Alt-F Reset: Examining the drivers of forestry in New Zealand

Summary document

April 2025

Parliamentary Commissioner for the Environment
Te Kaitiaki Taiao a Te Whare Pāremata

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Forests in Aotearoa New Zealand

Two main types of forests predominate in New Zealand: native forests that are maintained for their environmental, cultural and conservation values; and exotic commercial forests, which are managed for timber, fibre and (increasingly) carbon storage. The latter is vastly dominated by radiata pine plantations.

A lot of deforestation (removal of forests), reforestation (replanting former forests) and afforestation (establishing new forests) has been largely driven by short-term market and regulatory signals. In more recent years, the role of forests for carbon storage has created a new incentive for afforestation.

New Zealand's current approach to climate mitigation means that between 2022–2050, more than 900,000 hectares of new forests could be planted across the landscape.[1] While many New Zealanders may hope that much of this will be native forest, current economic and policy drivers, such as the New Zealand Emissions Trading Scheme (NZ ETS), make it more likely that these will be once again forests of radiata pine (*Pinus radiata*).

This report aims to inform discussions on future afforestation in Aotearoa New Zealand. It asks where we are currently headed and what some of the possible alternatives are. Specifically, it considers:

- What is currently driving afforestation in New Zealand and what effect is this having on our environment?
- What do we know about establishing native forests at scale?
- What are some of the most promising alternative exotic species that could be established at a greater scale in New Zealand? How much do we know about them?
- What do we know about long-term management of different types of forests and what management systems are possible other than clear-felling?
- What environmental impacts could result from greater uptake of alternative forestry systems (i.e. other than radiata pine under a clear-fell or carbon forest regime)?
- What is preventing greater uptake of alternative forestry systems?

To be clear, radiata pine has, and should continue to have, an important role in New Zealand's economy. Sited appropriately (and managed well) it is a highly valuable resource with many benefits. However, our current heavy reliance on a single species comes with environmental and economic risks that could impact the resilience of our forests. In some places the adverse environmental effects of the current clear-fell regime are simply too great to justify. Using forests to offset fossil emissions carries even greater risks. This report also investigates what wider changes are needed to address issues with our current approach to forestry.

1 Climate Change Commission, 2024. Advice on Aotearoa New Zealand's fourth emissions budget. Table 4.2.

What is a forest?

The term ‘forest’ can be defined in different ways. In this report, the term is used in its broadest sense and includes these different types:

Native forests are any type of forest dominated by native tree species.

Exotic forests are any type of forest dominated by exotic tree species.

Plantation forests are where trees are planted at scale for commercial purposes, such as wood production or carbon.

