Silviculture Programme

- Five workstreams
  - Each creates independent value with interacting synergies between workstreams
- Emphasis is on adoption and adaptation
  - Don't re-invent the wheel
  - Utilise NZ-based innovation
- Partnership approach
  - Governance through independent chair
  - Innovation and technical support through industry, science providers, manufacturers and contractors



Prototype mechanised pruning

## Governance & Management Structure



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## Terms of Reference for TST

- Advice on technical direction to ensure high quality and alignment with objectives
  - Via TST, sub-group meetings etc
- Act as industry subject matter experts rather than company representatives
- Review work plans
- Review programme progress and outputs
- Make recommendations on authorisation of payments based on project progress
- Make recommendations on significant changes to research plans or programme
- Support technology transfer to ensure maximum uptake
- Identification of IP to be protected or have restricted access
- Review draft publications for commercial sensitivity prior to release
- Act as PSP advocates and support comms to all industry stakeholders
- Support creation of sub-groups to focus on specific topics/projects

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## Future TST Operations / Processes

- Scheduling TST meetings to synch with payments:
  - TST Agenda ~ 1 month prior to end of Quarter
  - Presentations to Programme Manager 8 days prior to meeting
- Review reports as they come in (IP ; technical) – process?
  - Identify who is able to review reports in different Workstreams

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## Workstreams

- Nursery workstream (\$6.4 M over 7 years)
- Planting workstream (\$6.3 M over 7 years)
- Pruning workstream (\$3.9 M over 7 years)
- Thinning workstream (\$6.4 M over 7 years)
- Data workstream \$?

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## SFFF contract

- Each Workstream has a contracted set of activities, milestones & funding
- These provide the initial template for project development BUT are changeable (via PGG)
- Currently scoping out projects and evaluating these set templates
- Likely that changes will be made to initial plan

Activity	Milestones	Start/On track	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
2.1 Validation and efficiency	2.1.1 Mechanised planting economics are benchmarked in a scaled setting	✓							
	2.1.2 System design improvements are developed and prototype testing is complete								
	2.1.3 Early tree stock performance is characterised								
	2.1.4 Human factors assessment is complete								
	2.1.5 Planting configurations are optimised								
2.2 Data and digital	2.1.6 Production prototype unit is built and optimised planting designs are available								
	2.2.1 Precision technology review is complete								
	2.2.2 Precision tolerances are characterised across geospatial settings								
	2.2.3 Data delivery protocols are developed and systems integration is complete								
	2.2.4 System precision is optimised								
2.3 Steep land planting	2.3.1 Site suitability studies are complete	✓							
	2.3.2 Steep land tethering technology review is undertaken								
	2.3.3 Design specifications are created								
	2.3.4 Prototype systems are built, site tested and optimised through to a production-ready prototype								
	2.4.1 A review of water retention systems is complete								
2.4 Extended planting	2.4.2 Matrix systems are tested and optimised at nursery scale	✓							
	2.4.3 Engineering designs for matrix delivery systems are developed								
	2.4.4 Prototype delivery systems are built and tested								
	2.4.5 Prototype systems (delivery and matrix) are tested in a variety of geospatial settings								

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## Reports and Presentations

All reports will be posted on website in a private TST area

Veronica to send out link with access instructions.

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