



The Forests Dialogue

ENGAGE! EXPLORE! CHANGE!

Field Dialogue on Tree Plantations in the Landscape (TPL) in New Zealand 29 October – 2 November 2018 | Rotorua, New Zealand

Background Paper

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1. INTRODUCTION

The Forests Dialogue's *Scoping Dialogue on Intensively Managed Planted Forests* ('IMPF'; September 2015, Durban, South Africa) agreed to convene a series of field dialogues to discuss key issues associated with tree plantations, as a particular form of planted forests. The dialogue series was renamed *Tree Plantations in the Landscape* (TPL) to emphasise its focus, and the landscape context of tree plantations. TPL Dialogues are conducted in partnership with the New Generations Plantations Platform (NGGP¹), and with key stakeholders in each field dialogue location. The New Zealand TPL Dialogue is third in the TPL series, following field dialogues in Chile (May/June 2016) and Brazil (March 2018).

The Durban Scoping Dialogue agreed on five priority areas for future dialogue about tree plantations² (Box 1). Scoping Dialogue participants noted that the particular mix and emphasis of priorities discussed at each field dialogue would depend on its context.

BOX 1.

PRIORITY TOPIC AREAS FOR FUTURE DIALOGUE ABOUT TREE PLANTATIONS (DURBAN, 2015)

1. Plantation forests in the context of the global development agenda (as represented, for example, by the Sustainable Development Goals) & megatrends, and in the contexts of development at multiple scales, from global to local. This topic would also include consideration of:
 - the definition and scope of plantation forests and 'IMPF', and associated data and reporting issues;
 - articulation of a shared vision for the roles of plantation forests.
2. The design and implementation of plantation forests in the context of a landscape approach, and at different scales and geographies. This topic includes consideration of approaches to landscape-scale integration of forestry and agriculture, and of meeting

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multiple demands from and through sustainable productive landscapes. It also includes exploration of the contribution of plantation forests and planted trees of other forms to landscape restoration.

3. Approaches to enable good governance and inclusive development, including (but not limited to):
 - recognition of rights holders in decision processes;
 - implementation of the principle of Free, Prior and Informed Consent;
 - exploration of how different models of plantation forest development can act as models for inclusive development and locally-controlled forestry;
 - exploration of the complementary and synergistic roles of key actor groups (e.g. governments, financiers, businesses, consumers);
 - promoting of the flow of information between stakeholders and across scales.
4. Identifying key externalities associated with the development and management of plantation forests, from the perspectives of multiple stakeholders; identifying gaps in knowledge; and considering the net impacts and externalities of plantation forestry as key decision criteria. This topic would also consider the definition and assessment of environmental and social services associated with models of plantation forestry, and how they might be monitored.
5. The diversification of the forms and species composition of plantation forests, the sustainability of plantation forestry systems, and access to and use of new technologies.

Source: TFD IMPF2 Scoping Dialogue, Co-Chairs' Summary Report.³

The Background Paper for the IMPF² Scoping Dialogue⁴ also noted other relevant initiatives related to tree plantations that informed that Dialogue, and remain relevant here. Those with a global focus are shown in Box 2. The 4th International Congress on Planted Forests (Beijing, China)⁵ immediately preceded this Dialogue.

BOX 2. OTHER GLOBAL INITIATIVES RELEVANT TO TPL

- Global initiatives such as the New Generation Plantations Platform (NGPP)⁶ managed by WWF international, the International Union of Forest Research Organizations (IUFRO)⁷; and some civil society groups⁸: Forests Peoples Programme, Global Justice Ecology Project, and the World Rainforest Movement;
- The series of International Congresses on Planted Forests, the 4th of which immediately precedes this Field Dialogue⁹;
- Related TFD past initiatives¹⁰, including those on Free, Prior and Informed Consent (FPIC); Food, Fuel, Fibre and Forests (4Fs); Understanding Deforestation-Free (UDF); Genetically Modified Trees (GMT); Investing in Locally Controlled Forestry (ILCF); and Forest Certification;
- The FAO's statement of Principles and Voluntary Guidelines on Planted Forests¹¹;
- The Sustainable Development Goals (SDG), which encompass forests in various ways¹².

