TĀNE'S TREE TRUST

Native Forests for our Future
Hereherea te Wao-nui-a-Tāne

Developing a functional supply chain and building local capacity for farm-tōtara in Northland

MPI – Tāne's Tree Trust Contract Number: C0038681

Final project report (Milestones 4 & 9) – 28 June 2026

By Paul Quinlan

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Paul Quinlan

Executive Summary

This report completes Milestones 4 and 9 of the Te Uru Rākau – New Zealand Forest Service funded project, *Developing a functional supply chain and building local capacity for farm-tōtara in Northland*. Coordinated by Tāne's Tree Trust, the project tested whether small volumes of farm-tōtara harvested under Part 3A of the Forests Act could support a practical, values-based supply chain involving Māori landowners, local milling, a committed timber user and technical support.

Two harvests were undertaken:

1. The first, on the McGee property near Kaeo, produced 9.22 m^3 of logs from seven trees, yielding 3.75 m^3 of graded sawn timber dispatched green-off-the-saw to Timbers of NZ. This reconfirmed that small-scale harvest, milling and sale is viable, but also showed the high costs of difficult extraction, and poor economies with small volumes and long skidding distances.
2. The second harvest, at Te Whangae Farm, was the main supply-chain test. Following a *kanohi ki te kanohi* meeting between Tapuaetahi Inc., Oromahoe Trust, Innate Furniture Ltd, Horowai Trust, Te Uru Rākau/MPI and Tāne's Tree Trust, a supply and purchase arrangement was signed. The harvest produced 27.15 m^3 of logs from 18 trees, yielding 12.48 m^3 of sawn timber, of which 9.63 m^3 met the agreed grade for Innate Furniture Ltd.

The Te Whangae Farm harvest showed that lower-cost harvesting is possible on accessible sites with experienced contractors and short extraction distances. Harvest and extraction costs were about \$118/m^3 of log volume, compared with \$370/m^3 for the McGee harvest. Timber sales of 9.63 m^3 at \$2,000/m^3 returned \$19,260 to the landowner, leaving a surplus of \$11,692 before forest management and harvest-planning costs.

Estimates for future harvests suggest returns to the landowner, after all production costs, including harvest management, to be equivalent to stumpage rates of \$193 - \$292/m^3, or \$558- 847/m^3 for merchantable sawn timber. The supply chain therefore appears viable, but remains sensitive to extraction costs, graded recovery, and management costs.

A key outcome was that Innate Furniture Ltd gained enough confidence to promote Northland tōtara as a timber option to customers. The first of the Te Whangae timber sent to Canterbury for drying arrived without apparent issues. Drying schedules may still need some refinement.

The project also built local capability. Josh and Te Ariki Witehira of Ngāti Hine Forestry Trust gained experience in selective harvesting, felling, milling, grading and forest inventory, with NorthTec training support. Four Permanent Sample Plots were established on the Oromahoe Trust property, creating a basis for future monitoring, silvicultural trials, field days and demonstration of sustainable tōtara management.

Overall, the project moved the Northland farm-tōtara opportunity from aspiration to an early but functioning supply-chain model. The next step, if the landowners are willing to support this kaupapa and participate as partners, is a harvest this summer from the Oromahoe Trust, for continued supply, improve cost and recovery data, and to assess the potential to scale this in the future into a Northland tōtara industry initiative.

Content of report:

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Associated documents:

1. Timber grading specification developed during the project
2. Spreadsheet of PSP data for Oromahoe trust

1.0 - Introduction

1.1 Background

Regenerating tōtara on private land in Northland presents an opportunity for a sustainable, native timber industry to be developed in the region, with many associated benefits[1]. This opportunity has been highlighted by several funded research projects in the past[2] and land management agencies have supported the promotion of it as an appropriate and sustainable landuse for the future. However, despite a potential supply of timber being available and some market and stakeholder interest, a stable industry has not self-started. A lack of confidence in the continuity of supply and demand, along with perceived regulatory complexities and logistical unknowns involved with harvesting and processing costs, seem to have discouraged potential partners from investing in the risk and effort to engineer a functioning supply chain. This project aimed to address those barriers.

This report specifically completes Milestone 4 (Part A) and Milestone 9 (Part B) of the deliverables for the contract MPI – Tāne's Tree Trust Contract Number: C0038681.

1.2 Project overview and timeframe

Te Tai Tokerau Māori Forestry Incorporated has been working to secure funding for a wider Tōtara Industry Initiative. While that work continues, Tāne's Tree Trust coordinated and managed this interim project to keep the opportunity moving by helping develop a functional supply chain and build local capacity to sustainably manage farm-tōtara on two Māori-owned properties in Northland. Project management was funded by Te Uru Rākau – New Zealand Forest Service. The funded project ran from March to June 2026.

The project had two connected parts: two small farm-tōtara harvests from two different properties under Part 3A of the Forests Act, and the coordination of willing supply-chain partners while building and transferring local knowledge and experience needed for ongoing sustainable management and practice.

1.3 – Project concept, aim and purpose

The project aimed to facilitate the establishment of a farm-tōtara timber supply chain from two Māori-owned properties that, if economically and logistically viable, could continue beyond the project period and be scaled up over time. It also aimed to review and evaluate the relative success of that approach. Ernest Morton, chair of Te Tai Tokerau Māori Forestry Inc., has been kept updated on the objectives and progress of this interim project.

The project plan comprised two parts.

Part A of the project focused on stakeholder engagement and included the following activities:

1. A harvest from an existing SFM permit (on the McGee property)
2. Milling and selling the timber to a timber broker (Timbers of NZ) to assess feasibility of dispatching timber "green-off-the-saw", and market interest.

[1] E.g. The Northland Tōtara Working Group's Tōtara and Riparian Management Project: https://www.tanestrees.org.nz/projects/northland-totara-riparian-project/

[2] E.g. The Tōtara Industry Pilot (TIP) project: https://www.totaraindustry.co.nz/

3. Connected a direct "Buyer" (NZ-based, NZ-made Furniture Manufacturer (Innate Furniture Ltd.) with potential "suppliers" – two Māori landowners in Northland (Tapuaetahi Incorporated and Oromahoe Trust), and with a local portable sawmiller (Horowai Trust), to try and establish a relationship on which an ongoing supply and purchase agreement could be based.

Part B included a second harvest to test the newly established supply chain, along with skills transfer, training to build local capacity, and review of the results. More specifically, it included:

1. Coordinating and managing a harvest (Te Whangae Farm) and the dispatch of timber "green-off-the-saw".
2. Involving two trainees in forest harvest, forest inventory fieldwork (as part of an SFM Plan and establishment of Permanent Sample Plots for the Oromahoe Trust property), and in the milling of timber.
3. Recording costs, quantities and processing experiences in order to assess and refine the supply chain function (e.g., grade specifications etc.).

The project funding covered time and expenses for Tāne's Tree Trust to coordinate willing partners to meet and form supply-chain agreements, manage the harvests, include training opportunities (with trainee time and expenses also covered by the funding), and record, collate, analyse and report on the project results. The funds did not buy timber, or pay for harvest, milling, drying, or freight; those costs were met by the buyers or sellers.

1.4 – Key distinguishing features – a direct, values-based relationship approach

Creating a small-scale supply chain from scratch enables fresh and sometimes unorthodox approaches. Several aspects of this project distinguish it from typical timber supply chains. These include:

- The buyer is the timber user (a manufacturer) who has a direct and ongoing, long-term relationships with the landowners (seller), miller and processor (drying) thereby cutting out a timber merchant. An advantage for the buyer is that the timber is secured at a lower cost, but the buyer also takes on more of the risks associated with drying and processing the timber to usable condition.
- None of the partners is reliant on selling, processing, or buying tōtara for income. So, their motivation for participating is linked to realising the perceived associated benefits of the sustainable native forest management *kaupapa*[3], such as long-term forest management benefits, local employment and supporting cultural values. In other words, the motivation to participate is heavily based on values rather than maximising profit. This corresponds to a commitment to create and maintain a relationship chain that works for all partners.
- The focus is on utilising merchantable logs/timber from forest management practice that does not target the best quality trees in the forest.
- Sustainable yields from the forests should provide confidence in long-term supply, with scope to add additional properties as demand increases.

[3] As set out in the Tōtara Industry Pilot project vision statement and as promoted by the Northland Tōtara Working Group.

Overall, this approach reflects Māori values and influence insofar as it is relationship and values-based rather than transactional.

1.5 Report structure

Milestone reports 1–8 set out the work undertaken in detail.
This final report collates and summarises that work under the following sections:

1. The McGee harvest, milling and dispatch (March 2026).
2. The supply chain partnership meeting - *kanohi ki te kanohi* (March 2026).
3. Te Whangae Farm harvest, milling, and dispatch – supply chain test (May 2026).
4. Training and knowledge transfer opportunities (May-June 2026).
5. Analysis of supply chain function and recommendations.

2.0 - The McGee harvest, milling and dispatch

2.1 - Overview

This first harvest involved planning and managing the harvest of a small selection of tōtara trees from an already approved Annual Logging Plan (ALP3) associated with SFM Permit 5-00-01251A, and the milling, grading and dispatch of the sawn timber. The property, located near Kaeo, is owned by John McGee, a long-time supporter of the Northland Tōtara Working Group.

