Te Uru Rākau New Zealand Forest Service

Needs assessment for on-farm native tree establishment

Literature review

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Executive summary

Landowners have a critical role to play in helping Aotearoa New Zealand achieve a low carbon future, with around 17% of New Zealand's native forest found on private land. Although native forestry does not match the same financial returns as agriculture, native tree afforestation provides an opportunity for reducing sediment and nutrient losses, enhancing indigenous biodiversity, offsetting greenhouse gas emissions, and contribution to wider ecosystem services such as fibre, animal shelter, habitat for beneficial species and aesthetic values.

As it currently stands, landowners are mainly responsible for the establishment and ongoing maintenance costs of large-scale native forestry on their land. We have identified a range of key enablers and support mechanisms to help landowners with the transition to native afforestation on their properties. These could include access to specialised expert knowledge and professional support from both industry groups and the Government. In particular, landowners suggest help with finding seedling suppliers, applying for funding, planting plans and species selection and finding reputable nurseries as a key enabler to success. In addition, reorganisation of the current policy system and consideration of monetary incentives and financial subsides is important for the overall uptake of native tree species on private land. For Māori, building on cultural imperatives through exploring a ngāhere Māori model is an important enabler to the uptake of native afforestation. In addition, building and strengthening governance capabilities and partnering with investor groups and the Crown can with the upfront and ongoing costs associated with growing native trees.

This review provides an overview of motivations, barriers and enablers for native afforestation on privately owned land in Aotearoa New Zealand, based on publicly available literature and information. Both financial and non-financial barriers to native tree afforestation on farm have been considered including specific Māori motivations, barriers and enablers. As direct financial returns are lower for native forestry than for agriculture, incentives, funding programmes and other support mechanisms have also been considered as enablers to adoption of large-scale native afforestation on farm.

KEY FINDINGS

Motivators:

- Most landowners are planting native trees on their properties for erosion control, ecological and biodiversity enhancement, amenity and aesthetic purposes and to a lesser extent, for carbon farming, income diversification and as an intergenerational investment.

Financial Barriers:

- **Cost of establishment and maintenance** of large-scale native tree afforestation. These costs also include site preparation, management of planted areas and pest management.
- Costs associated with **participating in the NZ ETS** including meeting the minimum eligibility, measuring, verifying and permanence criteria may exceed the potential returns from the sale of NZU's for native species.
- Incentive programmes involve **transactional costs** (information search and compliance costs) and payments typically do not cover the full costs of establishment and ongoing maintenance of native plantings.

Non-Financial Barriers:

- **Biophysical-** conditions to establish native trees typically lack shelter and shade, promoting weeds and increasing grazing pressure from pests such as deer, goats and possums.
- **Regulatory-** current regulatory framework lacks policies specifically aimed at the use of natives to drive native afforestation and as it stands, the New Zealand Emissions Trading Scheme (NZ ETS) favours fast growing species over slow growing species.
- **Lack of knowledge and information-** General lack of knowledge on native trees, project planning, planting plans and species selection. There is also a lack of industry support in understanding the NZ ETS and how apply for incentives and funding schemes.
- **Nursery seed supply-** Seedling suppliers have historically focused on riparian species over native tree species. Native tree species take approximately two to four years to establish from seedling to potable plant, therefore nurseries will require more capacity than when they focused on riparian species. Due to the exponential demand of native plants through programmes such as Jobs for Nature and the One Billion Trees programme, nurseries have not been able to keep up with the demand and typically individual landowners are not prioritised over larger public contracts with Government including roading, infrastructure and restoration projects. This is exacerbated by challenges attracting and retaining skilled people in the nursery sector.

SUMMARY OF KEY KNOWLEDGE GAPS AND RECOMMENDATIONS

A key motivator for landowners to plant native trees is protecting their land from erosion, and recent cyclone events may have highlighted this further as a driver of change. Programmes explicitly targeting erosion control may therefore have a better chance of uptake.

Financial barriers, in particular the low financial returns from native forests, operational and transaction costs and the opportunity cost compared with other land uses, are a significant barrier to planting.

Recommendations include:

- Identification of other market opportunities for native forest areas and species (e.g. totara oils) to provide diversification options to landowners and further incentivise native plantings. This should include consideration of mātauranga Māori.
- Inclusion of native trees for specific purposes, in agroforestry plantings together with other productive species.
- Further research and assessment on the value of ecosystem services in New Zealand to promote financial incentives for native tree establishment, either within the NZ ETS framework or as biodiversity credits.
- Research and development of a carbon accumulation model is required for native trees. This will allow landowners to be adequately rewarded for their carbon sequestration efforts.
- Further research to identify additional financing mechanisms outside of the NZ ETS and an assessment on their potential in New Zealand. For example, green bonds, environmental impact bonds, continuous cover forestry funds, climate risk adjusted loans, and community funding.

To directly address non-financial barriers, there is a need to:

- streamline and simplify applications for funding and entry into the NZ ETS.
- Improve understanding of how the non-monetary incentives that reduce transaction costs influence decision-making. To adequately understand these factors may require in-depth interviews with landowners and those supporting them directly, for example levy bodies, council staff and consultants.

Leadership skills are required to overcome the multiple barriers for native afforestation as it is implied from the examples presented in this literature review. Understanding the factors that have enabled this leadership is a knowledge gap that deserves further exploration from an assets-based/appreciative enquiry approach, building on existing strengths and mapping potential networks.

Many organisations, in particular regional councils, are providing ongoing support and resources for on farm planting, with some excellent tools and support available. However, this is at different levels and stages depending on the region. It would be timely to engage with regional councils, in particular staff providing direct support to landowners, to properly understand the most effective practical and regulatory options to improve and coordinate support for native planting on private land.

These may include, for example:

- Building on, improving and replicating or supporting existing programmes and tools that have shown (potential) benefit, particularly those that may achieve multiple goals, such as Trees for Survival and prison nurseries.
- More agile monitoring and evaluation of historical and current incentive schemes to establish lessons learnt and further enhance accessibility to schemes by landowners.
- Biodiversity extension resources to incorporate biodiversity targets and outcomes into existing farm planning. This could be achieved through the Freshwater Farm Plan framework.
- Development of a national best practice guideline for native afforestation. Including research based principles on ecosourcing, advice for farmers on where to incorporate afforestation vs leaving land for natural regeneration.
- Developing or building on tools, calculators and search engines.
    - The potential for newly developed tools such as the healthy waterways land management actions database (Healthy Waterways, 2024)
    - A centralised search engine of funding opportunities for native establishment with quick links to the application process (Tyas, 2023).
    - A centralised search engine for nurseries providing native species (Tyas, 2023).
    - An online network of forestry professionals with expertise in land identification for forestry, native afforestation including species selection, forest design and forest management to allow landowners, as well as farm consultants advising landowners, to easily access experts (Tyas, 2023). This could also include educational hui and wānanga.
    - Promote existing and refining online “calculators” for farmers to understand the true cost of native establishment to allow comparison to current land use on marginal land. Refining calculators so that regional differences can be estimated.

For Māori, there are a number of additional barriers. It is recommended to:

- Improve governance of Māori land by developing a series of governance, capability, and development programmes to assist those overseeing Māori entities to be better equipped to consider native afforestation as part of their portfolio of intergenerational investment.
- Shifting towards a holistic and equal consideration of all values will require learning from and applying mātauranga Māori (Māori knowledge) and applying tikanga and kawa (protocols and practices) to capture cultural values.

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1 Introduction

Aotearoa New Zealand, like the rest of the world, is facing a number of interlinked ecological challenges. With a decline in native biodiversity from the intensification and evolution of different land use changes, New Zealand faces a complex set of challenges and consequences, with implications for the countries climate resilience, culture and prosperity (Case et al., 2023; The Aotearoa Circle, 2020). Protecting and enhancing New Zealand's biodiversity is fundamental to supporting the countries unique natural environment, which so many rely on for social, economic and cultural wellbeing. With increasing focus on the reduction in greenhouse gases to combat global climate change, New Zealand has committed to reaching net zero emissions of long-lived greenhouse gases by 2050, and to reducing biogenic methane emissions between 24-47% by 2050 (Climate Change Commission, 2021d). Native forests provide an opportunity to address both the climate and biodiversity crisis (Forbes et al., 2023)

In New Zealand, the government and the private sector have aspirations for large-scale native forest restoration and forest establishment through the active management of planting native trees (Case et al., 2023). The integration of native forests into farming systems in New Zealand have clear benefits for the wider agroecosystem; including erosion control on steep and marginal land, water quality mitigation, carbon sequestration, improvement of animal welfare and human wellbeing (Case et al., 2023; Dominati et al., 2021; Kaine, 2021; Polyakov et al., 2024). In New Zealand, a considerable proportion of remaining indigenous biodiversity occurs on farmland in private ownership outside of the public conservation land (Maseyk et al., 2019). Both private and Māori owned land hold a large proportion of the total potential afforestation area across New Zealand. Māori owned land covers 5% of New Zealand's total land area and native forests have been used as a source of fuel, medicine and food for many generations (The Aotearoa Circle, 2020).

The New Zealand Climate Change Commission estimates that there is between 1.2 and 1.4 million ha of marginal and non-productive land that could be planted in trees for carbon sequestration (Climate Change Commission, 2021d; Kaine, 2021). With most of that land under private or Māori ownership, landowners have a critical role to play in helping New Zealand achieve a low carbon future by protection and expansion of native forest on their land. Afforestation is costly for landowners, therefore the current incentives, funding schemes and support mechanisms to landowners has been considered throughout the review.

This review explores the publicly available literature and information for on-farm native afforestation in New Zealand. The financial and non-financial barriers to native tree afforestation on farm has been considered including specific Māori motivations, barriers and enablers. As native forestry returns are perceived as less than agriculture, incentives, funding programmes and other support mechanisms have also been considered as enablers to adoption of large-scale native afforestation on farm. This review is intended to help science and policy advisors better understand how to support farmers to uptake native afforestation projects on private land.

1.1 SCOPE

This literature review provides an overview of barriers and enablers for native afforestation on privately owned land in New Zealand. It focuses on farmer perceptions of native tree plantings, with consideration for indigenous land use practices.

The scope of this review includes:

- Analyse the identified motivations and benefits driving farmers towards on-farm native tree planting.
- Evaluate the array of required support mechanisms, including financial incentives, knowledge dissemination methods, maintenance and planting assistance, and potential appreciation schemes.
- Integrate Mātauranga Māori insights to enrich support mechanisms by acknowledging indigenous knowledge and values.
- Examine the barriers and challenges inhibiting farmers from engaging in on-farm native tree planting initiatives. Propose suitable planting locations, e.g., shelterbelts and hillside planting.
- Consider indigenous land use practices in identifying areas where tree planting aligns with traditional knowledge and benefits the land.
- Provide practical recommendations based on research insights, addressing motivations, support mechanisms, barriers, and planting locations.

Topics that are out of scope for this literature review include the following:

- Native tree regeneration and native forest protection on farms/private land, including Nature Heritage Fund and QEII Trust.
- Projects focused on exotic/non-native species, other than where these are mentioned as pest plant species, are playing a role in transitioning to native forest, or are non-native shrubs used as nurse crops.
- Projects focused only on native riparian species or restoration of riparian environments. However, those projects with elements of riparian as well as forest species or restoration are included with a focus on specific forest establishment aspects,
- Information sources that are unpublished or not publicly available, as well as interviews and primary data collection.
- Projects and literature that are pre-1989.

2 Materials and methods

We conducted a targeted literature review using different combinations of the following keywords: ‘mātauranga Māori’, ‘kaitiaki principles’, ‘native/indigenous tree establishment’, ‘tree planting’, ‘natives on farm, ‘native agroforestry’, ‘farmer motivations’, ‘financial incentives’, indigenous biodiversity’, ‘native afforestation’, ‘land use drivers’, ‘farmer barriers’, ‘native biodiversity’, ‘forestry incentives’, ‘native trees on farm’, ‘sheep and beef biodiversity’, ‘landowner attitudes’, ‘landowner incentives’, ‘opportunities native trees’, ‘native forestry grants’, native forestry funds’, ‘native forestry incentives’, ‘Māori land fragmentation’, ‘land use change’ ‘Māori land ownership’, ‘mahinga kai’.

The databases included: Google Scholar, Science Direct and Research Gate and websites (e.g. Maanaki Whenua- Landcare Research, Tane’s Tree Trust, Pure Advantage, The Aotearoa Circle), the MPI One Billion Trees Programme and general Google searches. Only literature which is published and publicly available was used for the literature review and followed the guidelines developed by Te Uru Rākau New Zealand Forestry Services “*Research Expectations for Literature Reviews”*. When conducting the literature review, the top 15 hits were analysed and included if they were relevant to the scope of the literature review.

3 Motivations for native tree afforestation

To understand farmer barriers to planting native trees, farmer motivations for planting trees must also be considered. Understanding farmer behaviour and drivers for change play an important role in understanding how to support landowners to successfully adopt new practices or technologies (Small & Maseyk, 2022).
Kaine et al. (2023) argued that a series of steps occur before landowners participate in afforestation incentive schemes. These include landowners first having a need to plant trees, then becoming motivated to plant. Specific barriers to tree planting may include financial and non-financial barriers (discussed in section 4). When incentive schemes are available, the landowner needs to be motivated to apply for the scheme and potentially overcome any additional barriers to participating in the scheme (Figure 1).

Figure 1. Diagram outlining the 'steps' that occur before landowners participate in an incentive scheme for tree planting. (Kaine et al., 2023)

Like any sector in society, the farming community do not hold a united position on their motivations (Maseyk et al., 2021). In general, motivations to plant native trees are driven by farm profitability, productivity, and wider environmental benefits. Across the literature there are conflicting views among what the main drivers of land use change are. Some studies have determined that financial motivations are the largest driver of land use change (Kaine et al., 2023), whereas other studies suggest that environmental or inter-generational benefit are the main motivations for landowners (Ford, 2021; Maseyk et al., 2021; Stahlmann-Brown, 2019). Many farmers are highly motivated stewards who protect the land and catchments due to inter-generational benefits for their families and whānau, as well as their personal and family wellbeing (Greiner & Gregg, 2011). Some Māori landowners may be less motivated by financial drivers, but more motivated by intergenerational benefits from protecting their environment, following kaitiakitanga principles (Pohatu et al., 2020). This is the case for the Haig whānau who are owners and kaitiaki of Kaitoto station near Tikitiki, Gisborne (Parkes, 2022; Tāmata Hauhā, 2024). The whānau have a deep sense of belonging to the land. They wish to restore native vegetation and biodiversity on their whenua and are motivated to create a legacy for future generations which allows them to live and thrive on their land (Tāmata Hauhā, 2024).
We first introduce general motivations below and barriers to planting native trees on farm (section 4). This is followed by ways to overcome barriers (section 5) and Māori specific barriers, enablers and how to overcome these (section 6).