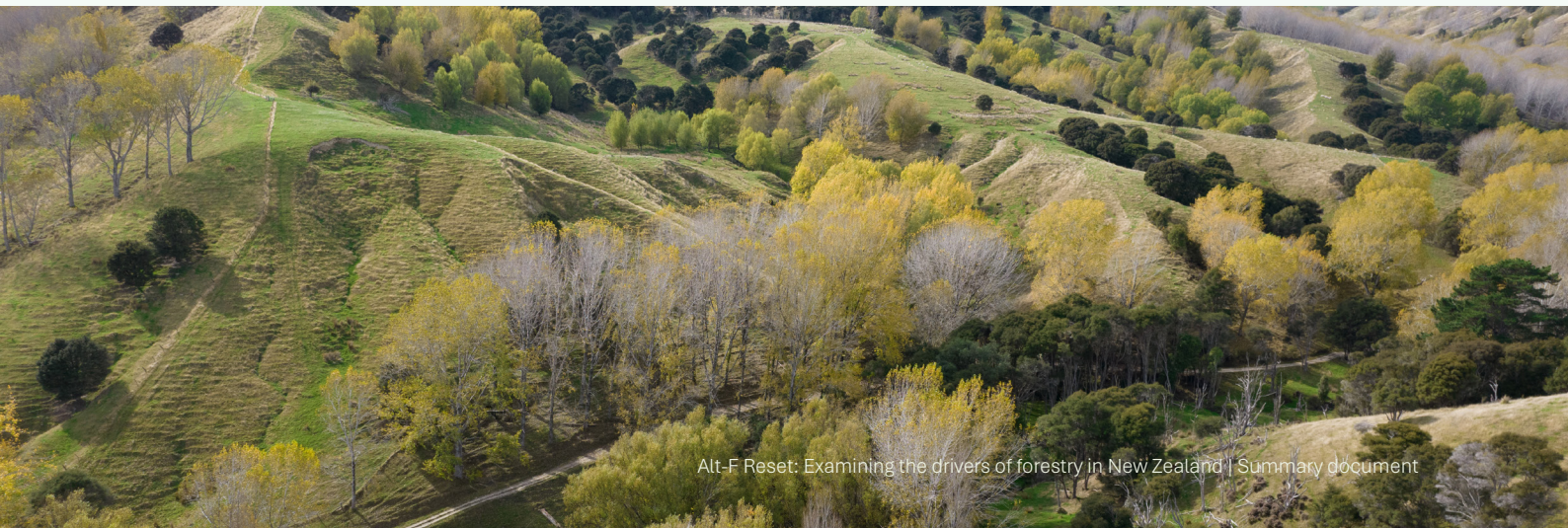
Production forests are managed for some level of wood (timber and pulp) production. This includes rotational forests that are clear-felled (and then replanted) and **continuous cover production forests** where harvesting is more selective and managed to maintain a high level of canopy cover.

Permanent forests are managed over the long-term (potentially indefinitely) while maintaining a high level of canopy cover.

Carbon forests are managed only for carbon sequestration and storage and will not be harvested.

An **alternative forestry system** is any forest in New Zealand that is not a radiata pine plantation forest managed under a clear-fell or carbon forest regime. The forest could consist of native and/or exotic species and be established for any purpose.

Ngahere is a term used by Māori for the broad purposes of defining a forest or any other land that predominantly has rākau (trees) on it. There are many words for forest in te reo Māori due to local dialectical differences. Here we use the term ngahere as it is the most common kupu (word) for forest.



What is the current state of our forests?

There are 10.1 million hectares of forests in New Zealand today, covering 38% of our land area. Of this, 8 million hectares are in native forests located on Crown, private land or whenua Māori, and 2.1 million hectares are exotic plantation forests.

Native forests

Native forests today cover about 30% of our total land area, reduced from an estimated 80% coverage in pre-human times. The total area of native forest has remained relatively static since 1996.[2, 3]

Native forests include the remnants of old-growth forest (native forests with large mature trees that have never been cleared by humans) and regenerating or secondary forests (areas that were deforested but have reverted or are reverting back to native forests).

Most native forests can be broadly classified as either beech forest or mixed broadleaf-conifer forest, with beech forests making up the largest area (approximately 60%).[4] These forest types are not distributed evenly throughout New Zealand, nor are they representative of the diversity of forests that existed prior to human arrival.

Many of New Zealand's remaining native forests are in declining or poor health. Decades of sporadic pest management mean that many forests have been ravaged by invasive plants and animal pests.[5] Climate change is adding yet more environmental stress. Better management is needed to improve forest resilience and stem further losses.

Some native forests have been established for commercial purposes, such as honey and timber production, and non-commercial purposes, such as enhancing biodiversity, improving water regulation and restoring the mauri of the whenua. These initiatives have been relatively small scale compared to the exotic forest estate, although government-funded afforestation programmes have boosted these efforts.

Exotic plantation forests

Of the 2.1 million hectares of planted exotic forest estate, approximately 1.8 million hectares (86%) are plantation forests managed for commercial production purposes (mostly wood and fibre).[6] These are predominantly on private land or whenua Māori.