Research published since the initiation of the TPL Dialogue series also informs this dialogue. Amongst papers with a global scope are a systematic review of the socio-economic impacts of tree plantations (Malkamäki et al 2018), an exploration of new generation plantations (Neves Silva et al 2017), and a typology of plantations (D'Amato et al 2017). These papers are available separately.¹³

1.1 Chilean and Brazilian TPL Dialogues

The Chilean and Brazilian TPL Dialogues each focused on the five themes identified in Durban (Box 1), in the respective local context. Key points from each Dialogue are summarised in Box 3, and the Co-Chairs' reports have been made available separately (see also the TDF TPL website¹⁴).

BOX 3. KEY POINTS FROM CHILEAN AND BRAZILIAN TPL DIALOGUES

CHILE (May/June 2016)

- An inclusive view of tree plantations presents opportunities in the context of the global development agenda and of a landscape approach
- Opportunities for governance improvement at a regional (sub-national) level, with a reduction in asymmetries between different sectors, and allowing for more diverse participation
- Knowledge exchange allows social and economic development at a regional level
- A proactive dialogue on land restitution is necessary
- Opportunities to implement innovative models and technologies in tree plantations.

BRAZIL (Bahia and Espírito Santo; March 2018):

There was a recognition that many social and environmental issues were mitigated and addressed during the past 10 years. Changes in relationships between companies and communities were acknowledged; but there are still challenges to be addressed through:

- Engagement with other sectors and government, seeking to improve landscape governance
- Social justice in landscapes, considering cultural aspects and community autonomy
- New models for ecological restoration
- Landscape diversification, based on better land use, different species and products
- An improved dialogue platform with balanced and neutral participation
- New plantation models, considering sustainable intensification and climate change
- Monitoring and reporting of achieved results in social, economic and environmental aspects of TPL.

2. AOTEAROA NEW ZEALAND

2.1 People¹⁵

Māori people, the first people of Aotearoa New Zealand, voyaged from Polynesia to the islands they called Aotearoa some thousand years ago. Following European voyages of discovery from the mid-17th Century, British settlers began arriving in the country they called New Zealand from the early 18th Century. The 1840 Treaty of Waitangi, between Māori chiefs and the British Government, facilitated colonisation by British immigrants. Frontier wars followed for some 30 years as British settlement expanded. While the Treaty guaranteed Māori “the full exclusive and undisturbed possession of their Lands and Estates Forests Fisheries and other properties which they may collectively or individually possess,” a series of Acts of Parliament and legal decisions dispossessed them of all but c 7% of their land by 1900. Conversely, since the 1970s, a succession of legal and parliamentary decisions progressively restored Māori rights, including through a series of treaty settlements. Now, Māori “history, language and traditions are central to New Zealand’s identity”.¹⁶

Aotearoa New Zealand’s population is c 4.88 million, of whom Māori people comprise 14%. Some 75% of New Zealand’s population live in the North Island; a third live of the population live in Auckland, and another third in other major cities. The OECD17 notes:

“New Zealanders enjoy high living standards, with all components of the Better Life Index stronger than the OECD average except household disposable income and wealth. New Zealand substantially outperforms most other OECD countries on social connections, health status and overall environmental quality. High living standards are also reflected in a superior subjective measure of well-being. They are underpinned by robust institutions, good governance, generally best-practice policy settings, a stable macroeconomy and a high-quality education system. New Zealand also performs well on gender inclusiveness, with one of the smallest gender wage gaps in the OECD. However, disposable income inequality is above the OECD average, reflecting less-than average redistribution through taxes and transfers, and the child poverty rate, which is around the OECD average, is more than double the rate in the best performing OECD countries. Living standards and economic growth also vary considerably ethnically and geographically.”

The OECD report alludes to the disadvantage suffered by many Māori people. This is reflected in poorer employment, health and other social indicators¹⁸.

2.2 Government¹⁹

New Zealand has only two tiers of government. The national government is unicameral, with 120 members elected to the House of Representatives under a proportional system. Coalition governments are now the norm. The second tier of local government comprises regional, district and city councils. Under the Resource Management Act 1991, much of the statutory responsibility for environmental management is devolved to

local government. However, central government retains some oversight through the Environmental Reporting Act 2015.