3.1 FINANCIAL MOTIVATIONS

Studies across New Zealand and overseas show that production focused motivations are one of primary reasons for farmers to plant trees (Kaine et al., 2023). For farmers to be motivated to plant trees, typically there needs to be a desire to change the land use and a financial benefit to the farmer. Land use changes are often influenced and limited by resources such as soil, slope, and irrigation availability. Farmers usually plant trees on farm for the management of marginal land, erosion-control on unstable slopes or for livestock and crop shelter, all of which have a financial benefit for the landowner (Kaine et al., 2023). Landowners typically select land according to its quality, with the best quality of land being the most productive,

while the more marginal, least productive land, is more likely to be utilised for tree plantings (Kaine, 2021).

3.1.1 Farming productivity and land protection

Farm production and land protection for erosion control purposes are identified as a key financial motivators for native tree afforestation on farmland (Kaine et al., 2023). Kaine (2021) identified through a survey of 500 farmers across New Zealand that the strongest driver to plant trees (including both exotic and native species) is to improve marginal land, to protect crops and livestock and to stabilise slopes and streambanks. For example, at Pukekauri Farm in the Western Bay of Plenty, steep erosion prone areas had been retired and planted in natives to reduce sedimentation in the Te Mania catchment and downstream estuary (Dodd et al., 2023). A number of other on-farm projects have also highlighted erosion control as a key motivator for native afforestation (Dominati et al., 2021; Farm Forestry New Zealand, n.d.; Ngā Uruora Committee, 2013; Te Uru Rākau, 2020a, 2020b; Trees that Count, 2024a, 2024b). Land protection is a key driver in farmer decision making, however these changes in land-use can also drive additional farm system changes such as livestock policies, grazing management and infrastructure (Dominati et al., 2021).

Approximately 42% of respondents to the Kaine (2021) survey planted trees on the basis that they were improving farm productivity, while also improving the look of their property, attracting birds and improving biodiversity. Sheep and beef farm case studies discussed within Dominati et al. (2021) showed an increased annuity in dollars per grazed hectare ($annuity/grazed ha) after implementing a biodiversity enhancement plan in Canterbury and the Central North Island. This suggests that these areas were contributing very little to the overall financial viability of the farm. As a result, planting marginal land for soil conservation or biodiversity restoration created an opportunity for increased returns on the productive areas on farm, with profit per hectare increasing by 5% for the pastoral land (Dominati et al., 2021).

3.1.2 Carbon farming

New Zealand's climate change mitigation policy allows any forests planted after January 1990 to be eligible to receive carbon credits under the New Zealand Emissions Trading Scheme (NZ ETS) (Cortés Acosta, 2019; Ministry for Primary Industries, 2023d). Native trees are also eligible under the NZ ETS, however the canopy cover must reach 30% and a mature tree must reach 5 m in height (Cotterrell, 2022; Ministry for Primary Industries, 2023d). As it currently stands, rural communities would prefer these tree blocks to be actively managed, rather than to be 'carbon farmed' due to the increased management requirements resulting in an increase in job opportunities available for rural communities (Bayne et al., 2020).

Some Māori groups do not see carbon farming or earning an income from carbon farming as a key driver in their land use diversification decisions, however it provides an opportunity for Māori landowners to receive carbon credits from afforestation (Cortés Acosta, 2019; Pohatu et al., 2019). It is estimated that about 5% of New Zealand's land area is Māori freehold land (Cortés Acosta, 2019) and this area is expected to increase as a result of post-Treaty settlements. A more detailed discussion of barriers and enablers for on-farm native afforestation for Māori is in section 6.

3.1.3 Income diversification

Alternative income streams such as carbon credits can help to spread the financial risk of a farming business (Bayne et al., 2020). Farmers are also aware of the potential for carbon liability of on-farm activities and see native tree planting as an option to offset their GHG

emissions through the NZ ETS. Native tree planting may also provide a source of income from honey production, as is the case for Michael Bird's farm in Taihape, where areas of land prone to severe erosion have been planted in mānuka with a resulting additional income to the farmers from local apiarists (Te Uru Rākau, 2020a). Essential oil extraction for mānuka, kanuka and totara is also a growing industry(NIWA, 2019). The market for essential oils is less developed and there are knowledge gaps in regards to cultivation, harvest, distillation and marketing, however small distillers have been reported to pay $500-600 per tonne of good quality harvested mānuka foliage (NIWA, 2019). Most sheep and beef farms in New Zealand have varying slope classes, some with steeper areas, vulnerable to soil mass movement, making these areas suitable for diversification in to native tree planting (Chege et al., 2022). With nearly 40% of New Zealand's total land area, approximately 10.6 million ha, used for sheep and beef farming, there is substantial opportunity for native tree afforestation on private land across New Zealand.

3.1.4 Intergenerational investment

Understanding the value of biodiversity to the farm system and maintaining profitability across generations will help shift perceptions towards biodiversity from a 'nice to have' to a business investment (Dominati et al., 2021; Maseyk et al., 2019). Intergenerational native afforestation is a way wealth can be passed down through farming generations. A study by Maseyk et al. (2021) discussed the advantages and disadvantages of managing or protecting native biodiversity on the farm, and it was identified that one of the most significant advantages of native biodiversity on the farm was intergenerational equality. This highlights that farmers prioritise leaving their land in a better state and value intergenerational equality of wealth. Family farmers also commonly recognise the value of afforestation and biodiversity enhancement for connecting their children to the land, which is the case for Riverland Dairy Farm, who have two young sons actively involved in restoration works and have become interested in conservation as a result (Trees that Count, 2024f).

Māori take an intergenerational view of the impacts of the actions we take now. Māori hold deep inter-generational views emphasising a profound connection to their ancestral land, known as "whenua." This spiritual bond is integral to their identity, fostering a sense of responsibility to preserve and pass down their cultural heritage. Māori inter-generational perspectives also prioritise transmitting traditional knowledge, values, and customs, ensuring a continuum of cultural richness for future generations. Māori intergenerational, long-term perspective is an essential frame of reference in science and a significant incentive for change (Our Land and Water, 2020).

Bayne et al. (2020) highlight that Māori prioritise intergenerational wealth. Afforestation may provide jobs and income for their people at the beginning of the project; however, it is not necessarily a sustainable income and opportunity stream. All landowners are obligated to leave the land and water they care for in good condition for their mokopuna (grandchildren) and generations to come (Our Land and Water, 2020). An example is the Haig whānau, who are kaitiaki of their farm near Gisborne and are regenerating indigenous vegetation across the whenua for future generations to live and thrive there (Tāmata Hauhā, 2024). More details about Māori cultural motivations are explained in section 6.1.

3.2 NON-FINANCIAL MOTIVATIONS

There are many social and environmental benefits to large-scale native afforestation, including an increase in habitat for native birds, regeneration of native plants, decrease in sediment loss and decrease in on-farm greenhouse gas emissions (Dominati et al., 2021). Large-scale native afforestation can potentially contribute to biodiversity enhancement,

aesthetic improvement of the land, increase in connection to the land and an increase in recreational, cultural and spiritual value. Kaine et al. (2023) surveyed farmers across five regions in New Zealand and suggests that in the absence of a financial motivation, non-financial motivations including environmental, ecological and cultural motivations alone are not enough for most farmers to plant trees. In contrast, the Survey of Rural Decision Makers 2019[1] (Stahlmann-Brown, 2019) found that the biggest drivers for the respondents' intention to plant native trees on their farm over the next two years were non-financial motivators, mainly: *to provide habitat to increase biodiversity* (74%), *increase aesthetics/amenity and landscape* (69%) and to *promote water quality* (56%) (Figure 2). The farmers who intend to plant both native and exotic trees on their property in the two years following the survey also include *increase aesthetics amenity value* (76%) and *habitats to increase biodiversity* (70%) as top reasons.

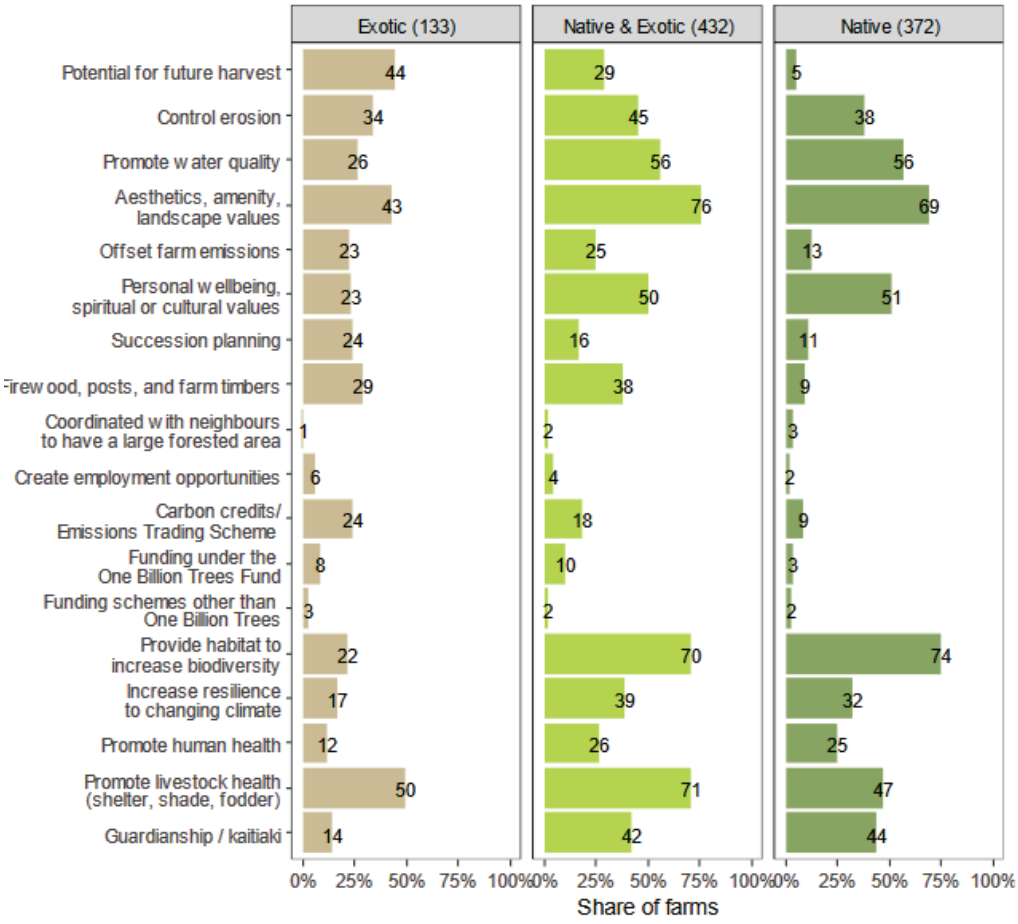

Figure 2. The reasons to plant trees listed by the respondents that intend to plant trees on their farms over the next 2 years (Edwards et al., 2022).

Despite a more recent Survey of Rural Decision makers by Manaaki Whenua Landcare Research, the 2023 version did not consider afforestation in the same depth as the 2019 version.

[1] The Survey of Rural Decision Makers is conducted by Maanaki Whenua Landcare Research every two years since 2013. The survey aims at improving understanding of decision making at the farm level. Each year the survey explores emerging topical issues, in 2019 it included specific questions about drivers of afforestation. There were 3,735 respondents from all across New Zealand, and of those 1,966 were commercial farmers. Respondents were mainly sheep and beef, dairy, grazing and commercial forestry with other industries represented such as deer, arable, kiwifruit, wine, vegetables/flowers, fruit/nuts, tourism and beekeeping.

3.2.1 Environmental outcomes

Kaine et al. (2023) suggest that the main motivators for planting trees on farm is driven by on-farm productivity and environmental outcomes, with the latter being slightly more influential. In addition, the main environmental drivers were attracting native birds, increasing biodiversity, habitat connectivity and resource availability for native fauna species (Dominati et al., 2021). It was also identified that farmers who had an interest in attracting native birds and improving biodiversity were more likely to plant natives that exotic species (Kaine, 2021). These findings are supported by our review of on-farm native afforestation projects (Appendix), many of which describe improving or enhancing biodiversity, habitat connectivity and increasing native bird populations as a key motivator for planting native trees (Clements, 2022; Dominati et al., 2021; Farming with Native Biodiversity, 2023a, 2023b; Ngā Uruora Committee, 2013; Tāmata Hauhā, 2024; Trees that Count, 2024d, 2024g, 2024f, 2024e, 2024a, 2024c).

Other environmental outcomes that motivate landowners to plant native trees include reducing sediment and nutrient runoff from the land, often with the aim of improving the health of waterways, wetlands or estuaries. An on-farm example is Kūao Kau Uha Farm who are working with the Kaipara Moana Remediation Programme to restore the health and mauri of Kaipara Moana by making changes on farm including native afforestation (Farming with Native Biodiversity, 2023a). Another unnamed farm discussed in Dominati et al. (2021) is motivated to reduce sediment and phosphorous runoff from their farm into the Kaipara Harbour which the farm's stream network drains into. These examples highlight that farmers are not only motivated to improve environmental outcomes within their farm but also for the wider catchment and connecting waterways.

Maseyk et al. (2021) found that most farmers saw social, environmental, practical and economic advantages of managing and protecting indigenous flora with only a small proportion (8%) stating there was no advantages. Bayne et al. (2020) found that environmental benefits of native tree afforestation were only considered when afforestation was not displacing productive land areas. The main practical reasons for planting trees were to make better use of marginal land and to stabilise slopes and stream banks, and to provide shelter for livestock while improving property aesthetics and biodiversity.

Inclusion of native trees species into agroforestry systems within New Zealand has been identified as an opportunity for landowners (Wills et al., 2024). Agroforestry plays an important role in the agroecosystem, including shading and shelter for livestock, forage and an increase in surrounding pasture production. In addition, agroforestry could play an important role for indigenous biodiversity in New Zealand by providing biodiversity corridors and creating habitat and food sources for bird and other fauna species as well as acting as a transport corridor between remnant vegetation. Ngāi Tahu Farming in Canterbury are driven by biodiversity outcomes and have the intention to systematically transition their current exotic tree system to a native agroforestry system over future generations as exotic trees die or are removed (Wills et al., 2024).