Radiata pine is the dominant species, making up about 90% of our plantation forests by area. Decades of targeted research and development have created a highly efficient industry built around radiata pine. Large areas can be planted cheaply using improved seedling stock, clear-fell harvested at around 28 years of age, and replanted a couple of years later. This efficiency has been the cornerstone for a forestry industry that contributes an annual gross income of around $6.6 billion (1.6% of New Zealand's GDP) and employs some 35,000–40,000 people.[7]

The remaining 10% of plantations in New Zealand are made up of different tree species, predominantly Douglas fir (5% of plantation area) but also cypresses, eucalypts, redwoods and others. These alternative exotic species have generally been planted at small scales rather than large plantations, such as in woodlots on farms.

In recent years, the NZ ETS has incentivised the planting of both new production forests, where carbon credits provide an additional source of revenue, and carbon forests funded purely through carbon credits. Most carbon forests are plantations of radiata pine, selected for the high returns that its rapid carbon sequestration rate can deliver.

Box 2: Benefits of forests

While commercial forests afford obvious financial benefits, all forests (including radiata pine) can provide environmental benefits. These vary considerably based on the characteristics and management regime of the forest. Benefits can include:

- regulation of soil-water interactions, which reduces erosion, improves land stability, limits the impacts of flooding and improves water quality
- greater biodiversity and ecosystem resilience
- animal welfare through the provision of shelter, shade and food
- social and cultural values
- improving and restoring the mauri of whenua
- carbon sequestration and storage, contributing to climate mitigation efforts.

900,000 hectares of new forests could be planted by 2050.

Source: CCC, 2024

Māori and forestry

Māori play a key role in the forestry sector, making up a large part of the forestry workforce and owning large areas of exotic plantation forest (190,000 ha) and native forest (570,000 ha).[8] They also own more than half a million hectares of land covered in exotic forests, owned by private companies. In 2022, Māori forestry assets were worth $4.3 billion.[9]

Māori have special relationships with their whenua and ngahere that need to be considered when discussing the future of forestry. Many whānau, hapū and iwi see afforestation as a way of protecting Papatūānuku.

Historically, breaches of te Tiriti o Waitangi led to large losses of Māori land and disrupted the traditional relationships Māori had with forests. Some land was retained under Te Ture Whenua Māori Act 1993 or returned in Treaty settlements, but much of this is remote and marginally productive with limited options for use. Planting carbon forests has been one way of using this whenua to generate revenue, but it presents a challenge to Māori decision-makers working with an intergenerational timeframe, as it limits options for future land use.

Today, many Māori landowners are trying to use their land as a source of resilience for future generations. This includes generating income and employment through commercial forestry, holding land for customary purposes, and contributing to the protection and conservation of forest biodiversity.

2 https://www.stats.govt.nz/indicators/predicted-pre-human-vegetation

3 Ministry for the Environment and Statistics NZ, 2024. New Zealand's Environmental Reporting Series: Our Land 2024.

4 Wyse et al., 2018. New Zealand forest dynamics: A review of past and present vegetation responses to disturbance, and development of conceptual forest models.

5 https://www.stats.govt.nz/indicators/extinction-threat-to-indigenous-species

6 https://www.mpi.govt.nz/forestry/new-zealand-forests-forest-industry/about-new-zealands-forests

7 https://www.mpi.govt.nz/forestry/forest-industry-and-workforce/forestry-wood-processing-data

8 Ngā Pou a Tane, 2024. Tū Mai Rā! Te Whānau o Tāne: Growing the total economic value of our national Māori forest.

9 New Zealand Government, 2022. Te hau mārohi ki anamata: towards a productive, sustainable and inclusive economy: Aotearoa New Zealand's first emissions reduction plan.

Where are we headed?

Current economic and policy drivers have put New Zealand on a trajectory towards establishing vast areas of new exotic production and carbon forests. These forests are likely to mostly consist of radiata pine, given the species' current dominance in the industry and economic appeal for both wood production and carbon sequestration.