Key central government ministries responsible for forests and forestry are the Ministry for Primary Industries (MPI), Ministry for the Environment (MfE) and the Ministry of Business, Innovation and Employment (MBIE). The newly-established Te Uru Rakau (Forestry NZ) is responsible for forestry generally, and the Department of Conservation (DoC) for conserving natural and cultural heritage.

2.3 Economy

New Zealand has an open, export-oriented economy, with a total value of c. NZD\$241 billion (USD\$170 billion). Primary products exports comprise c 30% of GDP, with agriculture contributing c. 40% of this value (dairy products – 24%; meat – 14%), and forestry c. 7%.²⁰

2.4 Land use dynamics²¹

Some 50% of New Zealand's land area is managed for pastoral agriculture, some 25% for conservation, and some 25% in other land-uses, including tree plantations. The other mixed land-uses include urban areas and the c. two million hectares (c 8%) of commercial forests. Over the past 25 years, the most significant land use change has been a switch from pastoral agriculture (sheep and beef farming) to dairying and forestry. Rural land use change is relatively permissive (ie market-driven), subject to operational (eg land quality and slope) and environmental constraints. Amongst the most significant of the latter is water abstraction and water quality; irrigated dairying, for example, can impact adversely on both these factors.

Over the past decade, dairying has been the most profitable agricultural land use, with an average cash surplus of NZD\$1600 /ha; forestry averaged c. NZD\$1200 /ha; and dryland farming c. NZD\$500 /ha. In this dynamic land use context, dairying now occupies around 2.1 million ha. Tree plantations expanded to a peak extent of 1.85 million ha in 2006, and have contracted subsequently to around 1.7 million ha.

3. NEW ZEALAND'S FORESTS AND TREE PLANTATIONS²²

The flora and fauna of New Zealand's native forests are also globally distinctive and highly endemic, reflecting the country's long isolation from other land masses. Both Māori and European settlement had major impacts on New Zealand's forests, through conversion, degradation and species loss. Today, some 38% (10.1 million ha) of New Zealand is forested, comprising 8 million ha of native forests (6.8 million ha of which are classified as 'tall' and 1.2 million ha as 'regenerating') and 2.1 million ha of tree plantations (with a corresponding net stocked area of 1.7 million ha). The national distribution of forests is shown in Figure 1.

The NZ Forest Accord, agreed between the government and all major stakeholder groups in 1991, agreed to focus management of native forests on conservation and to shift wood production largely to tree plantations.

3.1 Native forest tenure, values and management

Some 75% (5.2 million ha) of ‘tall’ native forests are publicly-owned and managed for conservation and other non-extractive services and values, largely under permanently-protected tenures of national park, scenic reserve or conservation areas. The remaining 1.65 million ha are privately owned and managed, including by Māori owners. The majority of private native forest is also managed for conservation, with wood production allowed only from the c. 85,000 ha that are covered by the Sustainable Forest Management Plans and Permits.

3.2 Tree plantations

3.2.1 Tree plantation history²³

State agencies played a leading role in establishing tree plantations and the plantation forestry sector in New Zealand in the first seven decades of the 20th Century, and the New Zealand Forest Service owned and managed some 50% of tree plantations in the early 1980s. However, as part of a major restructuring of New Zealand’s economy and institutions in that decade, most of the state-owned planted forests were sold to private companies, including Māori trusts and incorporated bodies; and the then New Zealand Forest Service was disestablished as the state exited from production forestry ownership and management. Te Uru Rakau (Forestry NZ) was established in 2018 as a state agency within MPI, with a broad range of responsibilities for forestry, including tree plantations.

3.2.2 Tree plantation species and tenure

Ninety percent (1.53 million ha) of tree plantations are radiata pine (*Pinus radiata*); Douglas-fir is about 60% the remainder, other conifers 20%, and eucalypts and other hardwoods 20%. Ninety-two percent of tree plantations are privately owned, including by Māori trusts and incorporated bodies; the balance is owned by different levels of government. Major ownerships are listed in NZFOA’s Facts and Figures²⁴.

Māori ownership of forests comprises a complicated mix of land ownership, forest investments, stumpage shares, management arrangements, hand-backs and forest purchases. Around 0.42 million ha of tree plantations are established on Māori land; this figure may increase to 0.68 million ha (40% of the plantation estate) by the conclusion of Treaty processes. Currently, c. 80,000 ha of tree plantations are owned by Māori²⁵. Plantation forest ownership by Māori is expected to increase as Treaty settlements progress, because many Māori see forestry as the best land use and selling the land will not be a viable option²⁶.