Several harvests have been carried out on this property in the past, including as part of the Tōtara Industry Pilot project.

The purpose of this harvest was to test the feasibility of supplying 'cut-of-log' grade timber, milled to order and dispatched 'green-off-the-saw' to a timber broker, Angus McKenzie (Timbers of NZ). Only a small volume was involved, which was appropriate for an initial trial. This provided a provisional 'stop-go' review point for the project and demonstrated market interest beyond Innate Furniture Ltd.

The landowner paid for the harvest and milling and received the full payment for the timber directly from the buyer at the pre-agreed price of $2,200/m^3 + GST. Freight was paid by the buyer.

No health and safety issues, incidents, near-misses, or reportable events occurred.

2.2 - Harvest tree selection

Only seven trees from the approved felling list were selected for harvest during this operation. These trees were conveniently clustered, concentrating operations in a limited part of the farm. The estimated recoverable sawn timber volume (estimated at 4.5–5.0 m^3) was expected to closely match the buyer's demand for a minimum of 5 m^3. In addition, the landowner's intention to transition the current SFM Permit into an SFM Plan and amend the Forest Area at the same time limited the potential harvest area to avoid complicating that process.

The selection criteria for the approved trees on the felling list were set out in the ALP as follows:

Harvest tree selection considerations

Harvest tree selection will result from an in-the-field process of considering complex interrelationships of many diverse issues. In no prioritised order these may include:

1. *Retaining and improving sustainable tōtara timber production potential from the residual forest.*
2. *Reducing the poor-quality or non-merchantable component of the forest and promoting new opportunities for regeneration that can be better managed for quality timber production.*
3. *Avoiding damage to non-target native tree/shrub species (with priority given to less common species over the more common – for example, rather risk damage to a towai or taraire than a black maire).*
4. *Minimising potential damage to residual tōtara trees from falling, access and extraction.*
5. *Inclusion of merchantable tōtara trees accidentally damaged in operations in the harvest volume.*
6. *Maintenance of edge of stands in respect to adverse effects of wind and light and weed ingress.*
7. *Controlling the natural encroachment of the forest area and consequently loss and reduction of adjacent pasture area.*
8. *Minimising risk of damage (breakage) of target tree.*
9. *Avoiding/minimising risks to personnel health safety, and physical and environmental property damage.*
10. *Thorough checking of vicinity for kiwi burrows, bat roosts, and/or other wildlife values and ensuring their protection.*
11. *Efficiency and economy of operations.*

Conflicts exist between some of the above considerations. Value judgements and relative weighting of the competing considerations were undertaken by Paul Quinlan during the tree selection process.

This was applied in practice, and a mix of trees was taken: some with high-quality merchantable volume and others with poor-quality, knotty, bent, or small-diameter logs.

2.3 - Felling and extraction

Felling and extraction occurred on 7, 8 and 9 March 2026 and was arranged and paid for by the landowner. A bulldozer with winch and snatch-blocks with tree-protector straps were used to directionally fell the tōtara trees and minimise damage to the residual native bush. Extraction involved winching the logs through a thin strip of pine forest (see Figure 1), and snatch-blocks were also deployed there to avoid damaging the pine trees while winching the logs between them. This added considerable time and cost to the harvest operation.

The owner did the extraction with his own forestry-equipped bulldozer. For the purposes of economic analysis, his machine time has been accounted for at a contractor's rate.
As expected, skidding logs long distances with a bulldozer damaged tracks and was very slow. This reconfirms previous experience that efficient forwarding of logs to a mill site is one of the key logistical issues associated with farm-tōtara harvesting.

The following tables set out the respective estimated standing tree volumes and actual harvested log volumes. Note that tree 26 had a top log and tree 25 was later cut into two log lengths, making a total of nine logs from seven harvested trees.

Table A – Estimated merchantable volume of standing trees (as in Potential Felling List of ALP 3)

Tree #	DBH cm	Merch log length m.	Estimated merch vol. m^3*	Comments
24	64.8	5.4	1.70	Maire sapling at base to preserve
25	59	10.8	2.20	Premium tree
26	72.1	8.55	2.82	
27	51.3	4.8	0.99	Rough & knotty
28	32	6	0.45	Bent. Thin barked. Unhealthy crown.
29	23.8	2.7	0.15	Bent. Rubbing on a residual tree. Cull.
30	42.1	6.5	0.81	Rough & knotty, but potentially some heart?
			9.137m^3	

* Using volume formula: =0.147*(DBH^1.985)*(Log length^0.639)/1000 -originally provided by Greg Steward of Scion

Table B – Record of extracted log volumes

Tree #	L.E.D. cm	S.E.D cm	Mid-point Dia cm	Length m.	Log vol. m^3** (under bark)
24	66	41	53.5	6.11	1.397
25*	62	58	60	9.67	2.745
26	76	61	68	5.43	1.961
26a	57	46	51	3.33	0.701
27	51	44	47.5	5.32	0.959
28	36	28	32	6.00	0.483
29	24	22	23	2.70	0.110
30	46	33.5	40	6.92	0.867
					9.223 m^3

* N.B. – Tree/log # 25 was later cut into two log lengths (approx. 4.85 & 4.82 m)

** Log volumes derived using Indigenous Timber Table of Metric Cylinder Volumes, Ministry of Forestry 1993 (reprinted from N.Z.F.S. Information Series No. 70 Second Edition, 1976)

Figure 1 – Care was required when winching through a strip of existing pine trees to avoid damaging the pines.

Figure 2 – Tree No. 27 was a poor log taken for production thinning purposes, as were the two small-diameter trees to the left of it (trees 28 and 29 in Table A above).

Figure 3 – Careful felling avoided damage to a black maire sapling growing against a harvested tree (left side of stump – tree no. 24).

2.4 - Milling and grading

Li Legler, of Horowai Trust, milled the logs into timber on 12 and 13 March. On 14 March, Paul Quinlan helped grade and record the packets ready for dispatch.

The buyer had nominally agreed to a 'cut-of-log' grade, but then supplied minimum specifications that meant all 'Box' grade and some 'Merch' grade boards with excessive knots were still graded out.

From the total extracted log volume of 9.22 m^3, 4 m^3 of sawn timber was produced (43% recovery of log volume). Of that, a total of 3.75 m^3 was graded and dispatched in 4 packets (volumes of; 0.855 + 1.10 + 0.7965 + 1.00 m^3). One very small diameter log was not milled (tree # 29) – which reduces the milled log volume by 0.11 m^3 (making a total of 9.11 m^3). This makes the final sawn and graded recovery 41% of total log volume. This was lower than expected. The reasons for this include wastage due to the taper of long logs (e.g., 5.3 - 6.1m lengths), inconveniently placed knots (precluding useful clearwood lengths either side – resulting in docking to make packets), and defects such as bark inclusion, the pith, and wane.

2.5 - Loading out

A HIAB-equipped flat-deck truck had no trouble self-loading the packets of timber. However, if a curtain-sided truck had been sent, loading by the sawmiller would have been necessary. It is also uncertain whether a curtain-sided truck would have been willing to use the farm access track due to overhanging branches.

It was important to be there during loading to ensure that the dunnage was well-placed and positioned to avoid bending the timber. The driver was asked to re-position packets to avoid damage.

2.6 - Feedback from the buyer

The buyer reported no issues in receiving the fresh ('green'), block-stacked timber (e.g., no mould or degrade was apparent) despite the timber not being filleted immediately upon arrival. We understand the timber is air-drying and no feedback on performance of the timber has yet been obtained. However, it appears the grade met initial satisfaction, and the buyer is interested in purchasing more at larger volumes.

2.7 - Financial breakdown

The landowner invoiced Timbers of NZ for $8,250 + GST (i.e., 3.75 m^3 @ $2,200/$m^3$). The incurred costs are set out below as GST-exclusive figures.

Costs:
$1,426 Harvesting and extraction 9.22 m^3 logs (Faller @ $80/hr x 17 + $66 travel)
$1,980 Harvesting and extraction by owner with machinery @$90/hr (x 22)
$1,500 Milling and packeting ($400/$m^3$ x 3.75 m^3 of sawn timber)

$4,906 costs to landowner excluding forest management fees

This left a profit of $3,344 (i.e., $363/ log m^3, or $892/m3 of dispatched graded timber). Some costs associated with the SFM permitting process, title registration, ALP 3, harvest planning and record keeping (including forest and health and safety management) should also be spread across the harvested volumes involved with this harvest. Unfortunately, because some of this work occurred before this project started, no precise estimate of these associated costs can be made.

However, using estimated figures for costs of forest management from a 2024 tōtara harvest on another property, Kapiro Station (i.e., $160/ log m^3 to the milling site), would suggest around $1,475 of cost spread over the 9.22 m^3 of extracted log volume. This seems to be a reasonable figure to use in this case too. Applying that assumption would reduce the landowner's real surplus to only around $205 per log m^3 (i.e., stumpage value), or $498 per sawn m^3. However, there would be economies of scale in spreading such management costs over larger volume harvest operations.