Timber production

The global demand for wood continues to be an economic driver for establishing new forests, as it was throughout the past century. Radiata pine remains New Zealand's preferred choice for timber production for many reasons, including its rapid growth, adaptability to a wide range of environmental conditions and versatility of use. New Zealand's forestry infrastructure has been developed around radiata pine, and no other species has been so well studied or developed.

The NZ ETS

The NZ ETS currently includes forestry and allows fossil fuel emitters to purchase unlimited forestry offsets (a unique feature of any of the existing schemes globally). If allowed to continue, this poses significant social and economic risks, including that:

- large areas of land will effectively become locked up in forests with carbon liabilities, severely restricting the option of future land use change
- productive land (including production forests) could be lost to carbon forests with impacts on rural communities
- future generations will be faced with the costs of maintaining a much larger forestry estate in a warming world
- the Crown may face implicit liabilities if forests established to offset emissions are damaged by pests, diseases or natural events.

Impacts of climate change

Climate change poses increasing risks to existing and future forests. These include:

- more extreme rainfall events, creating greater risk of erosion and slips with sediment and woody debris being washed downstream
- more extreme winds, increasing damage to forests
- increased fire risk in some areas
- increasing regional differences in rainfall – wetter in wet areas, drier in dry areas – causing stress to trees and making forests more vulnerable to pests and diseases
- the potential for increased spread of existing pests and diseases, and arrival of new biosecurity risks.

Production forests need to withstand changing environmental conditions until harvesting (about 28 years). This seems manageable. However, trees planted for long-term carbon storage will need to withstand changes over many more decades to form a permanent, self-sustaining forest.

In general, planting monocultures for long-term carbon mitigation purposes is unlikely to result in permanent, resilient forests. Regardless of the type of forest, ongoing management is likely to be needed.

2.44 million hectares of pastureland have been identified as potentially suitable for afforestation.

Where could future forests grow?

An analysis by the Ministry for Primary Industries (MPI) in 2024 identified approximately 2.4 million hectares of pasture that may be suitable for afforestation, with about 1.7 million hectares potentially suitable for permanent or production forest and another 770,000 hectares only suitable for permanent forests. The analysis identified large areas of the South Island as potentially suitable for afforestation, but most recent afforestation has occurred in the North Island.

Additionally, the Department of Conservation (DOC) had estimated that about 59,000 hectares of Crown land could be suitable for afforestation, and recently, the Government sought information from private parties who might be interested in planting trees on public conservation land.

What are the alternatives?

There is a range of alternative forestry systems that could be considered in New Zealand, including alternative exotic forests and management regimes, as well as the establishment of new native forests.