3.2.3 Tree plantation-based industries

The forestry sector is worth NZD\$3.55 billion (2016-17), about 40% of which is attributed to forestry and logging, and 60% to downstream activities. Ownership of both tree plantations and processing is highly international, and more than half the annual log harvest is exported as round logs. About half the value of exports (NSD\$5.44 billion, 2016-17) were round logs, and half processed products (see NZFOA²⁷

(attached), and at the NZ Planted Forests Portal²⁸). Log export volume and values have risen by some 16% in the year 2017-8²⁹; the principal destinations and products are summarised in Figure 2.

3.2.4 Tree plantation governance

State governance

New Zealand does not have a comprehensive national forest policy; rather, different elements of forestry are regulated by various instruments with more specific foci³⁰. The principal national legislation and policies relevant to tree plantations are summarised in Box 3. Forestry sector programs are now coordinated or facilitated by Te Uru Rakau (Forestry New Zealand), which was established by the current government as a business unit of the Ministry of Primary Industries. Its mission is growing trees, growing the economy, and supporting the planting of exotic and native forests and sustainable forest management.³¹

Private governance

Some 1.24 million ha of tree plantations are FSC-certified, and some 350,000 ha of these are also certified under the PEFC system³².

BOX 4. PRINCIPAL NEW ZEALAND NATIONAL LEGISLATION AND POLICIES RELEVANT TO TREE PLANTATIONS

| POLICY/LEGISLATION | RELEVANCE TO FORESTRY |
|--|---|
| Treaty of Waitangi (1840) | “The Treaty of Waitangi was signed in 1840 and is the foundation legal document that recognises the rights of Māori in New Zealand and their partnership with the Crown. Its principles are provided for in many pieces of legislation, including the RMA and Conservation Act 1987.” (Ministry of Primary Industries 2015: 174) |
| Resource Management Act (1991) | The RMA is the primary legislation for statutory resource management planning, having brought together laws governing land, air and water resources. ... The purpose of the RMA (section 5) is “...to promote the sustainable management of natural and physical resources”. (Ministry of Primary Industries 2015: 176) |
| Biosecurity Act (1993) | Collaboration between the government and the forest sector working to ensure that any pest incursion either does not occur (detected and neutralised at the border) or appropriate management of an incursion. Pest incursion is potentially the greatest threat to the plantation forest industry in New Zealand. |
| New Zealand Emissions Trading Scheme (2008) | “The New Zealand Emissions Trading Scheme (ETS) is the primary mechanism for the country to reduce greenhouse gas emissions and meet international commitments. It puts a price on emissions from most sectors of the economy and a value on carbon sequestration and storage to change behaviours through a market mechanism” (Ministry of Primary Industries 2015: 180) |
| National Policy Statement for Freshwater Management (2014) | “The Freshwater NPS directs regional councils, in consultation with their communities, to set objectives for the state of fresh water bodies in their regions and to set limits on resource use to meet these objectives.” (Ministry of Environment 2017) |
| National Environmental Standards for Plantation Forestry (2018) | “The NES-PF objectives are to: maintain or improve the environmental outcomes associated with plantation forestry activities increase the efficiency and certainty of managing plantation forestry activities.” (Ministry of Primary Industries 2018) |

Box sources:

Ministry of Environment 2017. <http://www.mfe.govt.nz/fresh-water/national-policy-statement/about-nps>

Ministry of Primary Industries 2015. *Sustainable Management of New Zealand's Forests: New Zealand's 3rd Country Report on the Montreal Process Criteria and Indicators*. <https://www.mpi.govt.nz/growing-and-harvesting/forestry/overview/montreal-process/>

Ministry of Primary Industries. 2018. <https://www.mpi.govt.nz/growing-and-harvesting/forestry/national-environmental-standards-for-plantation-forestry/>

4. FOCAL ISSUES

4.1 Opportunities for Māori forestry³³

Māori removed ~30% of the indigenous forests to provide shelter, cultural material, and open up areas for cultivation in the period prior to British colonisation. That colonisation catalysed further substantial forest loss, and appropriation of most Māori land by the British Crown. Since 1989, reparations and return of Māori land has been made under Treaty of Waitangi settlement negotiations. Land that had exotic forest on it was placed under the guardianship of the Crown Forest Rental Trust, who administered the land and collected rent on behalf of the future owners. As Treaty settlements were made, this forested land was returned to Māori ownership, and continues to be returned to Māori.