3.2.2 Amenity and aesthetics

Using trees for amenity purposes on private properties has been a common practice for many years, and in many studies farmers rated aesthesis as an important motivator for planting trees (Clements, 2022; Kaine et al., 2023; Maseyk et al., 2021). The Rural Survey of Decision makers 2019 reports that the dominant reasons for planting native trees are biodiversity, aesthetics, and water quality. With a large proportion stating they would set land aside on their properties for aesthetic values, highlighting the important of aesthetics to the farming community (Edwards et al., 2022). Similarly, (Maseyk et al., 2021) identified that social

parameters (aesthetics, intergenerational equity and "feel good factor") were the biggest reason, for farmers to consider managing and protecting native biodiversity on farm totaling 47% of participants. This was related to the perceived increase in farm value, with statements such as "it is going to look prettier". Landowners may not only be motivated to improve the aesthetic value of their farm for themselves, but also if the land is within public view. Improving the aesthetic view of the Perkins Farm Escarpment by restoring native vegetation and biodiversity is one of the main drivers for the Ngā Uruora - Kāpiti project, as the escarpment provides part of the backdrop for communities along the Kāpiti Coast (Ngā Uruora Committee, 2013).

4 Barriers to native tree afforestation

The main barriers to native tree afforestation on farmland are financial costs (including establishment and ongoing maintenance), workload, lack of time, resourcing and technical knowledge on native forest development and seedling establishment and the lack of participation in incentives schemes and subsides (Bayne et al., 2020; Edwards et al., 2022; Maseyk et al., 2021). In the Survey of Rural Decision Makers 2019, the major barrier to planting trees for farmers (including commercial farmers whose main primary sector was not forestry) was the perceived "better uses for the land" (Figure 3). The next biggest barrier to farmers was the financial costs of planting trees on farm, closely followed by the uncertainty of the best land use for their property and labour constraints (Stahlmann-Brown, 2019).

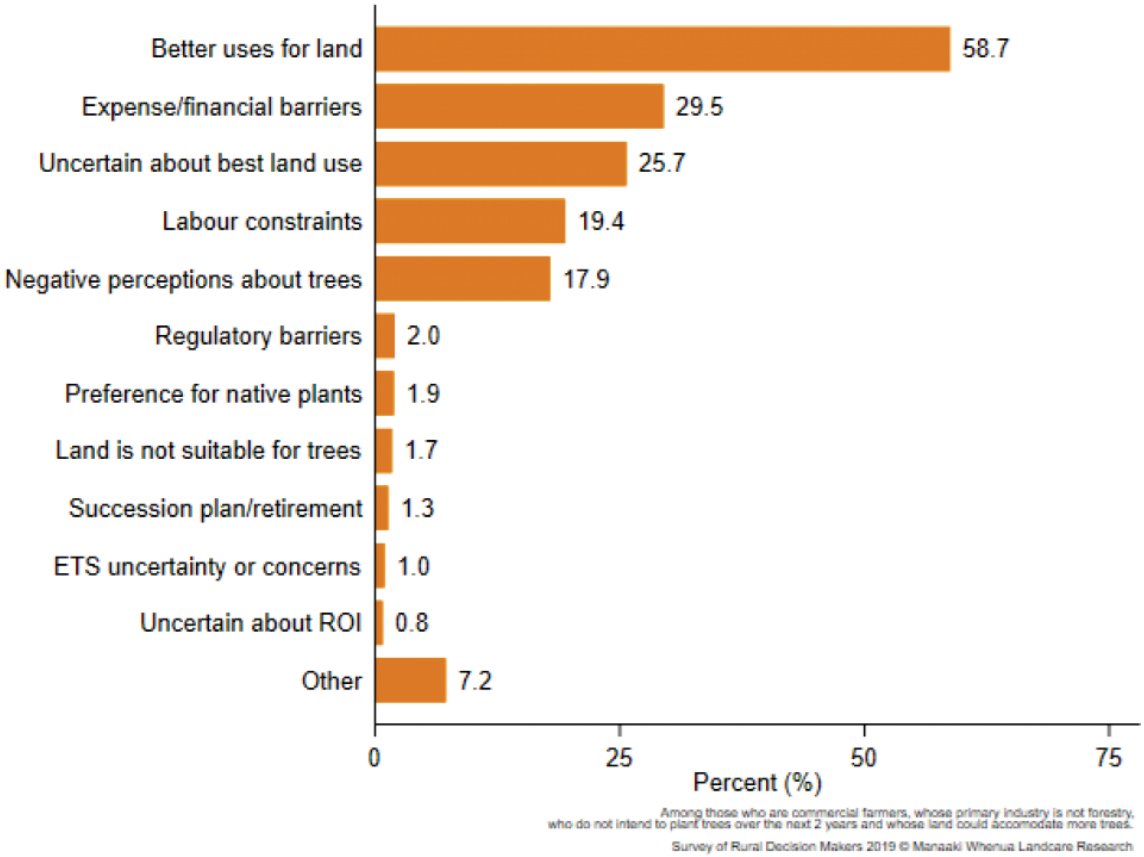

Figure 3. Farmer reasons for not planting trees in the near future (Stahlmann-Brown, 2019)

4.1 FINANCIAL BARRIERS

The following financial barriers (including cost and time) have been identified as the key barriers for landowners in implementing large-scale native afforestation on their land:

- Perceived lower financial returns from native forestry than agriculture.
- Native afforestation is costly to establish. Costs can include site preparation, management of planted areas and pest management.
- Extremely high costs associated with establishing native forests on marginal, erosion-prone land.
- Cost associated with participating in the NZ ETS including meeting the minimum eligibility, measuring, verifying and permanence criteria may exceed the potential returns from the sale of NZU's.
- Incentive programmes involve transactional costs (information search and compliance costs) and payments typically do not cover the full costs of establishment and ongoing maintenance of native plantings.

Financial restraints are recognised as barriers for a number of the reviewed projects (see Appendix; Dominati et al., 2021; Tāmata Hauhā, 2024) and include a lack of access to capital funding for afforestation and reduced farm profitability as a result of retiring land for afforestation.

The perceived loss of production has always been a major barrier to landowners investing in forestry (Bayne et al., 2020). There is a perceived loss of 'productivity' if farmland is converted to forestry, even if the forest is grown for commercial timber. This is due to the perceived lower returns of native forestry compared with agriculture which leads to an overall general reluctance from farmers to take land out of pasture (Bayne et al., 2020; Edwards et al., 2022). For example, if all the agricultural land in New Zealand suitable for mānuka and kānuka were to be converted to mānuka and kānuka forestry, the resulting economic losses would be of the order of $350 million to $700 million annually (Edwards et al., 2022). Globally, afforestation is more likely to occur on farms that have hill country with marginal land available for native forestry (Kaine, 2021). This is because it is seen as being less likely to disturb current land management practices on the productive farm areas. The time to a positive cashflow for native forestry is longer than for exotic tree species. It can take up to 70 years for harvesting native trees, which is time and cost prohibitive for many landowners. Therefore, to drive native afforestation, farmers perceived loss in farm income would likely need to be offset with financial incentives.

The Climate Change Commission (2021d) estimates that the establishment costs of 300,000 ha of native trees on steep, eroding and marginal land may range between $5 billion and $15 billion. Establishment costs can include infrastructure such as roading upgrades and processing facilities (Tomlinson et al., 2000). Establishing native afforestation could be cost prohibitive for landowners. Establishment costs for large scale native afforestation are estimated to be around $6,600 per hectare and can be as high as $24,000 to $50,000 per hectare (Climate Change Commission, 2021d). On the higher side of this range, Pohatu et al. (2020) estimate that large scale native afforestation establishment ranges from $24,000 to $66,000 per hectare. These substantial costs also do not consider the cost to upkeep and maintain the native plantings. The cost of fencing, planting, and continuous weed and pest management could range from $12,000 to $15,000 per hectare (Pohatu et al., 2019).

For some landowners, the cost of participating in the NZ ETS can be a major barrier to establishing large-scale native forestry on their properties. Participating in the NZ ETS requires registration, start up and ongoing compliance costs which are currently direct costs to the landowner (Edwards et al., 2022). As of October 2023, there has also been an increase in the fees charged for some ETS services (Ministry for Primary Industries, 2023h). In additional to the application fees there are also fees associated when submitting returns in the ETS Depending on farmer risk appetite, the volatility of carbon prices is a further additional farmer barrier to being included in the NZ ETS (Cortés-Acosta, 2019).

Access to capital is another financial barrier and this varies between landowners, particularly the differences between Māori and non-Māori landowners (Journeaux et al., 2017; Pohatu et al., 2019). When accessing capital, documentation and proof of the return on investment (ROI) is required for bank-lenders and this can prove difficult due to the establishment duration. Due to the complexity of the regulatory framework and as land use is still developing, capital can be difficult to access. The additional challenges for Māori landowner are discussed in section 6.

4.2 NON-FINANCIAL BARRIERS

In additional to financial barriers, non-financial barriers to native afforestation on farm have also been identified. The following non-financial barriers have been identified as the key barriers for landowners in implementing large-scale native plantings on their land:

- Biophysical
- Regulatory
- Lack of knowledge and information
- Labour force
- Nurseries
- Social barriers

4.2.1 Biophysical

Biophysical factors affecting land management decisions include the inherent soil type, topography, climate, availability of water and pest and weed management (Journeaux et al., 2017). Biophysical factors influence on-farm management decisions and under most circumstances y these factors cannot be changed, therefore matching land management to land use capability is important to drive optimal on-farm productivity. For some landowners, land use and management decisions are constrained by land capability classes (Lynn et al., 2009). Native forestry is suitable on most land classes, however farmers tend to plant trees on marginal land or land considered ‘non-productive’ from an economic perspective (Journeaux et al., 2017).

Biophysical factors may also constrain the ability for landowners to plant trees or for trees to establish and survive. An example is the Perkins Farm Escarpment, where a key barrier for native afforestation is the physical access to very steep areas to plant trees, and therefore a natural regeneration approach is being taken for these areas (Ngā Uruora Committee, 2013). Native forest restoration is often established in environments with a lack of shelter and shade. For example, at Hororata Farm, establishing plants in dry, exposed areas where there is a lack of irrigation and high wind exposure was seen as a restriction to planting some areas of the farm (Clements, 2022). Under these conditions, planted trees are stressed and weeds can be favoured, leading to low survival rates (Forbes, 2021).

Climate change will drive different weather patterns in New Zealand changing land management decisions on farm. With predicted warmer annual temperatures, increased rainfall on the west and drier conditions on the east as well as an increase in frequency and intensity of storms. This change in climate may cause some fungal diseases, insect pests and invasive plant species to become more prevalent (Scion, 2012). In addition, increased severe weather events can become a barrier to planting. For example for Kūao Kau Uha Farm flood events are seen as a barrier to planting (Farming with Native Biodiversity, 2023a). With a change in climate, some native plant and animal species may not be able to survive, and the prevalence of pest species such as stoats, rats and mice may become more prevalent at higher altitudes (Christie et al., 2020). For example. native animals in beech forests and sub-alpine zones may no longer be able to survive with an increase in predator numbers(Christie et al., 2020). Like pastoral systems, pests and weeds in native forests may become more prevalent, however we have not found any specific evidence to suggest that this is a farmer barrier to planting native trees on farm.

4.2.2 Societal and regulatory barriers

National and regional policy and regulations have an impact on farmer decision making around land use and management (Norton et al., 2013). We have explored the following societal and regulatory barriers in this section:

- Lack of acts and policies aimed specifically at natives.
- Complexities of the New Zealand Emissions Trading Scheme (NZ ETS).

Agriculture has always operated within a "societal licence to farm" which has become more prevalent as societal pressures on agriculture have increased in the last few decades (Journeaux et al., 2017). This concept drives regulations affecting the primary sector. Government policy and regulation exert a very powerful influence on land management decisions (Norton et al., 2013) and public policy plays a key role in bringing about behaviour changes (Small & Maseyk, 2022). Regulation may directly or indirectly impact land use change. Directly by allowing or restricting activities on the land and indirectly through policies or incentives to shift changes in land use (Edwards et al., 2022). The current regulatory framework lacks acts and policies specifically aimed at the use of natives to drive native afforestation (Edwards et al., 2023).

As it stands, the NZ ETS favours fast growing species over slow growing species in relation to carbon sequestration (Edwards et al., 2022). Understanding regulation and the complexities with the NZ ETS is another major barrier for farmer participation in the programme. Cortes-Acosta (2019) identified additional barriers for Māori landowners entering into the NZ ETS. In particular, liabilities, complexity of participating in the NZ ETS (such as establishing land eligibility requirements and calculating the carbon units generated by the trees), uncertainty about future carbon prices and the monetary return for establishing forest, and a lack of structural attributes of governance institutions that shape the decision-making processes.

4.2.3 Lack of knowledge and information

The lack of information and knowledge in the farming community is a major barrier to the uptake of native afforestation on farm, this includes:

- Lack of general knowledge on native trees, in particular project planning and planting plans, species selection and suitability to land classes on farm.
- Lack of industry support to apply for incentives and funding.

- Complexity of incentive programmes and in particular, involvement in the New Zealand Emissions Trading Scheme (NZ ETS).
- Lack of industry knowledge on native carbon sequestration.

For most landowners, there is a general lack of knowledge around native tree establishment and the success factors of native tree species. The lack of general information and knowledge available to landowners is a key barrier to large scale native tree establishment on farm (Edwards et al., 2022). Farmers have a lack of knowledge on funding alternatives, project planning, species selection, establishment and maintenance of large scale native tree establishments (Bayne et al. 2020). As well as a lack of information about native trees, there is also a general lack of knowledge from landowners on the forestry sector in general and when and where to get help from a forestry consultant or advisor (Te Uru Rākau, 2023). For many landowners, the complexity of incentive programmes and the lack of support to help understand them is a major system barrier to native afforestation uptake (Cortés Acosta, 2019). In a report by Kaine (2021), it states that most farmers would not seek assistance or support to plant native trees due to a lack of information and the arduous application processes. Historically, incentives schemes to encourage tree planting in New Zealand, have had a limited uptake (Bayne et al., 2020). Farming industry groups and Council staff that Bayne et al. (2020) interviewed suggested that "farmers do not have the time or resources to take the administrative burden of applying for, and reporting on, grant schemes", therefore have not applied for incentive schemes. Ford (2021) documented that the lack of government support or financial incentives prevented farmers from taking up biodiversity protection activities on their properties. More information on incentive schemes and their uptake can be found in Section 7 of the report.

The ability to understand, enroll and participate in the NZ ETS is a particular barrier to native afforestation on farm. Cortes-Acosta (2019) suggested that landowners face difficulties in effectively participating in the NZ ETS as it requires "understanding and application of highly technical scientific and legal knowledge". Depending on the landowner's education and knowledge on the NZ ETS, some landowners were in a "better position to access and interpret than others". The application process requires expert advice, including analysis of the land eligibility for planting; sourcing and planting seedlings and monitoring for seedling survival (Edwards et al., 2022). In additional, another barrier to participating in the NZ ETS, is the time consuming eligibility and registration process, which can take up to one year to process (Weaver, 2022).