New native forests

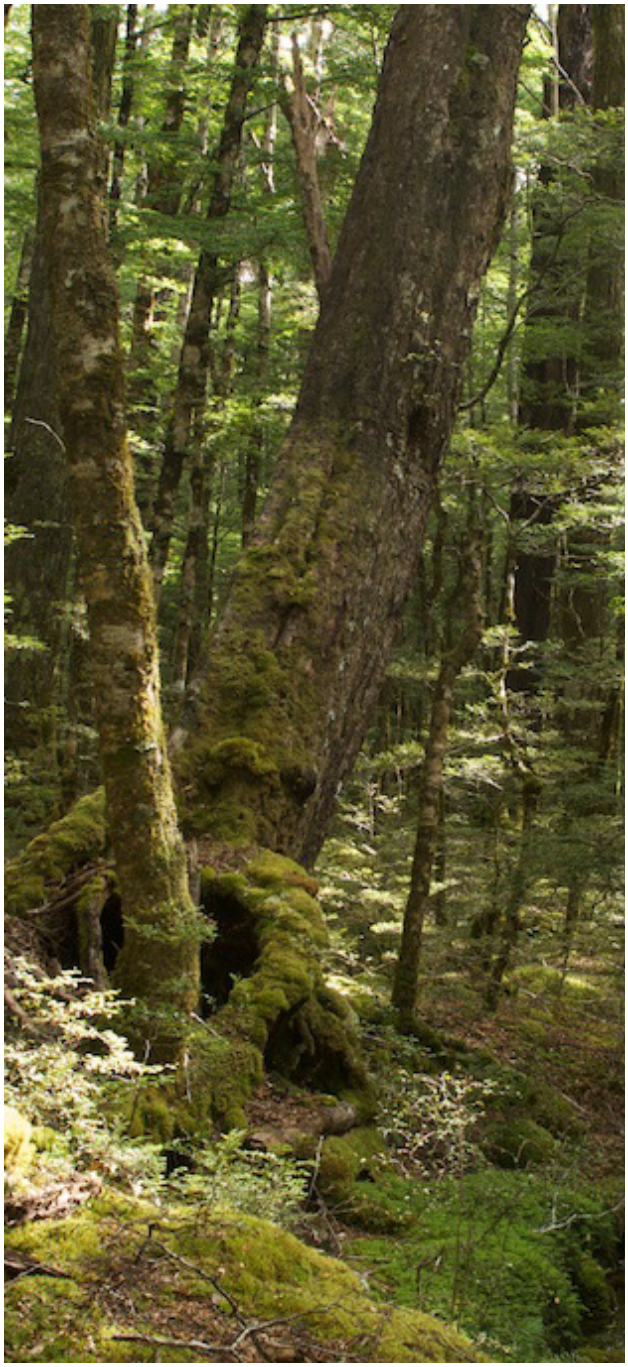
While there is a great deal of public interest in establishing new native forests, little is known about how to successfully do so at scale. Significant environmental changes have occurred since the arrival of humans in New Zealand, including land use pressures, the introduction of pest plants and animals, accompanied by the loss of native seed sources from many areas. This means that large-scale native afforestation is likely to need human intervention to succeed. This could range from simply aiding natural regeneration with browser and weed control, through to high-density plantings of a diverse range of native tree species. The best approach for a particular location will depend on various factors, including climate, topography, accessibility, presence of native seed sources, existing vegetation, browsing pressures and if any natural regeneration is already occurring. Costs increase with the scale of intervention. Assisting regeneration, combined with some targeted planting of native species, is likely to be more cost effective and achievable at scale than widespread planting.

In addition to the upfront costs of establishing the forest, there are potentially significant ongoing costs. Some degree of forest maintenance is likely to be required to manage the effects of plant and animal pests over the lifetime of the forest, particularly where tall, diverse forests are the aim. Without this help, new native forests will suffer the same fate as many of our existing native forests. Large-scale plantings have failed in the past due to a lack of maintenance.

Box 3: What could be gained from better management of existing navtive forests?

Some of the values being sought from new native forests could be achieved through better management of our existing native forest estate. Many of New Zealand's existing native forests are in poor health, but they are still highly valuable, supporting native biodiversity and providing substantial carbon storage, water regulation and erosion control, as well as cultural, recreational and amenity benefits. However, environmental and human-induced pressures, such as climate change or pests, mean that even retaining these benefits can be difficult. Better management is needed to improve forest resilience and stem further losses. A particular risk from a climate mitigation perspective is that failing to adequately maintain our existing native forests could see them become a major source of carbon emissions.

"Large-scale native afforestation is likely to need human intervention to succeed."



Beech forest, Lewis Pass, Canterbury
Source: Jon Sullivan, Flickr

Transitional forestry

Transitional forestry is a relatively new form of forestry, where fast-growing exotic forests are managed to transform into native forests over time. While the transition often involves radiata pine as the exotic crop, other exotic species could be suitable.

One of the key benefits expected from transitional forestry is that the approach could offer a more financially viable alternative to planting a native forest from scratch, with the transition to native forest being funded by the exotic crop's rapid carbon sequestration. However, research undertaken for this report by Manaaki Whenua – Landcare Research found that a 'carbon dip' is likely to occur during the transition, as the exotic trees are replaced by slower-growing native trees that (at least initially) hold less carbon. The carbon liability incurred during this time could be significant.