Māori currently control 520,000 hectares (c. 30 per cent) of New Zealand's exotic forest land, with the potential for that area to increase to 785,000 hectares within the next 10 years as further Treaty settlements are completed. In addition, an estimated 500,000 hectares of Māori land is non-productive with forestry a potential value proposition for some of this land.

This return of forest land to Māori through the Treaty settlement process is neither a simple nor straightforward process. Until forest land has been harvested by the leaseholder, Māori owners are restricted to receiving rent on the unimproved value of the land. The Crown Forest Rental Trust reports that the harvesting and return of land to Māori is happening, but at a rate as low as 4% per year, leading to land fragmentation. This fragmentation means that many Māori may have a long wait before having a critical mass of land to undertake their own (forestry related) activities.

Once land is returned to Māori ownership, the iwi (syn 'tribe') faces numerous challenges before the potential of their land can be realised through forestry. Some of these challenges include the level of investment required, the scale of land required, ownership structures, and the diversity of priorities within communities. As a result of these challenges, land is often leased to large forest companies, effectively limiting Māori participation in forestry and the financial returns they can derive from it.

While exotic plantation monocultures provide a financial return and some ecosystem services, they are somewhat of an antithesis of what Māori view as forests. Multiple use forestry provides opportunities for Māori that are more aligned to their beliefs, which look to include food, energy, natural medicines, carbon and non-timber products as part of a 'whole' forest. As such, some Māori have included co-cropping of ginseng with radiata pine, eco-tourism ventures, and starting manuka plantations to bet honey. Other

non-timber uses include access to iwi for hunting and traditional food and medicine gathering. There are current projects underway between Scion and Māori exploring land use designs that incorporate agroforestry to achieve the unique intergenerational social, cultural, environmental and economic goals of Māori; these include horticultural crops (e.g. Chilean “hazel” trees) and eco-tourism (mountain biking and eco-lodges). If the business case stacks up, the iwi can make investment decisions.

As Māori have been largely left out of true partnerships in the current pruned (timber grades) and millennium (timber grade + yield) plantation regimes due to the land issues mentioned above, there is discussion of a the carbon regime (species/genetics + stocking + soils + pasture/under-scrub), which could be used to demonstrate how planted forest ecosystems can store more carbon and create greater shared and intergenerational benefits. Given their more holistic view of the environment, a Māori carbon regime would be different to a Pakeha (European) carbon regime.

Forms of collective management have potential to mitigate the problems of fragmentation for Māori who want to play a more active role in the management of the forests growing on their land. While the commercial case for collectivism should not be overstated, some potential benefits include:

- ➔ Continuity of employment opportunities; planting, tending, harvesting;
- ➔ Continuity of wood supply to multiple markets and a price premium for scale and reliability of supply;
- ➔ Continuity of management and overhead efficiencies;
- ➔ Infrastructural efficiencies (e.g. roading, shipping, transport)

Recent hui (syn. assemblies) with Māori have identified five key priorities that they have for forestry in New Zealand:

- ➔ Build effectiveness (including economies of scale) through cooperative structures
- ➔ Greater and more effective use of Māori land
- ➔ Greater Māori ownership and control in the forest industry
- ➔ Increase Māori capability and capacity in the forest industry
- ➔ Develop an industry that meets the socio-economic and cultural aspirations of Māori.

4.2 Planted forests and New Zealand’s Paris commitments

In 2015, the New Zealand Government committed, under the Paris Agreement which it ratified in 2016, to greenhouse gas emissions reductions of 30% below 2005 levels by 2030. The New Zealand Emissions Trading Scheme (NZ ETS) provides a framework for emissions reduction: businesses that emit greenhouse gasses can, among other things, buy credits that allowing eligible forest growers to earn New Zealand emission units (NZUs) for forest carbon sequestration. The Government has recently announced plans to achieve zero net emissions nationally by 2050.