In addition to the lack of knowledge on the administrative processes for the NZ ETS, there is a lack of knowledge around carbon sequestration for native species (Edwards et al., 2023). This is an issue not only for farmers but the wider primary industry. Landowners and the wider primary industry have expressed disagreement with the NZ ETS carbon sequestration methodology with sequestration rates being skewed towards exotic species based upon wood volume of the tree species. A key limitation of the NZ ETS methodology is that native tree values are based on measurements from naturally regenerating kanuka and mānuka shrubland (Kimberley et al., 2022). In addition, compared to the Radiata pine look up tables which have regional specific data, native trees have only one carbon sequestration table (Climate Change Commission, 2021a). New research indicates that managed native trees and forests can well exceed the growth and carbon sequestration values currently used by the calculation of natural regenerating kanuka and mānuka shrubland in the NZ ETS (Kimberley et al., 2022). Adapting NZ ETS values to better represent the carbon sequestered by native afforestation and forestry could motivate farmers to engage in large scale native plantings.

4.2.4 Labour force

Edwards et al. (2022) found little evidence to suggest that labour availability is a major factor constraining expansion in the native industry. However, the Wai Kōkopu catchment group identified that farmers often have a lack of time and resources to organise and carry out planting and maintenance, as resources are already stretched for day-to-day farming operations (Dewes et al., 2022).

We have considered the following barriers in relation to labour force:

- Nurseries - New Zealand Plant Producers Incorporated have reported that it is difficult to attract experienced and skilled workers to the industry due to the relatively low pay rate. Competition is high for skilled people within the industry and between industry sectors due to highly transferable skills (NZPPI, 2020).
- Lack of skilled landowners - for native trees, labour is required for soil preparation, fencing, establishment of trees and ongoing maintenance. Typically, native tree planting is conducted by volunteer labour, which is not always accessible. Landowners may also have limited time available to coordinate labour (Dodd et al., 2023; NZPPI, 2020).
- Pay equity - maintenance of natives requires a specialised workforce and typically they are paid lower than pastoral farmers (NZPPI, 2020).

4.2.5 Nurseries

A range of commercial nurseries have varying challenges that ultimately impact landowners and their ability to source natives for large scale planting. The main nursery barriers identified in New Zealand are:

- Lag time from seedling to a potable plant can take between one to four years for native species.
- Seeding suppliers have not historically focused on native tree species but have been more focused on riparian species due to high demand caused by regulation.
- The native nursery industry has grown at 12%-15% per year from 2017 to 2020. Most demand is from contracted Government projects, including transport, infrastructure and restoration projects, therefore smaller on-farm projects have not been prioritised.
- Lack of investment in technology and innovation in the native tree species sector.
- Public project tendering favours large-scale nurseries, leaving small scale nurseries with little buy in with project tendering.
- Challenge in getting nurseries (typically larger scale), local volunteer networks and community groups to adopt ‘best practices’ for ecosourcing seed.

The nurseries’ ability to upscale in native tree species has been impacted by resourcing and innovative science. The New Zealand Plant Producers Incorporated (NZPPI, 2020) suggested the overall challenge faced by the nursery industry is in upscaling supply chain, investment in science to support sustainable production and improvements in workforce training and capability. Factors such as the availability of supplies of native trees and knowing where to get help and advice on planting natives did not influence the decision between planting natives and exotics on farm (Kaine, 2021).

The time to raise a native seedlings is up to four years, depending on the plant species, providing little incentive for nurseries to only focus on native tree species (Edwards et al., 2023). Nurseries must grow the right plants for the market and it is difficult to predict and

forward plan what will be required for the next planting season, or what will be needed in two to three years' time (NZPPI, 2020). Particularly for slower growing native species. Due to the lag phase in establishing native plants, there is a lack of forward planning and motivation from planting contractors to make large-scale plant orders.

The nursery sector is mainly made up of smaller, independent businesses with fewer large-scale businesses. The sector is made up of approximately 66% smaller businesses and of those only 6% are identified as a Māori organisation (NZPPI, 2019). In recent times, the biggest growth has been in native nursery for shrubs, grasses and flaxes for riparian planting (Edwards et al., 2023). The increase in demand for natives has mainly been driven by larger orders and contracts with different sectors across central Government initiatives such as roading infrastructure, riparian planting and restoration projects and therefore smaller on-farm projects have not been prioritised (NZPPI, 2020).

Ecosourcing seed with 'local genetic stock' has been advocated and practiced in New Zealand for approximately the last 50 years and it ensures that plants are adapted to local conditions for successful establishment and ongoing success (Heenan et al., 2023).Currently there are no best practice standards for nurseries, volunteer networks and community groups to collect seed and distribute seeds. To achieve New Zealand's overall biodiversity outcomes, local, regional and central government policies require practical guidelines for ecosourcing of seed and undertaking ecological restoration plantings (Heenan et al., 2023).

4.2.6 Individual barriers

Individual contexts and situations play heavily into decision making around land use changes on farm (Edwards et al., 2023). Individual barriers such as age, education, access to information, life experience, family circumstances, lifestyle, finances and attitude to risk or change, impact individual views on land use change (Edwards et al., 2022; Journeaux et al., 2017). Changes to land use is driven by individual decisions and peoples' responses to economic opportunities (Journeaux et al., 2017). Land use change can be emotive and Bayne et al. (2020) suggested that afforestation is viewed as a permanent decision and once the land is in trees it cannot be easily returned to pasture due to removal of infrastructure, cost and land contour.

5 Overcoming barriers

Due to time and cost constraints associated with establishing large-scale native tree planting on private land, it is important that incentives and support mechanisms are understood by landowners and the wider farming community. For many rural landowners, there is interest in participating in tree support programmes to establish large-scale native tree planting, provided that monetary and non-monetary incentives are available (Polyakov et al., 2024). For many decades the New Zealand Government has provided multiple afforestation schemes at both the national and regional level, with some of these schemes being specific to native forestry afforestation. An overview of the current and past native tree planting afforestation incentive schemes are provided in Section 7.

5.1 OVERCOMING FINANCIAL BARRIERS

Section 4.1 identifies financial barriers as a major factor for landowners in relation to decision making around large-scale native afforestation on-farm. The major barriers included perceived loss of income from native trees, high establishment costs and the additional costs associated with participating in the NZ ETS. Another major barrier was the transaction costs involved in incentive programmes and that the payments do not typically cover the full costs

of establishment and the ongoing maintenance of the trees. Aotearoa Circle's Biodiversity working group has had similar findings to our conclusions in that there are a range of policy levers, financial incentives and updates to the NZ ETS which will narrow the financial gap currently causing monoculture exotic forests to be favored over biodiverse native forest (The Aotearoa Circle, 2020).

We have identified the following as ways to overcome the financial barriers identified above:

- Reorganise the policy system to consider incentives and rewards for good biodiversity management on farm.
- Simplification of the NZ ETS eligibility and application process.
- Monetary incentives and subsidies.
- Consideration of potential forest finance instruments.

5.1.1 Reorganise the policy system to consider incentives and rewards

Policy and regulation have an impact on farmer decision making and therefore land management decisions and inclusion of biodiversity on farm (Norton et al., 2013). Ensuring policy and regulation decision makers have a sound understanding of agricultural systems is very important to the success of sustainable changes at the farm level. Policy coordination between different business units within Ministry for Primary Industries (MPI), and between MPI and other central and local government departments can play an important role in facilitating the restoration of native forests (Forbes et al., 2020). Under the current policy and regulatory framework, Edwards et al. (2022) has suggested further monitoring, evaluation and data collection is a future requirement for any afforestation scheme or future tree planting funding so the Government has data to support evidence-based policy.

Government programmes, schemes or support mechanisms for native tree planting need to have clearly defined primary and secondary objectives (Edwards et al., 2022). Through determining the objective for the programme, tailored advice and approaches to the incentives can be personalised to the landowner.

It was outlined in A redesigned NZ ETS Permanent Forest Category: A discussion document on proposals to redesign the permanent forest category in the New Zealand Emissions Trading Scheme (NZ ETS) (Ministry for Primary Industries, 2023a) that under current ETS settings, there is a greater incentive to plant permanent exotic forests than native forests due to the higher possible returns from exotic forests. As part of the 2022 Managing Exotic Afforestation Incentives consultation, the main proposals to increase uptake of native afforestation was through restriction of exotic afforestation or through better enabling well-managed transition forests.

Biodiversity conservation objectives can support native afforestation on farm. Norton et al. (2020) suggest that we need to avoid letting our policy systems at the national, regional and district level from being a strict rules-based approach as this tends to reduce farmer innovation and can result in contrary outcomes. They also suggest that "we need to reorganise our policy system to incentivise and rewards farmers for good biodiversity management". Additionally, they suggest the sharing of resources between business, public, landowners and Government to help manage and restore biodiversity. This all needs to be backed with an independent verification system to empower a "true landscape partnership based approach".

Small and Maseyk (2022) suggest the following to be considered with future policy initiatives regarding biodiversity improvements on farm:

- Enhancing farmers' understanding of what native biodiversity is through:
  - Increasing awareness and understanding of the range and efficacy of on-farm behaviours for enhancing New Zealand's native biodiversity.
  - Increasing awareness about the private benefits of enhancing native biodiversity in their farm system.
- Enhancing knowledge of the positive social norm regarding on-farm biodiversity behaviour.
- Improving barriers to perceived and actual behavioural control and providing incentives to mitigate perceived and actual costs.
- Encouraging farm relevant pro-biodiversity actions in farm plans through goal setting.

The wider political environment drives changes to existing policy that could influence on-farm native afforestation. Under the current Coalition government, the time frame to cease the implementation of new Significant Natural Areas (SNAs) and to review the operations of existing SNAs as part of the reforms to the Resource Management Act, is unclear. There is an opportunity to integrate native afforestation on Farm Environment Plans to achieve multiple objectives such as managing soil health and freshwater ecosystems, integrating native biodiversity, responding to climate change and forage cropping (Beef+Lamb, 2024).

5.1.2 Simplification of the New Zealand Emissions Trading Scheme (NZ ETS)

The complexity of participation in the NZ ETS is a key reason for reluctance of landowners to participate in the NZ ETS. Edwards et al. (2022) suggest that simplifying the eligibility and application process would help to overcome this barrier. This includes streamlining and speeding up the process of NZ ETS eligibility determination and NZ ETS registration (Weaver, 2022). While there is an emerging focus on native plantings and restoration, there is limited knowledge on native forests' cash flow, carbon benefits and co-benefits, along with limited processing infrastructure and markets (Climate Change Commission, 2021d)). There needs to be future investment in updating the sequestration look-up tables for native trees to more accurately reflect the range of sequestration for different native species and at different geographic locations across New Zealand (The Aotearoa Circle, 2020). Future research with accurate regional data, broken down by species will strengthen landowner confidence with the NZ ETS look up tables.

5.1.3 Monetary incentives and subsidies

Financial barriers are one of the main barriers we found to large-scale native tree afforestation This was mainly driven by the perception that native forestry could not match the financial returns as agriculture could (Bayne et al., 2020). When considering incentives, it is important to understand what factors influence the farmer's decision in planting native trees. Financial mechanisms and monetary incentives are key to creating behaviour changes to land use changes. While monetary incentives may not trigger large scale native forestry conversions from pastoral land, they are a tool which can help influence native tree planting on marginal land (Edwards et al., 2022). Norton et al. (2020) suggests that we need to incentivise and reward farmers for good biodiversity management and financial and monetary incentivisation are a way in which landowners can be supported to make land use decisions on farm (Maseyk et al., 2021; Polyakov et al., 2024).

Incentivising and providing financial support for native tree enhancement and maintenance is a tool to help with the uptake of native afforestation on private land. Monetary incentives and subsidies have been a mechanism used over the last few decades to incentivise land use

changes. This is evident from the incentives table in the Appendix (Table A-2), which shows the increased expenditure on nature-based incentives programmes such as Jobs for Nature, which has been allocated $1.19 billion across nearly 500 different projects in New Zealand (Jobs for Nature, 2024).

Recloaking Papatūānuku (RP) is a proposed incentive programme looking to fund the reforestation of 2.1 million hectares of indigenous forests in New Zealand over the next ten years (PureAdvantage & Tāne's Tree Trust, 2023). It is projected to cost approximately $11.8b to $12.1b by 2050. Proposed indigenous reforestation treatments include new restoration planting, supported natural reversion and enhancing existing forest. Further work is currently underway on "incentive design, policy evaluation, market development and implementation planning" (PureAdvantage & Tāne's Tree Trust, 2023).

Bayne et al. (2020) suggest that not only Te Uru Rākau, but local Councils also need to provide farmers with assistance to help share financial risks of afforestation. This could be through funding or the provision of extension services, which are discussed in Section 5.2. Edwards et al. (2022) also note that rates rebates are already available for permanent native forestry under covenant for some regions and that a differentiated rebate, favouring native forestry could improve its uptake.

5.1.4 Consideration of potential forest finance instruments

Hall and Lindsay (2020) have identified a range of potential forest finance instruments that could be used in New Zealand context. These instruments have drawn on experiences from both New Zealand and from an international context. These proposed forest finance mechanisms could include examples of the following funds (Table 1):

Table 1. Example of forest finance instruments (Hall & Lindsay, 2020).

Proposed instrument	Context
Environmental Impact Bond	Pay for results. Using capital from multiple parties and re-allocates the risk.
Leveraged Carbon Fund	Acquiring a diverse land base and establishment of NZ ETS qualifies forests.
Continuous cover forestry fund (CCF)	Upscale continuous cover forestry (CCF) in NZ by bridging finance, facilitation and expert knowledge barriers.
Green covered fund	Issued by banks Bonds marketed to investors who wish to invest in climate mitigation project
Climate risk-adjusted loans	Financial products that reflect climate risk through settling interest rates. Offer low interest rates to forest managers who implement best practice
Community Funding programme	Project level structure for raising low-cost capital for the likes of local councils to deliver climate adaptation community resilience and biodiversity outcomes.
Natural climate solutions (NCS) exchange	Parties could purchase NCS to compensate for adverse environmental effects arising from development activities. Supply of NCS would be driven by conservation groups.

5.2 OVERCOMING NON-FINANCIAL BARRIERS

Non-financial barriers to large-scale native tree afforestation were identified in Section 4.2. The main non-financial barriers highlighted were biophysical barriers, regulatory barriers, the lack of knowledge/information and support for landowners, shortages in the labour force, challenges for the nursery sector and individual barriers. We have identified the following suggestions to overcoming these non-financial barriers:

- Access to specialised expert knowledge and professional support from industry groups and Government.
- Upskilling the work force.
- Improvements on the native seedling supply in New Zealand.
- Further research on the management of native forests in New Zealand.