2.8 - Discussion and review of the McGee harvest trial

Although the whole operation went smoothly and according to plan, several questions arise. The first is whether the final real return to the landowner is considered sufficient? Will landowners be willing to allow harvests from within their native forests and damage to tracks and fences, for stumpage returns as low as $205/log m^3, or $500/sawn m^3?

The second question is whether the harvest could have been done more efficiently. Considerable time was spent deploying snatch-blocks and redirecting logs during extraction to avoid or minimise damage to the residual forest. Although the machinery used was conveniently already located on the farm (saving relocation and transportation costs), it was arguably not the ideal machinery for the task. It was slow to get in position, required slewing the tracks while winching to keep the wire rope spooling correctly, and skidding was slow and

damaged the farm tracks more than a rubber-tyred machine would have (e.g., a 4WD tractor, wheeled skidder, or trailer forwarder). The second harvest of the project (at Te Whangae Farm) later showed that harvesting can be done more cheaply. However, the McGee harvest costs are valuable because they indicate the possible upper end of the cost range, due to small volumes, fiddly harvesting, and long skidding distances.

The slightly poorer than expected recovery of dispatched timber volume from the log volume (i.e., only 41%) was also a surprise. After discussion with the sawmiller, this appears to be related to the tree selection criteria (i.e., including a higher proportion of non-premium harvest trees for long-term forest management benefits), long log lengths (which exacerbated loss due to log taper), and possibly our assumptions about the lower limits of market acceptance for knotty-grade timber (i.e., grading out and rejecting boards that still had short sections of usable timber between large knots).

Yet part of the purpose of this project is to determine what the market tolerance and price point is for non-premium timber grades, and whether those grades can be the basis of a viable supply chain agreement. Therefore, although targeting trees for a better recovery percentage would improve those figures, it would likely be in conflict with wise tree selection for long-term sustainability.

Therefore, overall, the McGee harvest results probably usefully indicate the upper range of production costs, and realistic figures concerning recovery expectations. Nevertheless, it was still a viable operation.

3.0 – Supply chain partnership meeting – *kanohi ki te kanohi*

This was an essential part of the project - bringing the potential partners together to start a relationship and create a workable supply-chain agreement. The partners met 'kanohi ki te kanohi' – face to face, in Northland and in the forest. The purpose was to establish an ongoing, long-term relationship and for all parties to understand the forest resource, the opportunities, and each other's requirements. It is vital that the relationships are based on shared values, aligned wairua, and willingness to work together to create a functional supply chain that works for all parties and for the ngāhere. Starting from this values-based footing was a strong feature of the meeting.

3.1 - Participating attendees

Attendees were Mariao Hohaia (representing Tapuaetahi Incorporated), Bill Tane (representing Oromahoe Trust) along with the Oromahoe farm manager, Dean Candy, Guido Loeffler from Innate Furniture Ltd, Mark Hollis (representing Te Uru Rākau/MPI), sawmiller Li Legler (Horowai Trust), and Paul Quinlan coordinating the supply-chain project for Tāne's Tree Trust and the Northland Tōtara Working Group. Due to circumstances beyond his control, Bill Tane could only join the meeting from lunchtime, but he was briefed on the morning's excursions. Nick Lee, Guido's business partner in Innate Furniture, was also unable to attend, but was kept involved in the process and provided input via Guido.

Figure 4 – Field tour of proposed harvest trees/areas on Te Whangae Farm. Photo credit: Mariao Hohaia.

3.2 - Field tour

The field visit on 30 March started with a karakia, mihi, and whakawhanaungatanga. It then included viewing the marked-up potential harvest trees at Te Whangae Farm (in the approved Annual Logging Plan (ALP)), explanations of best-practice forest management (i.e., sustainable harvest-tree selection for production thinning), and discussions on implications for timber/log grades and quality in relation to the buyer's needs. A field visit to the Oromahoe Trust property followed. These field tours were extremely important for all partners to understand the nature and character of the resource - an untended natural forest. On 31 March, Guido Loeffler was shown samples of knotty-grade farm-tōtara timber in service applications.

3.3 - A supply and purchase agreement

The draft supply and purchase agreement for the planned Te Whangae Farm harvest was discussed at the Ngāti Rēhia premises and agreement in principle was established. The final details were refined in the following days and a contract was signed. This gave confidence for the planned harvest to proceed. A similar agreement will be needed with Oromahoe Trust.

3.4 - Outcomes

Key outcomes included:

- Guido outlined the ethical and business values of Innate Furniture Ltd.
- Mariao confirmed the support from the Tapuaetahi Inc. board because they support the long-term vision due to its principles rather than the just for the revenue. (Although the need for economic viability is still a critical reality for this to be a sustainable relationship and activity).
- Li Legler, the sawmiller, also confirmed his commitment to the vision and to the group of immediate supply-chain stakeholders. He will fulfill essential roles in the milling, grading, storage and dispatching of the timber, and hopefully also training and skills/knowledge transfer.
- Dean Candy, the Oromahoe farm manager, also confirmed support for the vision and potential interest in operational involvement, training opportunities for some of his staff. This support is extremely valuable for the project and operational function to integrate and accommodate this forestry activity with the farming operation.
- Innate furniture gained a better understanding of the resource and the need to focus on market development and utility of the poorer log grades for sustainable forest management reasons.
- Innate furniture also gained a better understanding of the social and cultural aspects – in addition to the environmental aspects associated with this timber and which can be part of developing the brand. Genuine relationships with the landowners are essential for this.
- Draft purchase and supply contract agreement details were discussed openly by all parties. This was for an initial trial of 10m^3 of sawn timber 'green off the saw', with repeat/ongoing orders expected.
- Tapuaetahi Inc. confirmed willingness to proceed with the proposed harvest on the Te Whangae Farm block after Easter – based on confidence that the contract agreement will be reached.
- Bill Tane indicated Oromahoe Trust support for the project, including development of a demonstration site on the farm.
- Discussion of how training and skills transfer could be integrated into the project's activities (e.g., a pānui circulated on the partner's social media).

This meeting was a step towards achieving the vision and opportunities that Northland Tōtara Working Group, Tōtara Industry Pilot projects and Te Tai Tokerau Māori Forestry Incorporated have been promoting over the decades.

Figure 5 – Discussing tree selection, log quality and implications for timber grades at the Oromahoe Trust property. (Photo by Mariao Hohaia).

4.0 – Te Whangae Farm harvest, milling and dispatch

This was the main harvest event of the project and the first under the supply and purchase agreement. It was a test run of the supply-chain partnership. Unfortunately, due to a series of three significant weather events, the operation planned for 8–9 April had to be postponed. A small window of sufficiently good weather enabled it to be undertaken on 4 May 2026. This experience confirmed that hill-country harvesting needs to be planned for the summer season where possible. Nevertheless, following a rousing karakia from Ngāti Rēhia kaumātua Kipa Munro, the harvest was safely and successfully executed.

4.1 - Stakeholder participation

The harvest operation involved: Kipa Munro – kaumātua Ngāti Rēhia (karakia); Mariao Hohaia (Executive Manager, Tapuaetahi Incorporation); Michael Harrison and crew (Isaac and Isabelle) from Tom Harrison's Future Ltd; Shane Maxwell, NorthTec Forestry Tutor/Assessor (engaged by Ngāti Hine Forestry Trust (NHFT)); Josh and Te Ariki Witehira (NHFT); and Paul Quinlan, coordinating the supply-chain project for Tāne's Tree Trust (and Northland Tōtara Working Group). Reuben Corbett, Farm Manager, was also involved and present at the karakia.

4.2 - Outcomes

Key outcomes include:

- Safe and successful operational harvest achieving the targeted 25-30 m^3 log volume (28 m^3 recorded), in order to meet the supply contract requirements (directly between Tapuaetahi Inc. and Innate Furniture Ltd.).
- Involvement of two trainees – Josh and Te Ariki Witehira, under tuition and for partial assessment of felling certificates by NorthTec assessor Shane Maxwell. Exposure of all three to a sustainable selective harvesting and extraction operation.
- Consolidated relationship with contractor Michael Harrison, who is now accruing considerable experience of tōtara harvests under SFM Plans (e.g., TIP, McGee's and now Te Whangae) for tōtara projects.
- Exposure and training for Isaac Varney in SFM harvesting – as part of Michael Harrison's crew
- Confirmed interest from Josh and Te Ariki in participating in further activities associated with this tōtara project (milling and inventory, etc.) and the tōtara industry kaupapa more generally. Arrangements were made with Ngāti Hine Forestry Trust (NHFT) to enable this.
- Milling and dispatch of the first tranche of timber (4.58 m^3) to Innate Furniture.
- Transport and storage of the remainder of timber at Horowai Trust's yard.
- Refinement of timber grading specifications (see separate grading spec doc.).
- Metrics captured to enable viability analysis and review of supply chain function.

4.3 - Health and Safety

A professional contractor with health and safety policies, plans, documentation and insurance cover was engaged by the landowners. Trainees worked under supervision of a NorthTec Forestry trainer and under NHFT health and safety policies, plans, protocols and insurance cover.

No health and safety issues, incidents, near-misses, or reportable events occurred.

Figure 6 - Isaac Varney got to experience sustainable selective harvesting as part of the contractor's crew. Opportunities were taken to explain about sustainable forest management principles and practice.