An Afforestation Grant scheme was established to encourage and support the planting of new forests to contribute to greenhouse gas reductions over the period 2015-2020. It aims to increase forest land by 15 000 hectares over this period.

4.2.1 Forests and the Emissions Trading Scheme (ETS)

Two categories of forest land are eligible for participation in the NZ ETS – post-1989 forest land and Pre-1990 forest land. Post-1989 forest land is defined as land that was previously non-forested, and on which forests were established after 1989. Owners of this type of land can voluntarily decide to participate at any time, and are entitled to receive NZUs for increased in carbon stocks, and pay units for any decreases. Post-1990 forest land is defined as land on which forests were established before 1990. Owners become mandatory participants when they harvest their pre-1990 forest land. They must pay NZUs for deforestation emissions, but do not receive NZUs for any increase in their forest carbon stock.

Some critics claim that the NZ ETS has not worked, largely due to the rise in dairying and relative profitability of different land uses compared to forestry supplemented with NZUs, and because of perceptions that establishing forests will lock that in as a land use. A Productivity Commission report noted that between 1.3M and 2.8M ha of new forest will need to be planted to realize a low/net zero emissions goal by 2050. Under the recent One Billion Trees Programme, the current government has set a goal to plant one billion trees over the decade to 2027. Climate change mitigation is one of the motivations for this programme, which is described below.

4.3 Te Uru Rākau and The One Billion Trees Programme

A key election promise of the current New Zealand Government was to re-establish a New Zealand Forest Service; Te Uru Rakau (Forestry New Zealand) was established as a business unit of the Ministry of Primary Industries. Its mission is growing trees, growing the economy, and supporting the planting of exotic and native forests and sustainable forest management. Its responsibilities include administering the One Billion Trees Programme (1BT), which is also a key initiative of the current government.

1BT seeks to establish a billion trees over the period 2018-2027 to realise the following social, environmental and economic benefits: diversification of income, investment in the future, improving land productivity and water quality, tackle environmental issues, reduce climate change effects, moderate river flows, provide habitat for native species, enhance natural landscapes, create jobs and develop more resilient communities. This planting programme is intended to be a mix of permanent (native) and commercially harvestable (primarily exotic) forests. A core principle of the programme is ensuring that the right tree is planted in the right landscape for the right purpose.

One half of the one billion trees are already in current commercial planting plans, with the programme hoping to double this number of trees in the ground. Two-thirds of the half billion trees not already planned are intended to be native species.

4.3.1 Funding 1BT

Te Uru Rakau also supports the ETS and forestry grants. These grants will be available to landowners, NGOs, iwi and government entities to enable planting. One such grant is the ‘kick-start’ grant to encourage joint ventures between private landowners and forestry companies. Further funding has been earmarked for erosion control programmes where Regional Councils can obtain funding to assist landowners in putting eroding hill country into tree cover.

The government has also created a Provincial Growth Fund (PGF) with \$3 billion over three years to enhance economic development in regional New Zealand. It has additional goals of creating sustainable jobs, enabling Māori, boosting social inclusion and participation, build resilient communities and help meet New Zealand’s climate change targets. The PGF will fund two new incentives announced through the One Billion Trees Programme, with \$240 million allocated, focusing on native forest restoration and on partnerships.

4.4 Sustainable intensification of the existing forest estate

New Zealand has been identified as one of a number of regions globally where there is potential to increase production from tree plantations. The New Zealand forest sector (including government agencies) aspires to grow New Zealand forest-based exports to \$12 billion per year by 2022 (from \$5.4 billion now), including through doubling forest productivity, to meet the anticipated global growth in demand for wood products. In this context, and in that of the competition between land uses of New Zealand, improving the productivity of the existing estate is essential, both for maintaining competitiveness of forestry and because there is limited scope for substantial expansion of the area of tree plantations.

Intensification of the existing forest estate is thus primarily driven by commercial forest owners, in partnership with government and research agencies. The sector sees both imperatives and benefits along the value chain resulting from intensification, with any attendant environmental issues addressed under sustainable forest management regimes and through certification.