5.2.1 Expert knowledge and professional support

It has been identified that landowners need to be able to easily access, experienced professionals to give them advice on the following aspects of establishing and maintaining large-scale native afforestation on their properties:

- Farm environment planning and modelling (to drive decision-making around land-use change).
- Finding seedling suppliers or providing seedlings.
- Help with funding applications or paperwork.
- Help with planting planning and species selection.
- Help with finding labour and reputable nurseries.
- Knowledge dissemination- including extension services.

Currently, organisations such as Te Uru Rākau and Farm Forestry New Zealand have a range of resources to help farmers with land use changes, decision making on native afforestation and understanding the complexities of the NZ ETS. Te Uru Rākau have advisory services, engagement teams on the ground and NZ ETS helpdesks to help landowners. The New Zealand Farm Association is another resource with varying levels of expertise to engage a particular audience (Farm Forestry New Zealand, n.d.).

A recent survey of catchment groups in New Zealand stressed their need for technical and administrative support to conduct their work, including native afforestation. Support could include machinery operators, species experts, hydrologists, planners, mātauranga Māori experts and legal advisors; while administrative support includes coordination of volunteers and support preparing funding applications (Sinner et al., 2022).
Pukekauri Farm has highlighted that many farmers lack farm modelling skills and are unable to apply results to their decision making around land-use and native afforestation, emphasising the value of hired expertise to support farmers where they have limited expertise (Dodd et al., 2023).

Professional support may also help landowners where they have limited time or resources available to carry out or coordinate native afforestation. The Wai Kokōpu project is mitigating this for farmers within the Waihī Estuary Catchment by employing skilled advisors and providing a free works coordination service for farmers to support them with organising planting and follow up management (Dewes et al., 2022). Polyakov et al. (2024) found that

Government help with planning and species selection and sourcing labour did not encourage farmer enrolment in planting programmes, however further analysis is required on the effect of the nonmonetary incentives that reduce transaction costs, such as assistance with the paperwork to enrol in the tree planting programmes.

Landowner access to expertise with local case studies have enabled decision-makers to better access the success of native tree implementation (Pohatu et al., 2020). By increasing the understanding and importance of biodiversity to the farm system, it will help shift perceptions towards biodiversity from a 'nice to have' to an investment opportunity that makes good business sense (Dominati et al., 2021).

Edwards et al. (2022) suggested that regional councils need to provide 'wrap-around' support to landowners in addition to providing financial support, to support those landholders who are considering planting native forests. Support for landowners is available to varying degrees from most regional councils, including roles dedicated to supporting landowners such as Land Management Officers (Bay of Plenty Regional Council, 2024). Much of this support is not captured in the literature and is beyond the scope of this review. However, many council employees working directly to support landowners would be well placed to provide further insights into motivations, barriers, and enablers of native planting on private land; as well as gaps and limitations in the context of institutional support and regulatory drivers.

Most regional councils also provide some form of fact sheets or online guides to native tree planting, with regionally specific information (e.g. Bay of Plenty, Waikato, Hawke's Bay). In some cases, these are now being developed as interactive spatial tools: A recent example in StoryMap format is the Otago Native Planting Guide (Otago Regional Council, 2024). Examples of more targeted approaches to improve native biodiversity on private land include Taranaki Regional Council's Key Native Ecosystem (KNE) programme, which provides free Biodiversity Plans to qualifying landowners (Taranaki Regional Council, 2024), however, currently this information is relatively general. However, the level of information and support provided differs significantly between regions, indicating a potential opportunity for greater sharing of tools, approaches and resources between different councils.

Regional Councils often also support catchment groups, as well as larger scale, collaborative projects such as the Waikato's Local Indigenous Biodiversity Strategy (LIBS) Pilot Project: Source to the Sea (Vare, 2016). In this project Waikato Regional Council worked with mana whenua, landowners, land managers and local councils, modelling and mapping ecological networks at catchment and zone scale; providing on-farm modelling to demonstrate that biodiversity management can go hand-in-hand with increased farm performance; and providing direct one-on-one support to landowners.

The requirement for Regional Councils to provide catchment context, challenges and values in the context of farm planning (Ministry for the Environment, 2023) (including significant species or ecosystems) may also provide an additional driver and/or opportunity to promote native planting on farms in key areas.

5.2.2 Skilled work force

A key challenge facing the afforestation of native tree species, is the labour resource required to undertake weeding, pest management and planting (Dewes et al., 2022). A skilled labour force will be required to meet the ambitious targets of New Zealand's climate change policies, while also ensuring that the growth of nurseries are supported during this growth phase of reestablishing native trees on to private land.

NZPPI (2020) reported the difficulty in attracting experienced and skilled workers due to a relatively low pay rate, and the improvements required in workforce training and capability. Therefore, they have considered the following as part of their action plan for native nursery capability:

- Improve the overall desirability of the industry through retention of skilled people, nurturing future leaders, celebrating successes, and communicating this story to the wider public.
- Demonstrate clear pathways for young people through the development of an industry workforce training and providing on the job training programmes.
- Industry training support of apprenticeship programmes and development of training programmes including online resources and practical workshops for native plant production, seed-collection and storage, germination, and propagation.

It is also important to consider other alternatives to traditional employment opportunities in the nursery sector and this has been investigated by Te Uru Rākau and Corrections through a planting pilot as part of the One Billion Trees programme, launched in 2019 (New Zealand Government, 2019). The primary objective of this pilot is to undertake forestry related training and work which will support prisoner reintegration back into the workforce and community and provide potential employment opportunities on release from prison. The nurseries provide plants, flowers, and seedlings to external clients under contract from regional councils or direct from the nurseries, all while giving prisoners the opportunity to complete a NZQA qualification in horticulture.

Skilled workforce could also come from inside the farming communities, as in the case of Wai Kōkopu catchment group. While we did not find specific leadership literature and on-farm native afforestation in New Zealand, Carroll (2021) recommended that "any government intervention must be built around the catchment leaders".

5.2.3 Native seedling supply

Finding native plant seedling suppliers and providing seedlings to land holders is viewed as one of the most influential non-monetary incentives that can influence on farm native planting (Edwards et al., 2022; Polyakov et al., 2024). To upscale the native seedling industry, significant investment is required to support the growth in nurseries (Polyakov et al., 2024). Historically, nurseries have been supporting farmers with plants for riparian planting, however, the recent growth of the native seedling industry could be unsustainable, as it has grown by 12-15% per year from 2017 to 2020 (The Aotearoa Circle, 2020). To ensure sustainable growth in the native seedling industry, market inefficiencies need to be addressed. For example, the majority of the demand for native seedlings comes from programmes such as the One-Billion Trees programme, which require more than 200 million native trees to be planted by 2028, and the majority of these plants are for roading projects, rather than on farm projects (The Aotearoa Circle, 2020). Partnership is required between Government, industry, and the public to ensure projects are delivered to the timeframes identified, as it is usually the nurseries that end up dealing with any financial risk with project delays. Further education on seedlings lead time for projects will help to reduce the friction between project managers and the nurseries, particularly as there is typically a two to four year lead time required to produce seedlings (Edwards et al., 2023).

5.2.4 Further research on the management of native trees in New Zealand

With an increasing interest in how exotic plantations can be transitioned to native forests, further direction and research is required to refine our knowledge of managing this transition

in a New Zealand context (Forbes, 2021; Forbes & Norton, 2021). There is also concern in the research community that the focus has been on planting and afforestation using native plants, while degraded or regenerating forests need as much consideration (Edwards et al., 2021). Consideration of the ecology in newly planted forests will face the same problems as degraded forests –poor seed dispersal, exotic weed competition, herbivory, and seed predation in their first few decades, and further research is required in this area (Forbes et al., 2020).

6 Māori motivations, barriers, and enablers for on-farm native afforestation

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

6.1 MĀORI CULTURAL MOTIVATIONS AND MATERIAL INTERESTS FOR NATIVE AFFORESTATION

For Māori, land, or "whenua," is not merely a physical entity but a sacred and ancestral connection deeply ingrained in their worldview. This profound relationship extends beyond a utilitarian perspective, emphasising spiritual, cultural, and familial ties to the land. Te ao Māori acknowledges the interconnectedness and interrelationship of all living and non-living things (Our Land and Water, 2020). Māori views on land also encompass the concept of kaitiakitanga, or guardianship, reflecting a responsibility to protect and preserve the environment for future generations, reinforcing the interconnectedness between the people and the land. To Māori, the land is viewed as a multi-dimensional asset, and they must give effect to their role as kaitiaki (Cortés Acosta, 2019; Pohatu et al., 2019; Tāmata Hauhā, 2024). The Māori understanding is that people are inherently part of the environment, and the environment is part of the people. Kaitiakitanga is an important Māori concept grounded in whakapapa (genealogy) and the interconnectedness of the natural world. It is about the value of natural resources, including birds, plants, fish, and other animals, and natural resources that sustain life, including people (Farming with Native Biodiversity, 2023a).

Te ao Māori, cultural benefits associated with native forests include mahi toi (artistic pursuits). For example, whakairo (carving), tukutuku (meeting house panels), raranga (weaving), rongoā (medicine), kaitiakitanga (preservation of species), toi rākau (making traditional weapons), whakatū rākau (weapon skill), and associated skills and cultural practices. On some leased land that has been returned to Māori (e.g., Ngāti Tūwharetoa ki Kawerau), Māori are planting native forests for cultural reasons (Climate Change Commission, 2021c). Mahinga kai is a culturally important practice as it connects people with the land, allows customary traditions to be passed down through generations, and provides a vital food source. The Farming with Native Biodiversity projects focus on mahinga kai as an essential consideration for indigenous land use practices, particularly in identifying areas where tree planting aligns with traditional knowledge and may provide species and mahinga kai.

Māori also have material interests in native afforestation as demonstrated by their participation in several initiatives that align with their values and indigenous land use practices, for example:

- A partnership in native nursery technology development that aims to scale up the production of native podocarps (Scion, 2017, 2019). Ngati Whare received $5.8 million under the Provincial Growth Fund to expand their nursery capacity from 250,000 to 1,000,000 plants per annum, employing locals, implementing a co-management plan with Scion's support and also supplied trees to the One Billion Trees Programme (Scion, 2019).
- The development of the Māori Forestry Strategy 2040 that outlines a "national vision to support Māori aspirations in forestry", under consultation (Ngā Pou a Tāne, 2023).
- Multi-use Ngahere Pilot Project, effective a "proof-of-concept towards a national scale tikanga-informed integrated forestry practice and data management system under the Māori Forestry Strategy". This system would capture a diversity of "intentions, aspirations, and goals in one place to lift the standards of performance, innovation, and productivity in forestry with te taiao environment and mokopuna next generations in mind" (Ngā Pou a Tāne, 2023). The project is funded under the Forestry & Wood Processing Industry Transformation Plan. While details of this project are not yet available, the expressed intentions include (Ngā Pou a Tāne, 2023):
  - "Multi-kaupapa forestry.
  - Forest and product credentials.
  - Sustainable forestry management policies, standards, guidelines, and methodologies for forest management.
  - Multi-exchange across many relationships.
  - Māori genomics in indigenous tree breeding and forest establishment.
  - Whakapapa benefit flow.
  - Data governance for Māori forestry decisions.
  - Integration of forestry technology systems.
  - Mātauranga Māori led brand stories, forestry systems and products".
- Māori have partnered in a project to process tōtara growing on Northland farms (Tōtara Industry Pilot, 2019).

6.2 BARRIERS FOR MĀORI LANDOWNERS

Barriers for Māori for afforestation, including on-farm native afforestation, remain the same as those that have been historically identified as evidenced in the submission "Taiao Mātāmua" suggesting "tailoring policies for Māori landowners is essential" (Mana Taiao Tairāwhiti, 2023).

In addition to the general barriers to native afforestation in Section 4, we have identified the following barriers for Māori landowners in implementing large-scale native afforestation on their land:

- The ownership structure of Māori freehold collectively-owned land can be complicated due to potentially hundreds of individuals having shareholding and there being generational interest in land use decisions on the land.
- Governance structures vary across Māori landowners; governance committees often have inactive participants who do not engage with the local landowners.
- Access to capital can prove difficult for Māori landowners due to challenges in conventional bank financing arising from the restrictions placed upon Māori land under the Te Ture Whenua Māori Act 1993. Under Te Ture Whenua Māori Act 1993 (the Māori Land Act), there are significant restrictions on transferring ownership of the land, whether

by succession on the death of an owner or through the selling or gifting of the land. The Act favours ownership of Māori land with the owners' whānau, hapū and descendants.
- Land management, funding and broad farming expertise and resourcing are significant barriers for decision-makers.

6.2.1 Māori-collectively-owned land

Pohatu et al. (2020), Cortés-Acosta (2019), the Climate Change Commission (2021c), and the Tax Working Group (2019) identified the critical challenges for Māori land, including historical contexts of Māori land use and development, trustee structure and Governance, trustworthy practical expertise, communication and decision-making and resourcing of Māori decision makers to support native afforestation and establishment. Te Ture Whenua Māori Act 1993 (TTWM) recognises that land is taonga tuku iho or a treasure for Māori people as land connects generations with their ancestors and future generations (Cortés Acosta, 2019). TTWM ensures the promotion of land retention in the hands of the owners, whanau and hapū.

The need to navigate complex restrictions created by the Māori Land Court rules about permanent changes to land and the multiple ownership of land are barriers to participation by Māori land owners (Kaine et al., 2023). Māori-owned land is typically communally owned, and culturally specific values can also constrain any land use decision (Edwards et al., 2022). Collective ownership of Māori freehold land is based on whakapapa or birthright. The number of owners increases as the population grows, perpetually diluting the distribution of the land shares as new owners do not need to pay for their ownership interests (Tax Working Group, 2019). Owners or shareholders of Māori land can be individuals or Whānau Trusts with interests in land blocks registered with the Māori Land Court (Tax Working Group, 2019). Succession, dilution and ownership fragmentation lead to many areas having little value and providing little return to their owners (McLean, 2002).

6.2.2 Māori land use Governance

The administration of Māori land can be very complex due to historical and cultural reasons (Cortés Acosta, 2019). For Māori land in multiple ownership, decision-makers often face additional challenges that restrict native afforestation on their land (Pohatu et al., 2020). TTWM 1993 dual objectives, of promoting economic use of Māori land and preserving Māori culture (Te Ture Whenua Māori Act 1993. The Māori Land Act 1993, 2023). The Māori Land Act 1993 has generated further challenges for Māori land management and governance (Kingi, 2008). Further challenges of Māori governance include: decision making connected to a two-tiered approach of trustees providing governance and staff and advisor providing implementation; committees chosen based on political influences instead of best available skills; need for balancing a wide range of aspirations and expectations regarding the land (Ministry of Agriculture and Forestry, 2011).