Figure 7 - Michael Harrison expertly winched logs with a TSK D4H Cat without the machine ever entering the forest area.

Figure 8 - In this case, only short skidding distances were involved with only a few logs being skidded more than 200 metres.

Figure 9 – Where possible, harvest tree selection attempted to effect a 'production thin' to benefit the residual trees left behind. In this case, Isaac Varney felled a tōtara uphill to the benefit of an adjacent rimu tree. Although rimu are not a species targeted for harvest, improving the biodiversity values of the forest is a worthy objective and one that can be supported by harvest tree selection.

4.4 - Harvested volume

Twenty-three trees had been marked up on the potential felling list in the MPI approved Annual Logging Plan (ALP). These had an estimated total merchantable volume of 35.5 m^3. Two extra trees (24 & 25) were added for flexibility and practical extraction options – however, the total volume of 36 m^3 remained as the maximum allowable on the ALP. More trees were marked up and included on the ALP than were needed to supply the contract volume. This was deliberate. It provided options for the contractor to make decisions in the field as to what is practical and safe to fell and extract.

The plan was to harvest a minimum of 25 m^3 and up to 30 m^3 if possible. (N.B., this was based on the assumption that a 40% merchantable grade recovery from 25 m^3 log, should equate to the targeted 10 m^3 of graded sawn timber to fill the supply contract).

On the day, a total of 18 trees were harvested. These were all the trees that were considered safely accessible. The other trees (not harvested) would have required the machine to go down a steep gully-head and the soil conditions were considered too marginal for that to safely occur.

The total estimated merchantable volume of the 18 trees while standing (i.e. – volumes estimated in the potential harvest tree register of ALP1) was 28.09 m^3. A running field tally/balance of harvested log volumes came to 26.68 m^3 at the end of the day. That volume indicated the minimum target volume of 25m^3 had been achieved. It was decided to call the felling and extraction operation complete.

Subsequently, after, using a spreadsheet (rather than the log volume tables used in the field), the total actual log volume of measured logs on the ground was calculated to be 27.15 m^3 from the 18 harvested trees.

A conservative expectation for merchantable sawn-timber volume recovery (e.g., 40% from total log volume) suggested that milling might yield around 10.86 m3 of merchantable sawn timber. However, the final total sawn volume was 12.48 m^3 (i.e., 46%), while only 9.63 m^3 met the grade suitable for dispatch to Innate Furniture Ltd (i.e., a 35% merchantable recovery from total log volume). This was less than the 40% merchantable recovery expected.

4.5 - Sizes of harvested trees

The DBH of the harvested trees ranged from 28.8 – 67.5 cm and the mean was 51.5 cm, with a mean merchantable height of 7.86 m and a mean estimated volume of 1.56 m^3. This mean DBH was similar to the McGee harvest (49.3 cm) and some harvest data from the Tōtara Industry Pilot project (e.g. the Cookson discs with a mean of 49.8 cm).
The logs had a mean mid-point diameter of 48 cm and 7.3 m of merchantable length. Some of the extracted log volume (especially the top logs) was not of merchantable grade or was of marginal merchantable grade. Some of the butt log sections were very good quality.

4.6 - Costs of felling and extraction

The contractor's invoice for the extraction costs was as per quoted ($ 2,500 day rate + $700 for machine transport, + GST). These totalled $3,200 +GST. This equates to a rate of $118/$m^3$ to fell and get the logs to the on-farm mill site. However, this figure doesn't include the cost of

felling and limbing up of approximately six of the trees done by the Shane Maxwell, Josh and Te Ariki Witehira. Furthermore, due to the short skidding distances involved with this operation, this efficiency will probably be difficult to replicate in future harvests. Nevertheless, felling and extraction costs of less than $200/m^3 certainly seem possible for this style of harvesting.

Figure 10 - Li Legler explains principles of milling to Josh and Te Ariki Witehira

4.7 - Milling

Li Legler commenced milling on 11 May. The first tranche of timber to Innate Furniture Ltd (4.58 m^3) was dispatched on Friday 15 May. Milling was finished on 15 June 2026, and some timber was dispatched that day. The rest of the timber is to be stored 'in fillet' at Horowai Trust's yard, as per the Supply and Purchase Agreement. Storage and handling costs are at the expense of the buyer, and this relationship is directly between Horowai Trust and the buyer.

The final sawn timber and graded recovery figures are:

- 12.48 m^3 total sawn volume from 27.15 m^3 of total log volume at the mill site (46% of log volume).
- 9.63 m^3 of sawn volume was graded suitable for the buyer (35% of log volume but 77% of total sawn volume).
- 2.85 m^3 of sawn timber was below merchantable grade (i.e., (23% of total sawn volume).

The 9.63 m^3 of recovered merchantable sawn timber was close to the targeted 10 m^3 under the Supply and Purchase Agreement and achieved the project deliverables. The merchantable (immediately saleable grade) recovery rate of 35% was lower than expected and raises questions that are discussed in Section 6. It appears mostly to reflect log quality and the application of grading specifications refined during this project.

4.8 - Financial breakdown of Te Whangae harvest

Under the Supply and Purchase Agreement the Buyer agreed to purchase 10 m^3 of the graded sawn timber for \$2,000/m^3 + GST. The landowner's incurred costs are set out below as GST exclusive figures (or see Tables E and F further on).

Costs:

\$3,200 Harvesting and extraction 27.15 m^3 logs to on-farm mill site
\$4,368 Milling and packeting (\$350/m^3 x 12.48 m^3 of sawn timber)

\$7,568 costs to landowner excluding forest management fees

Sales:

\$19,260 (9.63 m^3 of graded timber under the Supply and Purchase Agreement).

This leaves a profit of \$11,692 (i.e., \$431/ log m^3, or \$1,214/ graded sawn m^3).

The cost of producing the 2.85 m^3 of reject grade sawn timber has been included in the total production costs but has not been attributed any saleable value in the above breakdown.

However, no professional forest and harvest management costs were included in the production costs above. A cost estimate for such services is discussed in section 6.3 and is used in Tables H and I (see sections 6.9 and 6.10) for estimating viability and future returns to the landowner. Estimates for future stumpage values are made in section 6.11.

4.9 - Timber received in Christchurch

The first tranche of timber was transported by Mainfreight and arrived on 21 May (i.e., six days in transit). It was delivered to Specialty Timber Solutions (John Fairweather's yard) in Sefton, Canterbury, for kiln drying. Unfortunately, the kilns were not immediately operational while awaiting a replacement component. Therefore, the packets were filleted in stacks to enable some air-drying while waiting.

This enabled a thorough examination of each board. Guido Loeffler reported that there was no apparent mould, damage, or other concern. He was happy with the grade and quality.

John Fairweather has been experimenting with drying schedules – drying timber from green. He also has thermal modification technology and solar kilns at his facility. Refining the drying schedules for tōtara will be part of refining this supply chain function. Some degrade during drying is expected. Crook can be a particular issue. John's strategy is adjusting one variable at a time to systematically isolate and understand the critical factors involved and improve results.

Figure 11 – Some tōtara boards stacked in fillet to air-dry while awaiting repair of the drying kiln at John Fairweather's yard, Specialty Timber Solutions. Photo supplied by Guido Loeffler.

4.10 - Supply gives confidence to market Northland tōtara product lines

Innate Furniture Ltd. has trialed manufacturing products from tōtara in the past, particularly with timber supplied via the Tōtara Industry Pilot project. Those trials encouragingly indicated both market interest and that the timber was satisfactory for their applications. However, since then, confidence in supply, grades, and price has been lacking. Small volumes were supplied to keep the option of a tōtara product line alive, such as volumes supplied by Tapuaetahi Inc. from trees cut down under powerlines.

As a direct result of this project and the supply and purchase relationship agreement, Innate Furniture Ltd. has been prepared to promote Northland tōtara as a timber option to customers (See: https://innatefurniture.co.nz/pages/northland-totara). They expect to use approximately 10 m^3 of sawn timber by the end of 2026 and be able to purchase more in summer, potentially from a harvest on the Oromahoe property.

5.0 – Training and knowledge transfer opportunities

Another aspect of the project was to create opportunities to start transferring the skills and knowledge needed to conduct the diverse and highly specialised tasks associated with sustainable management of tōtara forests under Part 3A of the Forests Act. This recognises the need to build a wider base of competent local operators. To support this objective, younger trainees were engaged in harvest operations (felling and extraction), milling and

grading, and forest inventory (plot-based forest survey and mensuration, including the establishment of Permanent Sample Plots (PSPs)).

Primarily these learning/exposure opportunities were taken up by Josh Witehira and his son Te Ariki, with Josh Haenga joining for the PSPs. The project covered their time and travel expenses so they would not be out of pocket by foregoing otherwise paid employment with Ngāti Hine Forestry Trust. The three of them were engaged through Ngāti Hine Forestry Trust, who invoiced Tāne's Tree Trust for their services.