As one manifestation of this partnership, a major national research program, *Growing Confidence in Forestry’s Future*³⁴, was launched in 2014, focused on doubling tree plantation productivity. It aims to:

shift forest management to ‘precision forestry’ through a system-wide approach integrating the latest advances in sensor technology, tree physiology, genetics, forest ecology and complex problem-solving. Precision forestry [is defined as]:

“Planning and conducting site-specific forest management activities and operations to improve wood product quality and utilisation, reduce waste, and increase profits, and maintain the quality of the environment.”

Productivity comprises both biological and operational elements, which need to be addressed in conjunction to realise maximum improvement. Some interventions are possible in existing plantations; others are associated with the establishment phase of new plantations.

Capacity for the biological productivity gains depends on the gap between actual and potential productivity on a particular site. Preliminary analyses for radiata pine in New Zealand suggest a gap of 20-25% in current versus potential productivity across sites, at least some of which could be addressed by more fully using the site. Historically, stocking rates in New Zealand have been lower (~200 stems/ hectare) than the modelled maximum to allow ‘space’ for pruning and greater growth in radiata; however, the price premium for large pruned logs has recently become less attractive, and so favours increasing stocking rates and total harvested volume. Current research is focused on identifying the maximum stocking which, combined with other intensification prescriptions, will not reduce wood quality.

Genetic improvement of radiata pine has been one of the foundations of the success of New Zealand’s tree plantations. Genetic improvement for improving productivity is now focused on matching specific phenotypes to specific sites, and ‘conventional’ breeding rather than on genetic engineering. However, there has been some work on genetic engineering of other genomes in the forest ecosystem (symbionts) to aid tree growth.

In New Zealand plantations, soil nutrients have historically not needed supplementing with fertilizer. The question of whether fertilizer inputs will be needed for third and subsequent rotations is under investigation. The use of fertilizer brings with it the risk of environmental impacts, such as nutrient leaching and loss of biodiversity; development of fertilizer technologies and practices in forestry to align with the state of the art in other primary production sectors may reduce these risks.

Operationally, improvements in the efficiency of silvicultural and management operations (site preparation, planting, weed management, pruning, thinning, harvesting and transport) can contribute to productivity improvement. Research is addressing these, including through increasing use of technology and mechanisation. In particular, new remoting sensing technologies, particularly LIDAR, are assisting researchers and managers better understand how the interaction of genetics, environment and management affect productivity and wood quality.

4.5 Plantation Forestry Value Chains

4.5.1 Wood processing and value-add in NZ planted forests

An overview of New Zealand forestry value chains is presented in Figure 3. Individual wood processors are, for the most part, not vertically integrated with forest growers and harvesting contractors. The processing industry is ‘represented’ by the New Zealand Wood Processors and Manufacturers Association (WPMA). The general categories of processing include pulp and paper, solid timber, panels and engineered wood products.

Pulp and paper manufacturers generally produce pulp for the paper industry and containerboard for industrial packaging. Solid timber products include structural timber, outdoor timber, mouldings, laminated and engineered timber, furniture, doors, windows and stairs, appearance grade timber and finger jointed products. Panel products produced in New Zealand include medium density fibreboard

(MDF), particleboard, plywood and veneer. Engineered wood products include cross laminated timber, laminated timber and laminated veneer lumber.

While these mainstream industrial wood products represent the overwhelming majority of value chains, there are also a number of emerging niche processed products. Some of these products include essential oils from wilding pines and wilding Douglas firs. In other cases, planted forests have provided value-add opportunities outside of wood products. For example, Ernslaw One, stocked their fire ponds in the Otago region with freshwater crayfish as an additional revenue stream when log prices dropped. However, the success has meant that they continue to stock these ponds, develop new ponds specifically for the crayfish and are looking at ways to increase the carrying capacity of existing ponds.

Manuka, a native tree long considered a pest species, has been increasingly planted in large tracts to be used for manuka honey production, as well as the extraction of manuka oils. These products are produced in New Zealand and command high prices in the global marketplace.

4.5.2 'New' value-added operations and opportunities

Scion, the New Zealand Forest Research Institute has been at the forefront of developing new and innovative value-added options for wood and wood waste in New Zealand. Some of the key achievements to add value from, for example, lignin and other bio-based resources include wood fibre plastic composites, lignin-rich bioadhesives, bio-based materials for 3D printing, and lignin-based nanofibers. In plastics, Scion uses wood fibre to reinforce plastics and produce products that are stronger, stiffer and have greater thermal stability. These plastics deliver increased performance, are easy to use, are sustainable, and cost less than other fibres.