There is uncertainty around many aspects of transitional forestry, including:

- how to best manage the transition process and what the long-term outcomes may be
- the optimal planting densities for exotic crops and target native species
- the timing of the transition
- how carbon stocks could change over time and how the transition and ongoing forest management will be funded.

Alternative exotic forests

Alternative exotic tree species can complement radiata pine by offering diverse traits with different environmental benefits (and risks), as well as novel commercial and land use opportunities. Some could also act as a contingency species for timber production, should a biological disaster affect radiata pine – although no other species tolerates such a wide range of conditions as radiata pine.

The benefits and risks of exotics vary across species. Some species have traits that offer environmental benefits, such as strong interlocking root systems, which provide good erosion control, or being tolerant of shade, which makes them suitable for continuous cover forestry. Some are more susceptible to pests and diseases or are more flammable than other species. In many cases, the forest management approach will be a more significant driver of overall environmental impacts than the species of tree.

While there are many alternative species that could play a greater role in forestry in New Zealand, some have been more developed and attracted greater interest than others. Examples include coast redwoods, eucalypts, cypresses, poplars and the radiata-attenuata pine hybrid.

Alternative management regimes

There are a range of forest management approaches that are being applied at a small scale in New Zealand that could be adopted more widely.

Continuous cover production forestry retains a high canopy cover at all times with some low intensity harvesting, such as selective tree or small coupe harvest. This leads to the development of a mixed-age forest with greater structural diversity than a single-age forest. This approach combines commercial values with long-term environmental values, such as biodiversity, erosion control and carbon storage.

Agroforestry is the incorporation of trees within agricultural landscapes. This can include riparian plantings, shelterbelts and widely spaced trees within grazed areas. The integration of appropriate trees within pasture can reduce erosion in hill country and improve animal welfare through the provision of shade and shelter. Depending on the tree species, agroforestry can also provide fodder during periods of drought and feed shortage.

Many Māori landowners are managing commercial forestry and conservation forestry using **te ao Māori principles**, such as rangatiratanga, kaitiakitanga, mauri, whakapapa and ahikāroa. For example, some forests may be managed not only for timber production, but also for other activities, such as hunting by whānau.

"In many cases, the forest management approach will be a more significant driver of the overall environmental impacts than the species of tree."

What are the barriers to alternative forestry?

A more diverse forestry estate could offer environmental benefits, improve resilience and open up new economic opportunities, but multiple barriers are preventing this from happening.

NZ ETS

Under its current settings, the NZ ETS presents a range of issues and barriers to various types of alternative forestry:

- Fast-growing species, like radiata pine, produce better returns through the NZ ETS than slower-growing species, such as most natives.
- While there are regional carbon yield tables for radiata pine, other species are grouped together into broad forest types at a national scale, meaning that current settings may under or overestimate actual carbon stored.
- Practitioners of transitional forestry face uncertainty over how carbon stocks might change over time, how this would be accounted in the NZ ETS, and what carbon liability the forest owners may face.

Regulation

Different kinds of forests are subject to different sets of rules based on the species, type of land ownership, usage and whether they were planted or are naturally regenerating. Ongoing reforms of the resource management system mean that large parts of this framework are in flux, adding policy uncertainty to an already complex regulatory framework.

Some of the key regulatory barriers to alternative forestry systems are as follows:

- Under the **Forests Act 1949**, harvesting timber from existing or regenerating native forests on private land requires an approved plan or permit and only very small volumes of timber can be harvested. However, there are no restrictions on harvesting from planted native forests. This may disincentivise landowners interested in native timber production from supporting the regeneration of native forests – a far more cost-effective option than planting from scratch. There are also differences in how councils treat harvesting under the Forests Act.
- The **National Environmental Standards for Commercial Forestry** relies on a coarse erosion mapping tool for initial risk screening, which acts as a barrier to identifying where less intensive, small-scale forestry systems could be integrated into erodible landscapes.
- There were concerns that the identification of Significant Natural Areas (SNA) through the **National Policy Statement on Indigenous Biodiversity** could have disincentivised establishing new production forests with high biodiversity values (such as native forests and continuous cover forests) or the protection of biodiversity within existing production forests. The requirement for councils to identify SNAs has been paused until October 2027, but this offers little long-term clarity for a multidecadal venture such as forestry.
- Radiata pine is the most widely represented acceptable solution in relevant **Building Code** standards. While this does not exclude the use of alternative timbers in the building sector, it makes their use more uncertain, costly and time-consuming.

Economics

There are sticking points throughout the supply chain for alternative forestry systems that would need to be addressed to achieve scale and economic viability. Establishment and management costs can be high, and there is greater uncertainty about financial returns compared to a radiata pine clear-fell regime. For example, alternative production systems that involve longer rotations or lower intensity harvesting typically require high value timber markets to be economically viable. However, those markets may not be well developed due to inconsistent supply or quality of alternative timbers. Access to infrastructure, such as mills and transportation networks, can also be an issue, as can accessing quality seedstock and expertise in alternative forestry systems.

High upfront costs are a particularly important barrier for native afforestation, with high-density native plantings typically costing around $25,000 per hectare.[10] Costs can be higher than this on difficult terrain or where pest control or fencing is needed. Research into lower cost native establishment approaches is underway.

Various government funds have been set up to encourage afforestation, with the One Billion Trees scheme notable for promoting native and alternative species. However, these funds often do not fully cover the establishment costs of native species or, critically, long-term maintenance of afforested areas. Without long-term management, the health of the future forest and its benefits cannot be assured.

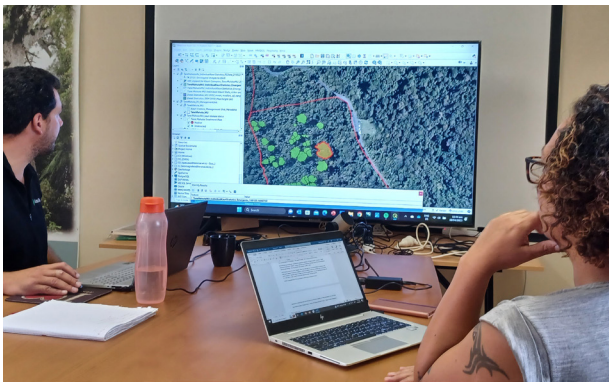
To justify greater investment in alternatives, the costs and benefits of the environmental services of both clear-fell radiata pine and its alternatives must be better understood. However, there are difficulties in measuring these services and questions over how any benefits should be financially rewarded.

Beyond these issues, other barriers to alternative forestry systems include resistance to change within the forestry industry, the costs of greater industry coordination and a lack of long-term direction for forestry in New Zealand.

Availability of information and research

Research and development gaps are another barrier. New Zealand has overwhelmingly invested forestry research resources into clear-fell radiata pine. Reliable information and expertise about every stage of the process from planting to processing is easily accessible. Investment in radiata pine research and development is ongoing and continues to exceed that of other species.

By contrast, we know much less about many of the steps involved in alternative forestry systems, from seed germination and establishment techniques to the economics of alternative management regimes and the properties of alternative timbers. This lack of information makes alternative forestry a potentially high-risk and expensive undertaking. When investment into alternative forestry has occurred, it has often been short-term and fragmented, and the findings not always shared. This has been particularly true of native afforestation initiatives, where the focus has been on upfront planting, with little ongoing monitoring or sharing of outcomes. We would already know a lot more than we do now about likely cost-effectiveness and success if learnings from these initiatives had been systematically collected and shared.



Te Roroa leader, Taoho Patuawa (left), demonstrates the GIS tools they use to manage *Phytophthora agathidicida* from their office in the Waipoua forest.