5.1 - Health and Safety

Trainees worked under Ngāti Hine Forestry Trust health and safety policies, plans and protocols, and insurance cover. During felling and extraction, the trainees worked under the supervision of NorthTec Forestry Trainer Shane Maxwell, engaged by Ngāti Hine Forestry Trust for staff training. This also enabled them to be practically assessed as part of their forestry certificates/qualifications. The work involved safely assessing, felling and delimbing harvest trees, and log-making for extraction. At all times they worked in agreed areas greater than two tree lengths from all other operational forest activities. Shane Maxwell was also present for half a day of PSP establishment.

No health and safety issues, incidents, near-misses, or reportable events occurred.

Figure 12 - Forestry trainer Shane Maxwell discussing a felling plan with Josh and Te Ariki Witehira during the Te Whangae Farm harvest operation.

5.2 - Experience and knowledge-transfer outcomes
The project provided the following opportunities and experiences:

- Exposure to small-scale selective harvesting and extraction of tōtara under an MPI approved Sustainable Forest Management Plan.
- Discussion on harvest tree selections and decisions (criteria and forest management principles – e.g., production thinning, thinning approaches from below/above).
- Practice directional tree felling (with a machine available on-site to assist if required).
- Partial assessment as part of gaining forestry qualifications (safely using a chainsaw and tree felling certificates).
- Exposure to portable sawmilling principles, techniques, and timber grading and handling.
- Fieldwork conducting plot-based forest inventory and training of participants (16 plots). Participants learned and practiced TUR standard SFM forest inventory protocol (i.e., using a nested plot arrangement for all native canopy tree species within a slope adjusted radius of 17.84m (i.e., 0.1ha area) to estimate standing merchantable volume.
- Participants gained exposure to the principles of randomised plot locations and statistically sampling, and tree measurement protocols and an outline of the Draft SFM Plan process (with the lodging of the Draft SFM Plan for Oromahoe Trust 20th May).
  N.B. – The trainees' time and travel costs were covered by this project; all other costs associated with the preparation of the Oromahoe Trust Draft SFM Plan were separately funded.
- Trainees learned to identify common native tree species. Also to consider forest successional processes deduced from observing the present species composition, structure and character of the forest stands.
- Establishment of four Permanent Sample Plots (PSPs) for ongoing forest measurement and monitoring. Plots were each 0.04ha and intended to be paired as silviculture trials (i.e., two for harvest/thinning demonstrations and two as control plots).
- In-forest discussions on harvest tree selection and low-impact extraction and techniques and approaches to thinning interventions (preparation for a potential demonstration harvest area on the Oromahoe Trust property).

Knowledge transfer and experience was not limited to Josh and Te Ariki. Isaac Varney, one of the contractor's young staff members also gained experience in sustainable selective harvesting. It was probably also a novel exposure to this form of forestry for NorthTec trainer Shane Maxwell. Similarly, although not directly involved with the operational activities, the farm managers of both properties have also now been exposed to concepts, processes, and possibilities of such sustainable indigenous forest management. It is important to have their support and cooperation for further activities on the properties.

Figure 13 - Trainer Shane Maxwell observes and assesses Josh's felling technique.

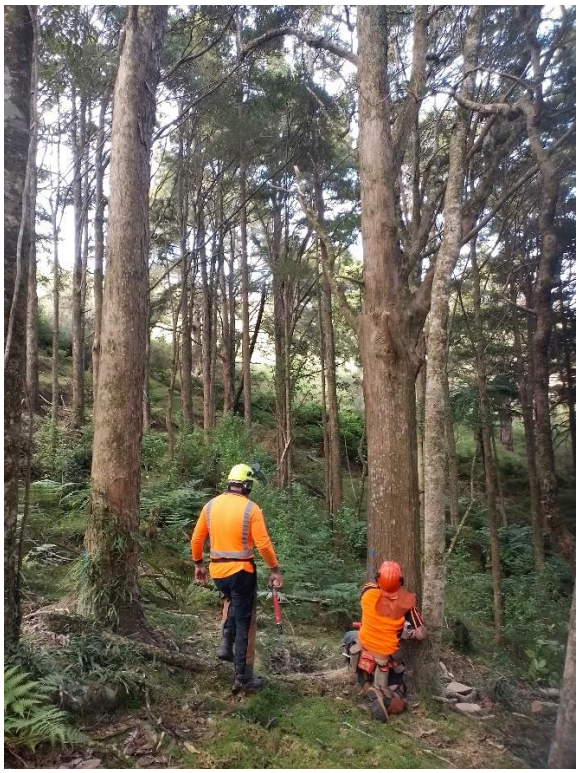

Figure 14 -Josh felling under supervision.

15 -Josh and Te Ariki delimbing and log-making.

5.3 - PSP establishment for Oromahoe SFM Plan & demonstration site

Four Permanent Sample Plots (PSPs) were established on the Oromahoe Trust property. These are located in a tōtara stand that is easily accessible in all weather conditions and seasons. The purpose of these PSPs includes:

- Establishing plots to enable the monitoring of growth and performance of tōtara on the property for future reviews of the Draft SFM Plan prepared for that property.
- Creating an accessible site for field days and field visits to discuss and demonstrate sustainable indigenous forest management practice and/or Continuous Cover Forestry practice.
- Knowledge transfer of forest monitoring, silviculture and potential harvest tree selection.
- Adding to the existing network of NTWG PSPs in the region (and the Tāne's Tree Trust database).

Details of methodology and results are set out in the Milestone 8 report and are not replicated in full here. However, the table below sets out some basic metrics for the four PSPs. The intention is that PSPs 1 and 2 could form one comparative treatment/control pair, and PSPs 3 and 4 another.

Table C - PSPs 1-4 established at Oromahoe

PSP No.	Stocking (stems/ha)	Mean* DBH (cm)	Mean Height (m)	Merch Vol (m^3/ha)	Total Vol** (m^3/ha)
1	650	40.0	27.60	571.75	1,226.5
2	775	41.8	29.28	723.25	1,603.1
3	500	49.6	27.10	674.75	1,338.3
4	525	43.7	26.56	478.25	1,098.3

*NB -Arithmetic mean

** Total Tree Volume based on Beets *et al.* (2012)

5.4 - Knowledge building and demonstration site potential

During establishment of the PSPs, frequent discussions were held regarding possible management options and approaches. These ranged from production thinning (e.g., applying the thinning schedule developed by the NTWG based on Stand Density Index) [4] to 'Selection Forestry' systems (e.g., the European approach of selecting "Frame/Future Trees" and targeting harvests to remove competing or co-dominant trees, versus 'thinning from below'). Premium trees that might be considered candidates to become "Frame Trees", or potential future crop trees, were identified and noted on the field sheets and in the spreadsheet comments column.

Discussion will be held with the landowners concerning the potential to develop these PSPs as a demonstration site. This could be combined with any future harvest operations on the property. These PSPs prepare this option for maximum advantage.

[4] See pages 7-9 of this report: https://www.tanestrees.org.nz/site/assets/files/1234/results_of_the_2020_remeasurement_of_totara_psps.pdf

Figure 16 - From left to right: Josh Haenga, Te Ariki Witehira and Josh Witehira, setting out PSP 2.

5.5 - Thinning recommendations based on Stand Density Index (SDI)

Overseas experience suggests that for a wide range of species, stands benefit from thinning when the stocking is greater than 55% of the theoretical maximum, and that stands should be thinned down to 25% of the maximum stocking. Based on this rule, a thinning schedule table was developed for tōtara providing the stocking above which a stand should be thinned, and the stocking to which it should be thinned down to (calculated for any given quadratic mean DBH). See:
https://www.tanestrees.org.nz/site/assets/files/1234/results_of_the_2020_remeasurement_of_totara_psps.pdf
This has been applied in Table D below.

Table D – Comparison between present stocking and Stand Density Index (SDI) stocking thresholds.

PSP #	Quadratic Mean DBH (cm)	Current Stocking (stems/ha)	Fully stocked Maximum SDI (stems/ha)	55% of maximum SDI (stems/ha)	25 % of maximum SDI (stems/ha)
1	42	650	774	425	193
2	43	775	745	410	186
3	51	500	567	312	142
4	45	525	693	381	173

5.6 - Recommended silvicultural actions

Table D above shows that the stocking of all PSPs is well above 55% of the theoretical maximum stocking — a threshold where competition is considered to significantly slow

growth and thinning would be beneficial. Thinning down to 25% of maximum stocking is recommended in the schedule for optimal growth. However, this would necessitate thinning 66–74% of the current stems (i.e., retaining only 26–33%). If implemented in a single operation, that would be a severe intervention that could expose the stand to greater risk of wind-throw. Therefore, a staged approach is recommended. Ideally, earlier management interventions would have been executed in stages within this stand over several decades. However, this is a common situation for many untended, naturally regenerated tōtara forests on farms.

Possible approaches to staging a progressive thinning of the stand/PSPs are discussed here. A combination of methods is suggested. The first is to lightly production-thin the PSPs/stand, focusing on a few co-dominant trees that are competing with the identified 'Frame Trees' or potential future crop trees (i.e., trees that could become premium, high-value trees in the long term and should be retained to grow on). The second is to 'thin from below' – but only those trees that have an unhealthy height-to-diameter ratio exceeding 80:1[5] (i.e., trees that are no longer viable as potential future crop trees). This could be done through several operations over 10–20 years. The third is to ring-bark large-diameter, non-merchantable trees. This enables a slower opening of the canopy and a slower increase of light ingress (minimising epicormic shoots on residual trees). It also avoids potentially damaging surrounding trees during felling. An alternative approach could be to trial small (30 m diameter) coupe-harvests of two PSPs to test regeneration of tōtara in larger gaps than selection forestry practice. However, such coupe-felling of podocarps is not presently provided for under Part 3A of the Forests Act, so a special allowance for research trial purposes may be required.