There is further complexity with Māori land due to 'private land holding' being a western construct and a one size fits all approach", rather than a Te Ao Māori concept (Pohatu et al., 2020). Decisions made on land use on Māori land can be time prohibitive, as it can involve many steps, and future generations also need to be considered (Cortés Acosta, 2019). When planning land-use investments, Māori also need to support the livelihoods of local people, return financial benefits to owners (Pohatu et al., 2020). Multi-decade commitments to afforestation and inter-generational land responsibilities further complicate the ability of decision-makers to create actionable change. Māori-owned land is typically owned and governed by many people; therefore, the following challenges need to be considered as described in Pohatu et al. (2019):

- Land trustees can be based all over the country; therefore, communication, trustee availability and ability to coordinate a wānanga or hui can be difficult to get a consensus.
- Varying relationships between trustees who live away from the day-to-day realities of the whenua and trustees and whānau who live on the whenua.
- Time involved in land decision-making is usually voluntary and not remunerated.
- Māori land governance requires a specialist skill base.
- Land use diversification is considered risky. Some land decision-makers are risk adverse.

6.2.3 Access to capital

Native afforestation projects require capital to outlay expenses such as nursery stock, planting, pest control or wind protection. This is a barrier to afforestation for Māori collectives that are asset rich but cash-poor (Climate Change Commission, 2021c). Loan financing through a standard bank lending scheme can be complex for many Māori entities. Challenges in conventional bank financing arise from the restrictions placed upon Māori land under the TTWM 1993. Under this Act, Māori land cannot be alienated, sold, transferred to general title, or forfeited as collateral without a decree from the Māori Land Court. Financial institutions are, therefore, hesitant to lend to Māori freehold land with multiple owners as the land cannot be used as collateral against default (Pohatu et al., 2020).

6.2.4 Access to specialised expertise

Access to expertise that can assess land use options for Māori land would require optimising for multiple objectives and clearly communicating the tradeoffs to decision-makers to meet aspirations for their whenua. Information discrepancies regarding land-use options are a significant barrier to decision-makers without them realising the full benefits of their land assets (Pohatu et al., 2020). With poor access to experts and relevant information, understanding the NZ ETS (requirements and potential liabilities) is a significant barrier to large-scale native tree uptake, and there is a significant need for improved effective communication amongst the decision-maker group and landowners (Pohatu et al., 2020).

6.2.5 Land accessibility

Landlocking affects access to Māori land. It is estimated that approximately 20% of all Māori land is landlocked in New Zealand (Waitangi Tribunal, 2024). This issue is significant for landholdings in the Taihape region as more than 50,000 hectares, totalling 70% of the remaining Māori landholdings, is affected (Waitangi Tribunal, 2024). It is expected that Māori apply and pay to retain access to this land, which undermines the Treaty of Waitangi, which guarantees 'full exclusive and undisturbed possession' of land. It is costly for Māori to restore access to these areas, with road networks focused on service of the more utilised land, leaving the land landlocked. Lack of roading, poor roading infrastructure and small or fragmented land blocks would present a barrier for economies of scale for production forestry (Climate Change Commission, 2021b) as these increase the cost of extracting products to market. In the case of carbon forestry, landlocked areas make it difficult or increase the costs of establishing and maintaining the forest.

6.3 OVERCOMING MĀORI BARRIERS

6.3.1 Building on cultural imperatives and exploring a ngāhere Māori model

Addressing the identified barriers for collectively owned Māori land requires acknowledging rangatiratanga, understating whānau/hapū/Iwi aspirations and an approach that upholds the Treaty of Waitangi (Climate Change Commission, 2021c). The Climate Change Commission

(2021c) argued that Iwi/Māori could partner in afforestation efforts in the short to medium term given the reasonably large areas of Māori collectively owned land, provided there is an appetite from Māori-collectives. Pohatu et al. (2020) suggested that a ngāhere Māori land-use model would follow kaitiakitanga and yield multiple benefits.

6.3.2 Establishing governance structures where these are lacking and adequate tikanga and processes

In some instances, collectively owned Māori land lacks basic governance structures. Landowner entities with governing bodies have better access to resources, advice and support and are more likely to see their plans implemented (Pohatu et al., 2019). Engagement and education from trustees or owner beneficiaries is required at both the governance and land owner levels to motivate decision-makers to make land use changes on farms (Pohatu et al., 2019). Dealing with absentee landowners and title fragmentation are complex barriers that Māori incorporations and Māori trusts address (Cortés Acosta, 2019). It is essential to allow adequate time frames for engagement within these governance structures, allowing enough time and space to deliberate, discuss and respond (Cortés Acosta, 2019).

6.3.3 Building and strengthening governance capabilities

Clarke-Nathan (2016) noted the importance of robust governance capabilities to make Māori land productive. Recent efforts to increase Māori governance capabilities include a trial training by Te Puni Kokiri that delivered governance skills, strategic planning, and financial literacy (Poppelwell et al., 2018), and other private Māori governance training providers (Te Whare Hukahuka, 2023) and academic organisations. Te Tumu Paeroa offers a free online governance training that are general in nature but targeted at Māori landowners and trustees to improve their governance skills and knowledge (Community Governance Aotearoa, 2023; Te Tumu Paeroa, 2023).

6.3.4 Partnering with groups of investors for different revenue streams and access to expertise

Tuahine (2018) suggested that groups of investors could come together under different revenue streams from native forestry, and each may pay for a portion of the establishment in return for the rights to revenue. This approach would share the costs and the risks and potentially access a pool of diverse expertise. While this concept is yet to be tested, the current initiative "Recloaking Papatūānuku" Programme by Pure Advantage and Tane's Tree Trust (PureAdvantage, 2023) is exploring funding native afforestation by approaching investors and raising public awareness. Accessing expertise from local case studies that have successfully implemented regeneration and demonstrated new planting approaches has enabled decision-makers to assess better the ability of these land-use options to meet their aspirations (Pohatu et al., 2020).

6.3.5 Partnering with the Crown to cover upfront costs of native afforestation

Different incentives discussed in Section 7 and Table A-2 in the Appendix have been made available for native afforestation. New policy options are being explored, for example, the Recloaking Papatuanuku" initiative proposes three policy options:

1. Landowners receive Crown financing to reforest land, repaying it through NZ ETS income. They own NZ ETS revenues and repay Crown loans.
2. Landowners get an upfront grant for reforestation, sharing costs with the Crown. They use NZ ETS income or carbon credit sales, sharing revenues with the Crown, which has a right of first refusal.

3. Crown funds reforestation and gets carbon credits in return. The Crown covers all upfront costs, and landowners receive a yearly incentive payment to support land use change.

The Climate Change Commission (2021c, p.20) identified the following opportunities associated with native afforestation for Māori-collectives:

- "Riparian planting can contribute to protecting water bodies from nitrate run-off and erosion.
- Potential to work with Māori-collectives already considering long-term strategies to replace exotics with natives, particularly species with longer growth cycles, for example, kauri, rātā, totara.
- Increased NZ ETS price could make afforestation a more viable option for Māori-collectives where previous barriers would have precluded afforestation as a land use option.
- Improved and increased hunting grounds to support the haukāinga/ahi kā and the marae (provided access is enabled and whānau are not locked off the whenua).
- Increased cover of indigenous forestry to support revitalisation and preservation of indigenous biodiversity, mahinga kai species and rongoā."

7 Native tree afforestation incentive schemes

There have been various incentive schemes set up within recent years to support landowners (or for local councils to support landowners) with native afforestation or related activities. A summary of these incentive schemes, including the scheme provider, status (currently open or closed – at time of writing this report), amount of total funds allocated, number of projects funded to date, and other general information including key eligibility criteria is provided in the Appendix, Table A-2 (Only post-1989 incentive schemes have been included).

Most of these schemes do not (or have not) provided support specifically for native afforestation, but also cover a broader scope for activities that include biodiversity enhancement, erosion control, planting exotic species, improving freshwater systems, nature-based training and employment, and protecting indigenous knowledge and practices.

7.1 EXAMPLE EVALUATION OF AN INCENTIVE SCHEME – THE ECFP

In a well-documented example of an evaluation of an afforestation incentive scheme, Velarde et al. (2019) provide an overview of the Erosion Control Funding Programme (ECFP; see Appendix). Although not limited to native afforestation, it is recognised that the lessons from this evaluation are applicable to specific native afforestation as well as broader erosion control incentive schemes. This evaluation provides insight into the barriers for implementation of the ECFP for afforestation, particularly for Māori, and lessons learnt for policy design. The fund was started in 1992 (previously known as the East Coast Forestry Programme) and despite multiple external and internal reviews which identified barriers to uptake of the programme, major changes took a considerable amount of time to be implemented. For example, it took 23 years since a Parliamentary Commissioner for the Environment (PCE) review in 1994 for the programme to start accepting community projects in 2017 (Figure 4). Further to this evaluation, Sharma-Wallace et al. (2020) highlight the importance of indigenous co-development of forest systems and adaptive governance as critical to success for the ECFP programme.

The ECFP for erosion control land treatments (including planted forest, reversion to native forest, and wide-spaced planting of poplar or willow poles) was closed in 2018 and currently just seeing through existing projects (Ministry for Primary Industries, 2023b).

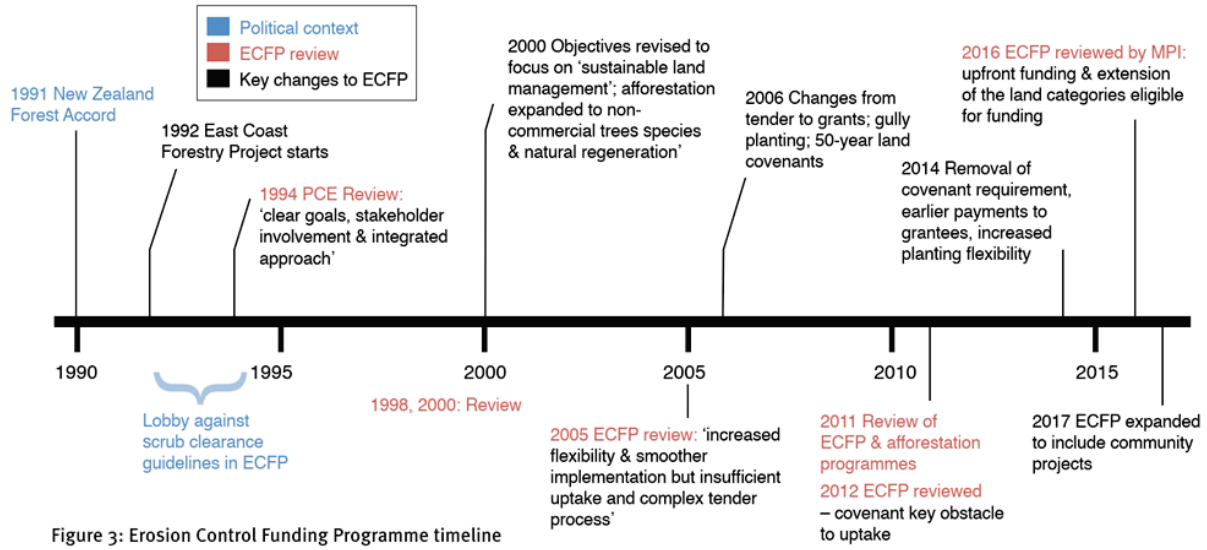

Figure 4. Erosion Control Funding Programme timeline (1990-2017). From Velarde et al., (2019).

A summary of the lessons for the design and implementation of afforestation programmes from Velarde et al. (2019; page 15) is provided below:

- "Meaningfully include Māori landowners' aspirations, values and assets in the design of afforestation policies, accounting for the quadruple bottom-line approach that includes social, cultural, economic and environmental aspects.
- Pay close attention to the local context, power relationships, equity issues and history to remove early barriers to afforestation.
- Increase the capacity of Māori to participate in decision-making processes through access to science, brokers and connectors, supporting local leadership and incentivising learning between different groups.
- Shortening the period between policy review and policy changes, making the learning process more agile and effective. This would also support the change of mindset from monitoring as a 'performance measurement tool' to a 'learning tool'."

8 Summary of knowledge gaps and recommendations

Based on the literature review, a number of key knowledge gaps have been identified for the barriers and challenges to on-farm native tree establishment:

- The role of farmer and catchment group leadership in the initiation, implementation and monitoring of native afforestation projects.
- No quantitative assessments have been completed on the impact of incentives for native afforestation and regeneration programmes in a New Zealand context.
- A lack of regional and national carbon sequestration values for different types of native forests for incorporation into the NZ ETS.
- Only a few experiences of carbon farming on Māori owned land are captured in the literature.

- Few studies compare financial and non-financial barriers and what impact they may have to areas planted in native forests on-farm.
- Non-financial incentives that may reduce administrative burden or transactional costs (e.g. assistance to enrol in tree planting programmes) are not well understood. If these were introduced, could it increase native afforestation?

Recommendations to overcome barriers and challenges to on-farm native forest establishment are either sourced directly from the literature or identified by the authors:

Catchment and farmer leadership

- Leadership skills are required to overcome the multiple barriers for native afforestation as it is implied from the examples presented in this literature review, Understanding the factors that have enabled this leadership is a knowledge gap that deserves further exploration from a assets-based/appreciative enquiry approach, building on existing strengths and mapping potential networks.

Funding streams

- Further research to identify additional financing mechanisms outside of the NZ ETS and an assessment on their potential impact to reduce the financial barriers of on-farm native establishment. For example, rates rebates, green bonds, environmental impact bonds, continuous cover forestry funds, climate risk adjusted loans, and community funding.
- Further research and assessment of ecosystem services in New Zealand to enhance financial incentives for native establishments either within the NZ ETS framework or as biodiversity credits.
- Streamline and simplify applications for funding and entry into the NZ ETS.

A key motivator for landowners to plant native trees is protecting their land from erosion, and recent cyclone events may have highlighted this further as a driver of change. Programmes explicitly targeting erosion control may therefore have a better chance of uptake.

Financial barriers, in particular the low financial returns from native forests, operational and transaction costs and the opportunity cost compared with other land uses, are a significant barrier to planting. Recommendations include:

- Identification of other market opportunities for native forest areas and species (e.g. totara oils) to provide diversification options to landowners and further incentivise native plantings. This should include consideration of mātauranga Māori.
- Inclusion of native trees for specific purposes, in agroforestry plantings together with other productive species.
- Further research and assessment on the value of ecosystem services in New Zealand to promote financial incentives for native tree establishment, either within the NZ ETS framework or as biodiversity credits.
- Research and development of a carbon accumulation model is required for native trees. This will allow landowners to be adequately rewarded for their carbon sequestration efforts.
- Further research to identify additional financing mechanisms outside of the NZ ETS and an assessment on their potential in New Zealand. For example, green bonds,

environmental impact bonds, continuous cover forestry funds, climate risk adjusted loans, and community funding.