10 Based on a survey of native forestry practitioners, and assuming typical planting densities of 4,444 stem/ha, seedling supply from a commercial nursery, use of a professional planting crew, and one year of commercially implemented releasing and blanking. (Forbes Ecology, 2022)

"Māori have unique relationships with their whenua and ngahere that need to be considered when discussing the future of afforestation."

Barriers faced by Māori

Māori face additional barriers to alternative systems due to the physical limitations of their land.

These limitations are compounded by challenges with securing investment for development. Complex ownership structures make it difficult for Māori to sell land or secure capital for land development. Māori therefore need to generate their own funding streams or rely heavily on government funding to support development of their land. The NZ ETS offers a way of doing this and has driven interest in carbon forestry and transitional forestry as a route to establishing native forests.

However, rules within the NZ ETS can disadvantage Māori landowners, notably the rule that only land afforested after 1989 can earn carbon credits through the NZ ETS. Much of the land returned to Māori was already forested before this, so is not eligible to earn additional credits in the scheme.[11] Changes to NZ ETS settings have the potential to disproportionately affect Māori landowners.

Te waharoa at Riuwaka Resurgence, Kahurangi National Park

11 Forests established before 1990 were automatically registered in the NZ ETS from the start. Owners of these pre-1990 forests were issued some carbon credits as a one-off compensation payment, but they have surrender liabilities and must return credits if the land is deforested. They do not earn more carbon credits for any additional carbon sequestration.

Recommendations

In response to the issues raised in this investigation, the Commissioner has made 15 recommendations, which have been summarised below. For the full recommendations, refer to *Alt-F Reset: Examining the drivers of forestry in New Zealand*.

NZ ETS reform	
1	Reform the NZ ETS to phase out forestry offsets for fossil emissions. Use the increased auction revenue to fund targeted and locally appropriate afforestation in areas that need it most (e.g. permanent native forests on highly erodible lands; whenua Māori).
2	Create a separate 'biogenic' trading scheme that allows warming from biogenic methane emissions to be offset by production forestry with radiata pine and other suitable species.
3	At the very least, reform the permanent forest category in the NZ ETS. This should include requiring permanent forest owners to have a realistic long-term management plan for the forest, and creating categories, with associated rules, for different types of permanent forests.
Better risk management	
4	The Government should ensure that the long-term physical risks to the nation's forests and the financial risks that may accrue both to the forestry industry and to the Crown are systematically monitored, communicated and managed.
5	Investigate how the value of forest carbon sequestration in the NZ ETS could be discounted to reflect the risks of forest impermanence.
6	The Ministry for the Environment should investigate ways to ensure that forestry companies cover the costs of the environmental damage they cause. This could include the use of levies, other market mechanisms and revised regulation.
7	Ban clear-fell harvest in areas where it is identified as high risk. To do this, the most at-risk areas should be identified and mapped at a suitably high resolution.

Regulatory change for alternative commercial forestry	
8	Review the application of the Forests Act to native forests that are established through assisted natural regeneration.
9	Develop national guidance about how councils should treat native timber harvesting carried out in line with the Forests Act.
10	Initiate a process to approve more alternative timbers as acceptable solutions under the Building Code, including reviewing the membership of committees that approve these solutions.
Funding, information and research	
11	Focus future afforestation funding schemes on successful establishment and long-term maintenance. Funding sources for the ongoing maintenance of forests for ecosystem services could include revenue from NZ ETS auctions, payments for ecosystem services or taxpayer funding. Any publicly funded afforestation projects must include maintenance, monitoring and reporting plans.
12	Ensure that alternative forestry systems are given prominent treatment in any future prioritisation of environment and forest-related research.
13	Develop and maintain a publicly accessible data system to improve the availability and usability of existing knowledge about alternative forestry systems.
Forestry policy	
14	Governments should try to develop a level of cross-party agreement on the broad strokes of forestry policy, including the degree to which diversification of the forestry estate is desirable and what will be needed to achieve that.
15	Any reframing of forestry policies as suggested by this report must engage Māori from the outset.