In summary, the recommended silvicultural actions/options are:

- Production thinning of co-dominant trees around the 'Frame Trees', and;
- Thinning from below in staged operations over 10-20 years (i.e., progressively removing suppressed and non-viable stems), and;
- Ring-barking large-diameter, non-merchantable stems; or
- Coupe-felling as an alternative to all of the above – if legally allowed.

5.7 - Valuable demonstration site created

Establishing these PSPs, with their associated metrics, has created an excellent potential venue for field days to discuss silviculture and management interventions within such naturally regenerating stands (and CCF forests generally). Such field day/workshop events would assist tech-transfer and the building of knowledge and skills for forest owners/managers.

Any felling/harvest activities within these PSPs (or stand generally) would need to be with the full consent and approval of the landowner (Oromahoe Trust) and in accordance with an approved Annual Logging Plan, associated with a registered SFM Plan.

The PSPs established by this project will usefully inform such future activities, and future reviews of the property's SFM Plan.

[5] Height to diameter ratio is the tree height (cm) divided by DBH (cm). A greater than 80:1 ratio is considered unhealthy, unstable and unlikely to ever recover sufficient vitality to become a viable a future crop tree.

Figure 17 - Shane Maxwell, Josh Witehira, Josh Haenga, and Te Ariki Witehira (hidden from view) measuring bearings and distances of trees from the centre peg of PSP 2

Figure: 18 – Excellent stocking rates of high-quality merchantable-sized tōtara are present in many stands on the Oromahoe Trust Property.

6.0 – Discussion and analysis of supply chain function and recommendations

This section compares both harvests, discusses the recorded data and makes estimates of likely future returns to the landowners based on the current supply and purchase agreement.

6.1 - Logging and extraction

Table E below compares the costs of logging and extraction between the two harvests. It reveals significantly different costs: the logging and extraction costs of the McGee harvest were more than triple those of the Te Whangae Farm operation. Multiple factors are relevant in explaining this discrepancy. These include:

1. Different harvesters, i.e., the McGee harvest involved the landowner himself with his own machinery, in contrast to the Te Whangae operation with a fully professional crew.
2. Considerable time was spent deploying snatch-blocks and machine-assisted directional felling to minimise damage to the residual forest in the McGee harvest.
3. Winching the logs out of the bush at the McGee site was complicated by having to winch through a thin strip of pine trees, without damaging them.
4. Considerable skidding distances (approx. > 800 m) with small volumes, were involved at the McGee property.
5. Costs associated with the McGee harvest include tidy-up and fence reinstatement etc. These are not included in the figures for the Te Whangae Farm operation.
6. Relatively simple felling and extraction at Te Whangae Farm, with short skidding distances (mostly < 200 m).
7. The cost of felling and limbing up approximately 6 trees by trainees are not included in the recorded costs of the Te Whangae Farm operation.

Consideration of all of the above suggests that the two operations may represent the two extremes of the cost range. This highlights the advantages of engaging an experienced professional crew, matching the right machinery to the task, and minimising skidding distances. It also confirms that forwarding logs from where they are winched from the bush to a mill or loading site remains a critical logistical issue requiring cost-effective machinery.

Nevertheless, despite the high costs associated with the McGee harvest, the operation was still viable. While the low harvesting cost of the Te Whangae harvest may be difficult to replicate, it shows that harvesting costs at or below $\$200/m^3$ should be possible and could be a reasonable target for reasonably accessible sites. It is recommended that future logging and extraction operations at Te Whangae (or Oromahoe Trust) budget for higher costs - a range of $\$150–\$250/m^3$ of log volume is suggested to allow for more difficult and less efficient harvest sites. This would equate to a cost of approximately $\$333–\$555/m^3$ of sawn timber (assuming 45% recovery of sawn timber from log volume). This range has been used in Table H further below.

Table E – Comparison of logging and extraction costs to on-farm mill sites for the McGee and Te Whangae Farm harvest operations

Property	Total cost of logging extraction	Total log volume at mill site (m^3)	Total cost per log m^3
McGee	$3,406	9.22	$370/m³
Te Whangae	$3,200	27.15	$118/m³

6.2 - Portable milling costs

Horowai Trust's base milling rate, based on sawn timber volume, is $350/m^3$, although there can be additional fees for grading, handling, packaging and dispatch. In this case, some of the sawn timber will be transported and stored in fillet at Horowai Trust's yard until dispatched on demand. This extra handling incurs additional costs of $280/m^3$ (as per the signed Supply and Purchase Agreement dated 18 March 2026). This extra cost is paid by the buyer rather than the seller. The minimum total cost to the landowner for portable milling, handling and dispatch was therefore $350/m^3$.

Table F – Comparison of actual returns to the landowners per log and dispatched timber volume

Property	Production costs* ($/graded sawn m³)	Graded sawn recovery (% of log m³)	Revenue received ($/m³)	Return on harvested log volume ($/m³)	Return on timber** dispatched ($/m³)
McGee	1,308	41	2,200	363	892
Te Whangae	786	35	2,000	431	1,214

* N.B. This includes logging and extraction and milling costs, but not professional harvest management costs.

** Graded sawn timber sold.

6.3 - Costs of SFM Plan/Permit, Annual Logging Plans, and forest management

The costs of preparing and registering an MPI-approved SFM Plan/Permit, Annual Logging Plan, and professional harvest management are not included in the production costs in the table above. In this instance, the costs of the SFM Plans or Permits had already been incurred before the project commenced and harvest management was covered by the project. However, going forward, the costs of harvest planning and management will need to be covered by the landowner. This cost will affect the return to the landowner.

Harvest management tasks will include:

- Liaising with the supply chain partners concerning volumes and timing of harvests.
- Scoping the potential forest areas for harvest and preparing an Annual Logging Plan for MPI approval (including accompanying pre-harvest inspection).
- Coordinating a harvest contractor (showing the trees & site), confirming harvest plan, checking insurances, etc.
- Recording log volumes, record keeping, and harvest oversight.
- Coordinate with transport contractors (if used), and sawmiller.
- Reporting to landowner.

This role should be conducted by a registered forestry professional. An estimate of likely costs for such a service for a 15–30 log m^3 harvest is $2,600–$3,000 + GST. Economies of scale would apply to larger harvest volumes. The above estimate equates to $173–$200/m^3$ of log volume for a 15 m^3 harvest, but $86–$100/m^3$ for a harvest involving 30 m^3 of logs. The latter suggests professional harvest management costs of approximately $191–$222 for every cubic metre of sawn timber produced (assuming 45% recovery of sawn timber from log volume).

Ultimately, it is envisaged that this role could be provided by an industry body, such as a tōtara co-op, and there may be scope for efficiencies to lower this cost. However, at this stage, anticipating harvest management costs of around $205/m^3 of sawn timber is a reasonable estimate for small volume harvests in the next few years. This figure is used in Table G below.

6.4 - Milling costs at Twinsaws Ltd, 290 Houto Road, Titoki.

A provisional figure for the cost of milling at a twin-band saw based at Titoki (Twinsaws Ltd.) is $200/sawn m^3 + GST. With the estimated additional minimum transport costs of around $186/sawn m^3 — assuming 45% gross sawn timber recovery from log volume, as per the Te Whangae Farm harvest — this suggests a minimum milling cost of approximately $386/sawn m^3. The Twinsaws Ltd. mill owner expects that higher grade and volume recovery per log should be possible than is obtained with the portable mill; however, for an even comparison, a figure of 45% is used for all mill types. This option is $36/m^3 more expensive than the portable mill option used to date.

If timber is stored at the yard, a similar figure for additional costs — around $250/m^3 — would need to be added, making the likely combined cost of milling and storage/staged dispatch around $636/m^3. This is comparable with the portable sawmilling and additional storage at Horowai Trust's yard option ($630/m^3).

6.5 - Milling at Northpine, Waipu

Northpine has successfully milled tōtara in the past as part of the Tōtara Industry Pilot project. The General Manager, Bruce Larsen, has confirmed that the company would be willing to mill tōtara again. A provisional figure from Northpine, to receive logs, cut to a product list, grade to specification, packet the green-sawn timber, strap and load onto trucks for cartage is $190/m^3 of timber produced. This figure is used in Table G below. They do not have the capacity to kiln dry it but could fillet and air-dry small volumes and then dispatch as block-stacked packets, for approximately $90/m^3 for the extra handling.

However, to mill tōtara, the Northpine mill would need to stop production of radiata timber and set up specially for a run of tōtara (the chip waste cannot go to their normal customer). This means that a minimum log volume of around 100 m^3 (approximately four truck-and-trailer loads) would be needed to make the set-up and clean-up worthwhile. The logs would need to be a minimum of 3.6 m long and have a maximum large-end diameter of 80 cm to fit through the saws.