To directly address non-financial barriers, there is a need to:

- Streamline and simplify applications for funding and entry into the NZ ETS.
- Improve understanding of how the non-monetary incentives that reduce transaction costs influence decision-making. To adequately understand these factors may require in-depth interviews with landowners and those supporting them directly, for example levy bodies, council staff and consultants.

Many organisations, in particular regional councils, are providing ongoing support and resources for on farm planting, with some excellent tools and support available. However, this is at different levels, stages and complexity depending on the region. It would be timely to engage with regional councils, in particular staff providing direct support to landowners such as land management advisors, to properly understand the most effective practical and regulatory options to improve and coordinate support for native planting on private land. Examples may include:

- Building on, improving and replicating or supporting existing programmes and tools that have shown (potential) benefit, particularly those that may achieve multiple goals, such as Trees for Survival and prison nurseries.
- More agile monitoring and evaluation of historical and current incentive schemes to establish lessons learnt and further enhance accessibility to schemes by landowners.
- Biodiversity extension resources to incorporate biodiversity targets and outcomes into existing farm planning. This could be achieved through the Freshwater Farm Plan framework.
- Development of a national best practice guideline for native afforestation. Including research based principles on ecosourcing, advice for farmers on where to incorporate afforestation vs leaving land for natural regeneration.
- Developing or building on tools, calculators and search engines:
    - The potential for newly developed tools such as the healthy waterways land management actions database (Healthy Waterways, 2024)
    - A centralised search engine of funding opportunities for native establishment with quick links to the application process (Tyas, 2023).
    - A centralised search engine for nurseries providing native species (Tyas, 2023).
    - An online network of forestry professionals with expertise in land identification for forestry, native afforestation including species selection, forest design and forest management to allow landowners, as well as farm consultants advising landowners, to easily access experts (Tyas, 2023). This could also include educational huis and wānanga.
    - Promote existing and refining online “calculators” for farmers to understand the true cost of native establishment to allow comparison to current land use on marginal land. Refining calculators so that regional differences can be estimated.

For Māori, there are a number of additional barriers. It is recommended to:

- Improve governance of Māori land by developing a series of governance, capability, and development programmes to assist those overseeing Māori entities to be better equipped to consider native afforestation as part of their portfolio of intergenerational investment.
- Shifting towards a holistic and equal consideration of all values will require learning from and applying mātauranga Māori (Māori knowledge) and applying tikanga and kawa (protocols and practices) to capture cultural values.

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Appendix

Table A1: List of native forest establishment projects on New Zealand farms included within this review.

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Pukekauri Farm The owners of this 295 ha mixed livestock hill country property have undertaken a development journey to improve sustainability across economic, social and environmental aspects of the farm. Part of this project has focused on establishing farm forestry and protecting areas of remnant native bush. Location: *Western Bay of Plenty* Timeframe: Since 1995, ongoing	**Key motivation – reducing soil erosion and estuary sedimentation** • Soil erosion was causing sedimentation damage to Te Mania awa and estuary. To mitigate this, a Land Environment Plan was implemented for the farm with unproductive grazing areas including critical source areas and steep erosion prone areas progressively retired from grazing into native forest. **Key barrier – limited farmer expertise** • The study concludes that mapping land use and land management to land capability will enable the development of a robust farm environment plan which can then drive farm change (including native afforestation), however many farmers lack the skills to do this and apply farm modelling results to their decision making. The study emphasises the value of hired expertise to support farmers where they have limited expertise.	(Dodd et al., 2023) (Dewes et al., 2022)
Kaitoto station A 1,500ha sheep and beef farm owned by the Haig whānau. The whānau have formed a carbon partnership investment with Tāmata Hauhā to create areas of transitional forest (establishing exotic species transitioning to native forest). Tāmata Hauhā are providing services	**Key motivations – restoring native forest and biodiversity, providing for future generations** • A key vision is to restore native vegetation and biodiversity to the farm which has predominantly been in pasture and bare hillsides for generations, while also improving the sheep and beef operation.	(Parkes, 2022; Tāmata Hauhā, 2024)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
such clearing scrub, creating tracks and supporting planting and maintenance. Location: *near Tikitiki, Gisborne region* Timeframe: Unknown when started; ongoing	• The whānau have a sense of belonging and kaitiaki to the land. They want to create a legacy for future generations, allowing them the flexibility to make decisions for their land, and also create a healthy lifestyle so that future whānau can thrive on the land. • A key success here is that Tāmata Hauhā have listened and understood what the whānau want and are working alongside them to achieve their aspirations for the land. This investment is providing the financial support and expertise needed for the whānau to transform their land and establish areas of native forest. **Key barriers – financial** • The whānau needed funding to improve the farm and establish forest but didn't want to lease out the land for long periods. The Tāmata Hauhā carbon partnership investment was an ideal solution for them.	
Perkins Farm Escarpment Revegetation The Ngā Uruora – Kāpiti Project Inc. is a registered charity organisation with an aim to restore the coastal forested areas of the Kāpiti – Porirua coast. The Perkin's Farm escarpment is an area of steep and exposed farmland that is adjacent to the main focus area of the Ngā Uruora native forest restoration work. Location: *Paekākāriki, Kapiti*	**Key motivations – aesthetic, environmental and community values, retiring steep erosion prone land** • The escarpment is considered an outstanding natural landscape under the Kapiti Coast District Council plan and restoring this area to indigenous vegetation will enhance the natural backdrop for the local communities along the Kapiti Coast and support the aim of "bringing back the dawn chorus" (bird song)	(Ngā Uruora Committee, 2013)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Timeframe: Started 2013, unknown if ongoing but mentioned in the Ngā Uruora animal pest control operational plan 2018-2021.	• The farm was transferred to NZTA ownership in 2013. If best practice farming is to be carried out on this land, then extensive and costly fencing is required, and this is considered uneconomic. **Key barrier/challenge – accessing steep areas for restoration** • The areas suggested for restoration are steep and access is difficult or unsafe, particularly for the extremely steep Paekākāriki Station escarpment area. Because of this, a natural restoration approach is recommended (besides fencing and removal of exotic weeds where possible).	
Wai Kōkopu A community catchment group with an aim to restore the Waihī Estuary Catchment, spanning an area of 34,000ha of which 6,540ha are steep and erodible. Part of this project involves supporting ngāhere restoration and establishment within the catchment. Location: *Pongakawa, Bay of Plenty* Timeframe: Started in approximately 2021, ongoing.	**Key motivation – reducing environmental impact** • For one case study dairy farm within the catchment (Ao Marama Farms), the farmers had decided to reduce intensity and negative environmental impacts of the farm after a period of intense growth in the dairy operation. Future plans for this farm include retiring areas to a mixture of native and exotic forest. **Key barrier – lack of time and resources** • Farmers often have a lack of time and resources to organise and carry out planting and maintenance, as resources are already stretched for day-to-day farming operations. This is being mitigated by the employment of skilled advisors by the wider Wai Kōkopu project. The use of advisors as a free works coordination service is available to farmers within the catchment, to support them with organising planting and follow up management.	(Dewes et al., 2022)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Unnamed case study farm discussed in Dominati et al. (2021) A 781ha property with flat to rolling topography dissected by steep gully systems. Predominant uses are sheep and cattle breeding and finishing, with large areas of indigenous vegetation. Location: *East Coast of North Canterbury* Timeframe: Modelled changes to the farm implementing a biodiversity enhancement programme over 10 years (2020-2030)	**Key motivations – N loss restrictions, enhancing biodiversity and habitat connectivity for birds, soil conservation** • Local government rules are in place to restrict N leaching losses, which is driving changes on farm. • Enhancing biodiversity by retiring grazing and planting native forest in areas surrounding the existing native vegetation and connecting existing remnants, as well as steep erosion prone areas to conserve the soil. The aim is to assist natural succession towards a mature forest state, protect a wetland and enhance connectivity for native bird habitat. **Key barrier – reduced farm profitability** • Modelling the implementation of the biodiversity enhancement programme showed that the net present value (NPV) reduced by 7% over 10 years. However, $/grazed ha increased slightly, suggesting that the areas retired from grazing were not contributing significantly to forage supply.	(Dominati et al., 2021)
Unnamed case study farm discussed in Dominati et al. (2021) A 151ha property with two thirds rolling and easy hills and the other third flat and poorly drained. Predominant uses are sheep and cattle breeding and finishing, with a small area of indigenous vegetation.	**Key motivations – reducing sediment and nutrient runoff, connecting native forest fragments** • Reducing sediment and P loading to the nearby coastal estuary in the Kaipara Harbour which the farm's stream network drains to.	(Dominati et al., 2021)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Location: *near Kaipara Harbour, Northland* Timeframe: Modelled changes to the farm implementing a biodiversity enhancement programme over 10 years (2020-2030)	• Fencing off areas to allow for both natural regeneration and connecting existing native forest fragments, while at the same time allowing for livestock movement and areas of shade and shelter. **Key barrier – reduced farm profitability** • Modelling the implementation of the biodiversity enhancement programme showed the NPV reduced by 8.7% over 10 years.	
Unnamed case study farm discussed in Dominati et al. (2021) A 2,091ha property which is part of a Māori Incorporation and has a mix of businesses including sheep and beef, dairy and forestry. The farm has varying landscapes from river flats to undulating and steep hills. Landscape erosion protection plantings (both native and exotic) has been a focus for the farm. This farm already has a considerable area of native bush and indigenous biodiversity and a history of restoration and management, providing a "good practice" reference for the other two case study farms within this review. Location: *near Taumaranui, Manawatu-Whanganui* Timeframe: Modelled changes to the farm implementing a biodiversity enhancement programme over 10 years (2020-2030)	**Key motivation – expanding native areas, habitat connectivity for birds** • The farm owners aim to increase the area of existing native trees and mānuka scrub and complement existing Ngā Whenua Rāhui covenants, with the aim of further enhancing habitat connectivity for native birds. **Key barrier – reduced farm profitability** • Modelling the implementation of the biodiversity enhancement programme showed the NPV reduced slightly by 3.1% over 10 years. However, $/grazed ha increased slightly, suggesting that the areas retired from grazing were not contributing significantly to forage supply.	(Dominati et al., 2021)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Michael Bird's family farm A significant slip occurred on this farm starting in 2012, resulting in a large loss of sediment and productive grazing land. Horizons Regional Council (HRC) provided support through the Sustainable Land Use Initiative (SLUI) programme, and funding was received from the MPI One Billion Trees (1BT) programme to plant mānuka on the erosion prone areas. Location: *Taihape* Timeframe: Since 2012 (the large slip occurred), planting programme ongoing	**Key motivations – erosion control, additional income** • Management of the large area of landslide slumping to prevent further erosion and sediment loss. Planting mānuka will both help to stabilise the land but also provide a source of income from the land via beehive placement (by a local apiarist). **Key barriers – lack of support** • When the slip first started occurring, the farmer found it hard to find support (before HRC agreed to support).	(Te Uru Rākau, 2020a)
Kūao Kau Uha Farm A 225ha family farm with a focus on prime beef finishing. A Biodiversity Management Plan (BMP) has been developed for the farm, which includes native afforestation. Location: *Northland* Timeframe: Since 2022, ongoing	**Key motivations – farmer enjoyment, enhanced environment and biodiversity, restore Kaipara Moana, mahinga kai, habitat connectivity** • The farmers have outlined their vision, which includes enjoying what they do and creating a beautiful environment with an abundance and diversity of native flora and fauna, for future generations to also enjoy. • They are also working with the Kaipara Moana Remediation Programme to restore the health and mauri of Kaipara Moana. • Mahinga kai values and species are mentioned in the BMP, and although not specifically mentioned, it is assumed that a motivation is to protect these species.	(Farming with Native Biodiversity, 2023a)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
	• Habitat connectivity is a goal for the project – creating a corridor of native canopy between two spring heads on the farm. **Key barriers/challenges – flooding, powerlines, pest animals** • Flooding is highlighted as a risk to terrestrial biodiversity and has restricted planting plans in some areas, particularly along river margins. • Areas planned for planting with powerlines require lower growing tree and shrub species to prevent contact with powerlines, restricting what can be planted here. • Pest animals including possums and rabbits pose a threat to establishing native plantings.	
Hororata Farm An irrigated 395ha sheep and beef farm (predominant use is beef finishing). The farm has very little native vegetation present, and a biodiversity management plan (BMP) is in place for the next 20 years which includes the restoration of native forested areas. Location: *Canterbury Plains* Timeframe: Presumed current; the biodiversity vision is for 20 years ahead	**Key motivations – restoring biodiversity, aesthetic values, shelter for stock, marketing advantage** • The farmers have a 20 year vision to restore native biodiversity on the farm and the Canterbury Plains, creating areas of habitat for native species particularly birds, which will also contribute aesthetically to the farm and provide shelter for stock. • Another benefit recognised by the farmers is that customers of their beef products can recognise the farm's efforts towards restoring native biodiversity (providing a marketing advantage, meeting market assurance programmes) – this will be supported by monitoring and recording changes in biodiversity.	(Clements, 2022)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
	Key barriers/challenges – establishing plants in dry, exposed areas; pest animals • Areas where there is a lack of irrigation and high winds will be limiting to plant establishment. • Pest animals including possums, hares, wild pigs and deer pose a threat to establishing native plantings.	
South Farm A 565ha sheep and beef breeding and finishing farm, which lies within the takiwā (district) of Ngāi Tahu. There are some areas of native vegetation present within gullies (mostly scrub and tussock), and a biodiversity management plan (BMP) is in place for the next 20 years which includes the restoration of native forested areas. Location: *West Otago* Timeframe: Presumed current; the biodiversity vision is for 20 years ahead	**Key motivations – restoring biodiversity, sense of pride** • The farmers have a 20 year vision to restore native vegetation and biodiversity on the farm, including supporting populations of native birds, healthy waterways, and regenerating native bush to provide a habitat for birds – and as a result, a sense of pride for what has been achieved. • Two threatened *Olearia* species are present and the farmers would like to protect these. Mahinga kai values and species are also recognised for protection within the restoration efforts. **Key barriers/challenges – pest animals, native species hindering regeneration** • Pest animals including possums and deer pose a threat to establishing native plantings. • Two native plant species that are present (pohuehue (*Muehlenbeckia australis*) and bush lawyer (*Rubus cissoides*)) are also recognised as	(Farming with Native Biodiversity, 2023b)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
	hindering regeneration within gully areas by smothering out other natives.	
MataRata Downs Planting Programme A 465ha sheep and beef family farm with a goal to restore areas of the farm native bush. Location: *New Plymouth, Taranaki* Timeframe: Started planting approximately 2019, ongoing	**Key motivations – family history, ongoing native forest and biodiversity restoration** • The farm has been in the family for generations and the current farmers have an appreciation for this history and the childhood spent there. • Outlined within the farm's business plan, one goal is to fence off a block of native bush area every 2 years. The aim is for the property to be "lush" with native forest growth and biodiversity.	(Trees that Count, 2024d)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
	Key barriers – • Not discussed.	
Rose Creek Farm Restoration A 140ha drystock farm purchased by the farmers in 2022. The property has a series of hills and valleys present with pockets of native bush surrounding small streams. Location: *Upper Moutere, Tasman* Timeframe: Since 2022, ongoing	**Key motivations – improving soil and water quality, create habitat connectivity** • The farmers have already fenced off streams and started planting some areas, with an aim to restore land previously used for sheep and cattle farming and improve the soil health and water quality in streams. • Another aim is to extend the bush areas and create habitat and wildlife corridors for native fauna. **Key barriers –** • Not discussed.	(Trees that Count, 2024g)
Riverland Dairy Farm Restoration Project A 194ha family dairy farm between Mt Pirongia and Mt Kakepuku. Extensive native planting has been ongoing since 2017, with some bush areas now well established. Location: *Waipa, Waikato* Timeframe: Since 2017, ongoing	**Key motivations – improve biodiversity, improve water quality, connect children to the land, waste reduction** • Key aims are to increase biodiversity on the farm, improve water quality of streams, and farm in a way that minimises environmental impacts. • The farmers two young sons are actively involved in planting and this is fostering an interest in conservation and a connection to the land.	(Trees that Count, 2024f)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
	• Native plants are sourced from a local business in biodegradable bags to reduce waste. **Key barriers –** • Not discussed.	
Ngahere Ngaruroro A small 16ha family farm. When planting started in 2007, the farm had only a single tree and the remainder was hill country grass. The family is aiming to continue to plant a small area of the farm each year to create areas of native forest. Location: *Hastings, Hawke's Bay* Timeframe: Since 2007, ongoing	**Key motivations – enhancing biodiversity, creating recreational spaces** • The main aim is to establish native forest over the whole farm and enhance biodiversity and provide habitat for native birds. • The project is also creating bush walking tracks for the family, friends and neighbours to enjoy. **Key barriers –** • Not discussed.	(Trees that Count, 2024e)
Glencree Estate - Kaikōura Biodiversity Planting Project A 680ha family owned property which was originally a high country sheep and beef farm, now retired and converted into a recreational estate. Native afforestation planting started three years ago and is ongoing. Location: *Kaikōura, Canterbury*	**Key motivations – regenerating land after earthquake, supporting biodiversity** • The vision of the landowners is to regenerate the natural landscape which had sustained considerable erosion damage during the Kaikōura Earthquake.	(Trees that Count, 2024a)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Timeframe: Since 2020, ongoing	• There is a diversity of native plant species close to the property and the owners wish to increase habitat and food sources for native birds and lizards. **Key barriers –** • Not discussed.	
Kupenga Farm An 837ha hill country sheep and beef farm with a 5ha area outlined for additional planting, extending an existing area of native forest. Location: *Tahunga, Gisborne* Timeframe: Since 2023, ongoing	**Key motivations – carbon reduction, erosion control, maintaining profitability and farming sustainably** • Multiple farm goals include reducing the carbon footprint of the farm, reducing erosion, and continuing to run a profitable farming operation in a sustainable manner. • An erosion prone, non-productive area of the farm adjacent to an existing area of native forest plantings is planned for planting, with an aim to stabilise the land. **Key barriers –** • Not discussed.	(Trees that Count, 2024b)
Lancewood Villa Forest A 12.5ha block which the owners purchased in 2010 and have developed into a permaculture farm with tourist accommodation, with a 0.75ha native forest remnant covenanted through the QEII National Trust, and an 8ha	**Key motivations – extending existing forest remnant, increasing biodiversity** • The existing covenanted area had ancient beech and podocarp forest present which includes threatened plant species and a diversity of	(Trees that Count, 2024c)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
area of grazed pasture planned for conversion to native forest. Location: *Upper Moutere, Tasman* Timeframe: Since 2011, ongoing	native birds. They wish to extend this area and enrich the existing plantings with a greater diversity of species. **Key barriers –** • Not discussed.	
Diane Strugnell's farm A 265ha beef farm. Working together with a Greater Wellington Regional Council (GWRC) representative, Diane decided to fence off a 7ha area of erosion prone land and a wetland to regenerate this to native forest. Location: *Porirua, Wellington Region* Timeframe: Approximately 2016-2019	**Key motivations – erosion control, council advice and farm planning** • The 7ha area was fenced off to allow for the land to regenerate to native forest and prevent erosion. The wetland area was also fenced off as recommended by the GWRC staff, which was also identified as helping with stock management "cows don't like walking through wet areas". This is a good example of positive engagement and support for farm planning between farmers and council staff. **Key barriers –** • Droughts, farm product pricing and tree supplies are mentioned as challenges for the wider Wellington Regional Erosion Control Initiative (WRECI); although it is not specified if these were challenges for this farmer.	(Te Uru Rākau, 2020b)
Wensleydale Station – Nick and Pat Seymour An 811ha sheep and beef farm with mostly moderately steep summer dry hill country. Location: *Whangara, Gisborne*	**Key motivations – erosion control, agroforestry, financial benefit** • The East Coast Forestry Project was introduced by the government in 1992, and more recently the Gisborne District Council (GDC) Sustainable Hill Country Project and Tairāwhiti Capacity Building and Erosion Control programme, to encourage planting or reversion to	(Farm Forestry New Zealand, n.d.)

Project description	Key motivations and barriers to on-farm native tree afforestation	References
Timeframe: Since 1962, ongoing	native forest and exotic trees to prevent erosion. A key priority is "to stitch the place together with trees" to prevent erosion. Trees are implemented on lower fertility soils and steep or unstable land unsuitable for stocking - "trees and livestock farming should complement each other, not compete". • There are 30ha of pre-settlement native forest remnants on the property which were protected by the farmers under a QEII covenant and fenced off from stock, with the aim to retain and enhance the biodiversity present. The farmers mention that the process of covenanting the land was a "good experience and painless". **Key barriers/challenges – flooding and drought** • Key challenges for the farm have been dealing with erosion and slumping caused by extreme weather events, particularly flooding and also drought. Although these are not specifically discussed in the context of establishing native trees or forest.	

Table A2: Current and recent financial incentive programmes available to support landowners in New Zealand for native tree establishment/afforestation or related activities.

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
Hill Country Erosion (HCE) Programme	Ministry for Primary Industries (Te Uru Rākau)	Open	$25 million (first 4-year programme)	14 regional programmes	General	**Offering:** Funding support in four-year blocks for regional erosion control projects which are beyond the capacity of councils to address on their own. The funding supports councils to work with landowners. **Eligibility:** funding is provided to regional councils however the support is ultimately provided to landowners in the form of council support, for erosion prone farmland. Not strictly for native trees/afforestation – also including exotic planting and other erosion control measures.	(Ministry for Primary Industries, 2023e)
Jobs for Nature (J4N)	New Zealand Government (multiple agencies)	Open	$1.19 billion	493	General	**Offering:** funding to bring people into nature-based employment to benefit communities and the environment. **Eligibility:** must be used for nature-based work activities. Not strictly for native trees/afforestation – includes freshwater related activities,	(Jobs for Nature, 2024)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
						fencing and pest control, and skills training for career development.	
Māori Agribusiness Pathway to Increased Productivity (MAPIP)	Ministry for Primary Industries (Agriculture and Investment Services)	Open	Not reported	Not reported	Māori	**Offering:** one-on-one support and expertise to improve the productivity of primary sector assets, transforming under-utilised whenua. **Eligibility:** for Māori landowners and trustees who have primary sector assets in collective ownership. Not strictly for native trees/afforestation.	(Ministry for Primary Industries, 2021b)
Ngā Whenua Rāhui Fund (NWRF)	Department of Conservation (DOC)	Closed	Reported for MKTF only	Reported for MKTF only	Māori	**Offering:** funding to protect indigenous biodiversity, including instating formal protection of whenua allowing landowners to uphold tikanga and tino rangatiratanga. Eligibility: for privately owned Māori land that represents the full range of indigenous biodiversity that was originally present. Includes indigenous forest remnants as well as other habitat types. Currently closed but there may be future funding rounds.	(Department of Conservation, 2021)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
Mātauranga Kura Taiao Fund (MKTF)	Department of Conservation (DOC) – administered through Ngā Whenua Rāhui Fund	Closed	$2.6 million	37 (as at 2022)	Māori	**Offering:** support tangata whenua to preserve their traditional knowledge in indigenous biodiversity management, tikanga, history, stories, and practise. **Eligibility:** for Māori applicants. Not strictly for native trees/afforestation, but the funded activities can support this. Currently closed due to over subscription.	(Department of Conservation, n.d.) (Ngā Whenua Rāhui, 2019, 2020, 2022)
Afforestation Grant Scheme (AFG)	New Zealand Government	Closed	$20 million	Not reported	General	Offering: funding to support tree planting projects. **Eligibility:** Not specific to any region. Not strictly for native planting – also included exotic plantings. Closed in 2018; replaced with 1BT programme.	(Ministry for Primary Industries, 2021a)
One Billion Trees (1BT) Programme	Ministry for Primary Industries (Te Uru Rākau)	Closed *(ran from 2019-2021)*	$67.3 million *(for grants projects – as at Jan 2021)* $67.1 million *(for partnership*	582 *(grants projects – as at Jan 2021)* 52 *(partnership projects – as at Jul 2020)*	General	**Offering:** funding to support tree planting projects. **Eligibility:** Not specific to any region. Not strictly for native planting – also included exotic plantings.	(Ministry for Primary Industries, 2023g)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
			projects – as at Jul 2020)	42 *(Crown Forestry joint ventures as at Sept 2023)*		Closed for new applicants but continuing support until 2028 for approved grants.	
Lottery Environment and Heritage Committee	New Zealand Government (Internal Affairs)	Open	$12.5 million (2022-23)	106	General	**Offering:** funding for plans, reports and one-off projects. Eligibility: Project must protect, conserve or promote natural, cultural and/or physical heritage.	(New Zealand Government, 2024)
Erosion Control Funding Programme (ECFP) – Landowner Grants	Ministry for Primary Industries (Te Uru Rākau)	Closed (2018)	$73.02 million contracted, $60.482 million spent	454	General	**Offering:** funding available for erosion control land treatments. Eligibility: Gisborne district only. Treatments included planted forest, reversion to native forest, and wide-spaced planting of poplar or willow poles. *Note: the $ allocated figures are approximate and rounded to the nearest $1,000*	(Ministry for Primary Industries, 2021c)
Erosion Control Funding Programme (ECFP) –	Ministry for Primary Industries (Te Uru Rākau)	Closed (2021)	$3.74 million contracted, $3.244 million spent	10	General	**Offering:** funding available for innovative projects to reduce erosion.	(Ministry for Primary Industries, 2023b)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
Community Grants						**Eligibility:** Gisborne district only, community projects only, must be used to address erosion issues. Not strictly for native planting – includes other activities related to erosion control measures. *Note: the $ allocated figures are approximate and rounded to the nearest $1,000*	
Whenua Māori Fund	Te Puni Kōkiri	Open	Not reported	Not reported	Māori	**Offering:** funding to support Māori land based economic, cultural, social and environmental projects which help strengthen whānau, communities, regions and the New Zealand economy. **Eligibility:** Available to trustees and owners of Māori freehold land only. Not strictly for native planting	(Te Puni Kōkiri, 2023)
Matariki Tu Rākau	Ministry for Primary Industries (Te Uru Rākau)	Closed (2023)	$5.16 million	188	General	**Offering:** funding for people to plant living memorials to honour members of the community.	(Ministry for Primary Industries, 2023f)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
						Eligibility: public participation encourages and plantings must take place on publically accessible land. Not strictly for native planting but there is a preference for indigenous species.	
New Zealand Emissions Trading Scheme (NZ ETS)	NZ Government	Open	Not applicable	Not applicable	General	**Offering:** New Zealand Units (NZUs; i.e. carbon credits each representing one tonne of CO_2) are earned when an area of forest is registered under the NZ ETS and as the forest grows. NZUs can be traded (bought or sold) within NZ. **Eligibility:** the forest area must meet specific size, cover and species requirements. For the permanent forest category, forests must remain for at least 50 years and not be clear-felled. **Note:** for native afforestation species, the carbon look-up table is based on information for mānuka and kānuka only and is called "indigenous forest"	(Ministry for Primary Industries, 2024)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
Permanent Forest Sink Initiative (PFSI)	NZ Government	Closed (Jan 2024)	Not applicable	Not applicable	General	This scheme is now closed and has been replaced with the permanent forest category within the NZ ETS. **Offering:** For areas covenanted, a reconciliation request for NZUs had to be submitted regularly, typically every 5 years. **Eligibility:** the forest areas were covenanted, with each covenant having its own specific terms.	(Ministry for Primary Industries, 2023c)
Recloaking Papatūānuku (RP) - proposal	Proposed to be funded by the Crown	Proposed 2024-34 (ongoing maintenance 2024-50)	Proposed $11.8-12.1 billion by 2050	Not applicable	General	Recloaking Papatūānuku is a proposal for a programme to fund the reforesting of 2.1 million hectares of indigenous forests in Aotearoa. Proposed indigenous reforestation treatments include new restoration planting, supported natural reversion and enhancing existing forest. **Proposed offering:** Three options are proposed, with option 3 suggested: “Crown funds reforestation and gets carbon credits in return. Crown	(PureAdvantage, 2023; PureAdvantage & Tāne’s Tree Trust, 2023)

Incentive Programme	Provider/s	Status	$ Allocated	No. projects funded to date	Māori or General	What is offered, eligibility criteria	Reference/s
						covers all upfront costs, and landowners receive a yearly incentive payment to support land use change." (PureAdvantage & Tāne's Tree Trust, 2023)	
Mahi by The Toha Network	Investors or donors, coordinated through The Toha Network	In development	Currently two pilots requiring $7.82million in funding (300,731 MAHI units)	2 (launching soon)	General	**Proposed offering:** A system based on MAHI, a tradeable unit that is used to fund network contributors carrying out nature-services for environmental regeneration in NZ, backed by measurable outcomes using claim templates. MAHI can also be traded for TOHA network tokens. Currently two pilot projects are launching soon and a preregister is open for MAHI investment.	(Toha, 2023)