The Northpine mill has the cheapest rate for milling, grading, packeting and dispatch green-off-the-saw. It also has a significantly cheaper rate for temporary storage/air-drying and dispatch. This is likely due to the excellent plant and high-production systems onsite. However, it is located the furthest from the Te Whangae- Oromahoe properties, therefore involving greater transport costs.

Transport options to the off-farm commercial mills are set out in the paragraphs below.

6.6 - Logging truck and trailer transport to an off-farm mill

The cost of transporting logs to an off-site mill is subject to many variables. Inquiries (to Newey Transport) suggest using a rate of $6.50/ km (+GST) for a dedicated log truck and

trailer unit with a combined total payload capacity of 28 tonnes[6] (mileage charged both ways from the transport yard). This would equate to an estimated cost of $1,326 ($47/tonne) to Northpine at Waipu, or $1,144 ($40/tonne) to Twinsaws, at 290 Houtu Rd, Titoki. However, due to inefficiencies caused by variable log lengths, shapes and unit sizes, it may not be possible to neatly match the actual loaded log volumes exactly to the maximum payload limit. Therefore, allowing for 10% inefficiency (i.e., a pay load of 25.2 tonnes rather than 28 tonnes) suggests likely road transport costs of $52.6/tonne to Northpine, and $45.4/tonne to Twinsaws Ltd. Assuming a 45% gross sawn timber recovery from log volume, requires multiplying those costs by 2.22 to equate them to production costs per gross sawn timber volume unit – used in Table G further below. These would be: $117m^3 for Northpine, and $101m^3 to Twinsaws.

However, this option also requires a forestry grade grapple digger (approx. >24tonne), to be at the farm sites to lift the log trailers off the truck units and then load the logs. Unless the harvest operation has used a grapple digger, it would require bringing one in specially just for the task of loading the trucks. Considerable transport costs are involved with relocating such machinery. A large transporter at a rate of around $325/hr plus a pilot vehicle at around $80/hr are required. Assuming 4 hrs for transportation to and from the site, suggests $ 1,620 for relocation. Then loading at a rate of $325/hr and assuming 1 hour and 20 minutes to load a truck and trailer unit, suggests between $432 and $1,733 depending on the volume (1 – 4 truck and trailer units).

This is where economies of scale become a consideration. Spreading the costs including the relocation over 25.2 tonnes (i.e., one 28 tonne maximum pay load truck and trailer load with a 10% loading inefficiency buffer) might be around $ 81/tonne, but the cost to load 101 tonnes (i.e. four truck and trailer loads) would be around $33/tonne. Assuming a 45% recovery of total sawn timber from log volume suggests these costs would equate to $74 – 180/m^3 for every sawn m^3 depending on whether 1 or 4 units are loaded (N.B. – the Northpine mill will only accept a minimum delivery of 4 units, or 100 tonnes). These figures are used in Table G below.

6.7 - Self-loading truck transport to two mill options

The option of a self-loading HIAB truck with a log trailer has been priced as an alternative transport option to avoid the need for a grapple digger to be on-site to load logs. For this purpose, the basic assumption is that one cubic metre of log volume is roughly equivalent to one tonne of log. Comparative estimates to transport logs to either the Northpine or Twinsaws mill are set out below.

Multilift Ltd. has a HIAB truck that could take 6.1 m long logs (6.45 m deck), with an 8-tonne payload, and an additional log trailer (with bolsters) with a 12.5-tonne payload capacity. Together, these could transport a combined maximum of 20.5 tonnes. The cost is $190/hr + GST (plus an 18% fuel adjustment) for the truck unit, plus $45/hr for the trailer unit, making a total hourly rate of $269.20/hr. Time would be charged from the 220 Lodore Road yard to and from the Te Whangae Farm site and the respective mill. Distances to two mills were priced: Twinsaws, at 290 Houto Road, Titoki, and Northpine, at Waipu. A loading time of 1 hr is

[6] Units with larger payload capacities are available and would be more efficient. However, the larger units may have access difficulties on some farm pick-up/loading sites. Therefore, the smaller units have been used for costing purposes in this analysis.

assumed and included in the total estimated hours for each option: 5.75 hrs for transport to Houto Road, and 6.75 hrs to Waipu.

Total transport costs (excluding GST) are estimated at $1,547.90 and $1,817.10 respectively. Assuming it is not possible to load exactly to the full payload capacity of 20.5 tonnes, an estimated total load volume of 18.5 tonnes is assumed. This equates to transport costs of approximately $84/tonne of logs to Houto Road, and $98/tonne to Waipu. However, assuming a 45% gross recovery of sawn timber volume from log volume [7], those transport costs would equate to $186 and $218/sawn m^3 respectively. Those figures have been used in Table G below.

Table G – Comparison of milling cost options for the Te Whangae Farm landowner with associated log loading and transport costs calculated as production costs per sawn timber volume, assuming 45% sawn timber recovery from log volume

Mill	On farm log loading costs (per sawn m^3 vol)	Log transport to mill (per sawn m^3 volume)	Milling, grading & handling-dispatch green sawn $/$m^3$	Combined total costs $/sawn m^3 (45% of log vol)
Portable bandsaw	Nil	Nil	350-400	350-400
Twinsaws – with 1-4 small log truck and trailers)	74-180	101	200	375- 481
Twinsaws – with self-loading HIAB truck with log trailer	Nil	186	200	386
Northpine* - with 4 small log truck and trailers – 101m^3)	74	117	190	381
Northpine* - with self-loading HIAB truck with log trailer	Nil	218	190	408

* N.B. – Northpine have a minimum volume of 100m^3 of logs (assumed 4 truck & trailer loads)

6.8 - Comparison of milling and transport options

Table G above indicates that portable sawmilling at $350/$m^3$ would be the cheapest practical option for Te Whangae Farm. However, the table also indicates that using a self-loading truck and transporting logs to mills at either Twinsaws (Titoki) or Northpine (Waipu) would still be

[7] i.e.- approx. 10% inefficiency allowance included – as was used for the logging truck transport option.

viable. If logging trucks and trailers were used, around 100 m^3 of log volume (e.g., four truck-and-trailer units) would be advisable to achieve comparable prices.

Table H – Estimated costs of producing sawn tōtara timber from Te Whangae Farm in future small volume harvests and assuming 45% gross recovery

Management costs sawn m^3	Harvest & Extraction sawn m^3	Milling & Dispatch sawn m^3	Total cost of production sawn m^3 (ungraded)
205	333 - 555	350	888 - 1,110

The range of harvest cost figures used in the table above is higher than was recorded in the recent harvest from the property. This reflects the assumption that the efficiency of that harvest may be difficult to replicate. Economies of scale with larger harvest volumes (say 100 m^3 of log volume) might be possible. However, this is untested. Therefore, the estimates above adopt cautious assumptions because of their potentially significant effect on viability.

6.9 - Estimated viability of future harvests

Table I below uses conservative figures from the analysis above to estimate the likely viability of small future harvests (e.g., 10m^3 sawn timber from approximately 22.3m^3 log volume) on Te Whangae Farm. It uses the recovery rates from the recent harvest (i.e., 45% sawn timber volume from log volume, with 77% of the total sawn timber volume graded as suitable for dispatch) and applies those rates to the estimated production costs of 10m^3 of ungraded sawn timber. On these assumptions, the estimated total profit is $4,300–$6,520, which is equivalent to $558-$847 on each saleable m^3 of graded timber produced. See Table I below.

Table I - Estimated viability of small future harvests at Te Whangae Farm

Production costs for 10m^3 ungraded sawn timber	Saleable grade volume at 77% of total sawn volume	Income @ $2000/$m^3$ on saleable grade of sawn volume: 7.7m^3	Return to the landowner per saleable m^3
8880 -11,100	7.7m^3	15,400	$558 - $847

6.10 - Estimated future returns to the landowners

This indicative return to the landowner ($558-$847 per graded and sold sawn m^3 @ $2,000/$m^3$) is possibly conservative — especially for potential harvests on the Oromahoe Trust property, where some tōtara stands are remarkably accessible and harvest costs may be lower than the figures used in the estimate above. Furthermore, the profit margin indicated above is sensitive to many variables, including:

- Recovery percentage of graded (saleable) timber volume.
- Harvest costs.
- Sale price.

Nevertheless, the table above suggests that the supply-chain agreement is likely to be viable, although profit margins for the landowner may be modest unless efficiencies, higher-value grades, or improved recoveries are achieved.

6.11 – Estimated equivalent stumpage values

A range of estimated equivalent stumpages value (for standing merchantable volume) can be calculated using the residual value method and the figures of Table I above (i.e., $15,400 estimated value of 7.7m^3 of graded sawn timber dispatched at farm gate at $2,000/m^3, less production costs including harvest management, felling, extraction, milling, and packeting – ($4,300- $6,520), and divided by 22.3m^3 of log volume estimated to be required assuming 35% net graded timber recovery).

This suggests a range of $193 – $292/m^3 as an estimated stumpage value.

6.12 - Scope to improve potential returns to the landowner

Scope to improve the potential returns to the landowner from future harvests should be explored. This might include combinations of any of the following:

- Possible efficiencies in harvesting larger quantities in a single operation (e.g., 100m^3 log volume).
- Potential higher sawn/graded timber volume recovery from one of the commercial off-site mills.
- Harvest tree selection for higher recovery of saleable timber volume – (however, a tension exists between best forest management practice and harvesting the best quality trees in the forest).
- Milling/grading out the Dressing and Premium grade heartwood for possibly more lucrative markets to improve returns from a proportion of the log volume. (For example, sales at $3,500/m^3 have been obtained for green-off-the-saw carving timber – mostly heartwood).
- Recovering at least some value from the reject grade sawn volume.
- Potential advantages of alternative harvest machinery options (especially in the longer term with a scaled-up industry).
- Exploring possible additional value from by-products from the harvest process (e.g., pharmaceuticals).

6.13 - Realising value from the reject grade timber and trees

Wood Carvery NZ is a company selling small dimension (e.g., 50 x 50mm x 100mm) blocks (of imported Basswood (Linden) for carving or whittling (https://woodcarvery.nz/). Inquiries, as part of this project, have confirmed they are interested in considering stocking tōtara timber options – with the idea that small blocks of suitable clearwood may be recoverable from between defects from some of the reject grade boards, or offcuts. As a result of that inquiry, samples of air-dry tōtara (from Paul Quinlan), and kiln-dried tōtara off cuts from Innate Furniture Ltd., have been sent to the company for trialling. They have since been in touch for more volume to test the market with.

While this could be a small potential market, it represents an example of exploring opportunities to find value from the reject grade sawn timber produced. Other areas to explore might include slab timber markets for logs likely to produce poor graded timber recovery. Such opportunities need active searching out and co-ordination to realise.

6.14 - Possible harvest machinery options

If a regional tōtara industry evolves, the harvest machinery and equipment typically used in European farm forestry should be explored. This could involve a 4WD tractor (minimum 95 HP) with a PTO-driven forestry winch with circa. 6.5 to 9-tonne of pulling power (e.g., the Tajfun VIP90: https://tajfun.com/). Such machinery may avoid costly relocation costs and could be driven between the two properties (and other local properties) on the road. It should also be quicker for skidding logs long distances, with less damage to pastures and tracks. In the longer term, a log trailer for efficient forwarding may be a useful complement.

7. Key findings and lessons

7.1 - Summary

This project has shown that a small-scale, values-based farm-tōtara supply chain can be made to function in practice, provided the relationships, harvest planning, grading, processing and logistics are well coordinated. It has also confirmed that sustainable native forest management can generate practical timber, training, cultural, environmental and local-capacity benefits when landowners, buyers, contractors, sawmillers and technical advisers are aligned around a shared kaupapa.

Key project outcomes and findings are set out below.

Supply-chain function

- A direct supply-chain relationship has been successfully established between Māori landowners, a local sawmiller, a timber user/manufacturer and other technical and processing partners.
- The supply and purchase agreement tested at Te Whangae Farm provided enough confidence for Innate Furniture Ltd to be more actively promoting Northland tōtara as a timber option for customers – with positive interest and feedback.
- Dispatching tōtara green-off-the-saw proved workable, with no immediate issues reported from the first timber batches received for drying and processing.

Harvesting, milling and economics

- Both harvests were completed safely and successfully, but they demonstrated the wide range of possible harvesting and extraction costs.
- The McGee harvest usefully indicated the upper end of likely costs where small volumes, difficult extraction and longer skidding distances are involved.
- The Te Whangae Farm harvest demonstrated that lower-cost operations are possible on more accessible sites, especially where experienced contractors, suitable machinery and short extraction distances are involved.

- Timber recovery rates were lower than expected for saleable graded timber, reflecting the realities of untended farm-tōtara stands, log quality, long-term forest-management objectives and grading requirements.
- The supply chain appears viable, with estimated future stumpage rates of $193-$292m^3 or returns to the landowner of $558- $847/m^3 on merchantable sawn timber. However, landowner returns are likely to remain modest unless efficiencies, improved recovery rates, higher-value grades, or value from lower-grade material can be achieved.

Sustainable forest management

- Harvest tree selection must continue to balance commercial recovery with long-term stand improvement, biodiversity values, protection of residual trees and sustainable forest management requirements.
- The project reinforced the importance of professional harvest planning, Annual Logging Plans, on-site supervision, log measurement, record keeping and coordination across the supply chain.
- Future harvesting should avoid simply targeting the best trees, as this would undermine the wider forest-management purpose of the kaupapa.

Training and local capacity

- The project provided valuable practical exposure and training for local participants in selective harvesting, safe felling, milling, grading, forest inventory and PSP establishment.
- The involvement of Ngāti Hine Forestry Trust trainees, NorthTec, Horowai Trust and experienced contractors helped begin the process of building a wider local skills base.
- The Oromahoe PSPs provide a strong foundation for future monitoring, demonstration, field days and discussion of sustainable tōtara management and continuous-cover forestry options.

7.2 Overall conclusion

The project has moved the Northland farm-tōtara opportunity from concept toward practice. It has not solved every issue, but it has demonstrated that the supply chain can work, identified where the main risks and costs lie, and created a platform for further commercial, training and demonstration activities. Its foundation is a values and relationship-based approach and in line with the kaupapa and vision set out by the Tōtara Industry Pilot project. It has created a functional small-scale supply chain that could grow and expand to meet increasing demand. This could be the starting platform of a co-ordinated future regional industry or co-op. Such a development could bring opportunities to improve the viability for landowners, provide local employment, and promote the sustainable management of indigenous forests on private land generally.

8. Recommendations

Contingent on ongoing support from the landowners and investment in developing a tōtara industry initiative, recommendations for the future are set out below.

Maintain and strengthen the supply chain

1. Continue supporting the direct relationship between landowners, Innate Furniture Ltd, Horowai Trust, drying/processing partners and technical advisers.
2. Develop a similar supply and purchase agreement with Oromahoe Trust, building on the model tested at Te Whangae Farm.
3. Keep the supply-chain approach relationship-based and values-led, while ensuring that the economic returns remain sufficient for landowners.
4. Explore expanding the Te Whangae Farm SFM forest area to include more forests on the property – possibly including tōtara forest areas under Ngā Whenua Rāhui kawenata (biodiversity covenants).

Plan future harvests carefully

5. Schedule future harvests, where possible, for summer or reliably dry periods to reduce weather delays, track damage and operational risk.
6. Use experienced contractors and machinery suited to low-impact selective harvesting and especially cost-effective forwarding.
7. Budget future harvesting and extraction conservatively, using a likely range of $150–$250/m3 of log volume until more harvests provide better cost data.
8. Explore contracting harvesters and forest/harvest management on quoted rate per cubic metre of log volume.
9. Ensure all future harvests include professional planning and management, ALP preparation, health and safety oversight, log measurement, record keeping and post-harvest reporting.

Improve viability and returns

10. Test whether larger harvest volumes can improve economies of scale without compromising forest-management objectives.
11. Continue comparing portable milling with off-farm milling options, including Twinsaws and Northpine, where sufficient volume and logistics make these options practical.
12. Refine grading specifications with the buyer so that recovery of usable timber is maximised while maintaining product quality.
13. Explore higher value uses for premium and heartwood grades, including carving or specialist products.
14. Investigate markets or uses for lower-grade sawn material, slabs and possible by-products so that less of the harvested volume is treated as having no value.

Protect the forest-management kaupapa

15. Maintain harvest tree selection criteria that prioritise long-term stand improvement, production thinning, protection of residual trees and wider biodiversity values.
16. Avoid commercial pressure to harvest only the best-quality trees, as this would conflict with sustainable forest management and future forest value.
17. Use future harvests to continue testing practical silvicultural options, including staged thinning, production thinning around selected future crop trees, and treatment of poor-quality or non-merchantable stems.

Build local capability

18. Continue involving local trainees and workers in harvesting, milling, inventory and monitoring wherever safe and practical.

19. Use future SFM activities at Oromahoe Trust and Te Whangae Farm properties as structured training opportunities with appropriate supervision, assessment and health and safety systems.
20. Develop the Oromahoe Trust PSP area as a demonstration site for landowners, forest managers, contractors, trainees, agencies, regulators and other interested parties.
21. Support the development of a wider Northland tōtara network or industry body that can help coordinate harvest planning, technical advice, training, marketing and supply-chain relationships.

Next steps

22. Circulate the experiences of this practical project in supply chain and capacity development to Te Tai Tokerau Māori Forestry Inc. and post on the Tāne's Tree Trust website. And publish results (e.g., a Northland Tōtara Working Group newsletter).
23. Undertake at least one further harvest, preferably at Oromahoe, to test repeat supply, costs, recovery rates and buyer demand.
24. Monitor drying, processing and product performance from the Te Whangae timber and feed the results back into grading, milling and harvest planning.
25. Support exploration of further options to improve viability (e.g., markets and uses for low/reject grade logs, timber, by-products and non-timber forest products.
26. Review the commercial results after the next harvest to determine whether the current supply-chain model can be scaled, refined or formalised through a wider tōtara industry initiative.

Whatungarongaro te tangata, toitū te whenua
As people disappear from sight, the land remains.