In addition to plastics, Scion has developed bioadhesives that are free from petrochemicals and formaldehyde, made from renewable lignin (a byproduct of papermaking). These bioadhesives are water-based, non-toxic and able to be used in existing manufacturing equipment. Scion is also involved in developing improved packaging, including paperboard boxes, packaging materials and surface treatments for packaging.

Scion has also partnered with industry in the development around biofuels. Sustainable bioenergy and biofuels can be produced from forestry, other biomass and industrial side-streams. The Biofuels Roadmap study examined large-scale production and use of liquid biofuels in New Zealand. Biofuels from forestry can reduce greenhouse gas emissions, including international commitments for their reduction, encourage regional economic growth and employment, and maintain access to international markets for New Zealand goods and services. However, a biofuelled future is only likely to happen with national-level leadership, large investment and industry taking ownership of delivery.

4.5.3 Log exports vs. local processing

There has been intense discussion and tension around the wholesale export of raw logs from New Zealand for processing overseas, rather than selling to local processing operations. Currently, some 57% of wood harvested is exported as logs (Figure 3).

5. CONCLUDING DISCUSSION POINTS

The unique natural and cultural history of Aotearoa New Zealand, and its contemporary environment, economy and society, provide a similarly unique context for tree plantations. For nearly a century, tree plantations have been a significant land use, an important contributor to the economy, and a means of delivering some environmental services. They are now important for Māori as well as non-Māori peoples, and could become more so as Māori ownership and enterprises develop further. The New Zealand forestry sector's goals to double productivity and more than double export value, and the New Zealand Government's 1BT program, define ambitious goals for tree plantations and their value chains in of Aotearoa New Zealand's future.

In this context, the experience of plantation forestry in New Zealand informs the focal questions of this TPL Dialogue:

1. What can we learn from the Māori approach to forestry that can add value to forestry management systems for improved sustainability?

Underpinning this question are:

- ➔ recognition of the Māori holistic view of the environment, and how plantation forestry can deliver cultural, economic, environmental and social benefits in that context;
- ➔ the opportunity for Māori-science innovation. *Given the history of land alienation, a key benefit of the 1BT program can be partnering with Māori to co-design new systems that they want to implement and manage on their lands.*³⁵ How can this ambition best be realised?

2. How can intensification and extensification through the 1 Billion Trees Programme promote tangible forest ecosystem services for regional development?

The environmental goals of 1BT include the improving land productivity and water quality, tackling environmental issues, mitigating climate change effects, moderating river flows, providing habitat for native species, and enhancing natural landscapes; its economic and social goals include diversification of income, investment in the future, creating jobs and developing more resilient communities.

A core principle of the programme is ensuring that the right tree is planted in the right landscape for the right purpose (RTRP2):

*This approach thinks beyond the existing paradigms (e.g. silo industries, conservation or production, and existing forest systems) to what could be new future regimes of mutualism, ... to identify new options and pathways to transformation with diversified land use systems involving forests and trees ...*³⁶.

How can this ambition best be realised?

3. What sustainable intensification research and practices can maximise timber production on existing forest estates?

Sustainable intensification rests on an integrated science and management platform that characterises individual sites and stands, informs management choices and decisions in the context of markets, and is responsive to new challenges and opportunities. It requires sustained and well-directed investment.

Sustainable intensification was the focus of a number of sessions at the 4th International Congress on Planted Forests (Beijing, China), immediately preceding this Dialogue; and dialogue will be informed by those who participated in those sessions.

4. How can planted forests support New Zealand to meet its Paris commitments?

New Zealand's climate change commitments and policies have recognised the role of planted forests from the outset. The potential of planted forests in climate change mitigation is emphasised by the IPCC's recent Special Report on *Global Warming above 1.5°C*, which identifies the importance of carbon dioxide removal (CDR) to limiting temperature rise, and afforestation and sustainable intensification as two possible components of CDR. It also notes that "Limitations on the speed, scale, and societal acceptability of CDR deployment hence determine the ability to return global warming to below 1.5°C following an overshoot."³⁷ These points echo those which underpin the TPL Dialogues (Box 1), and underline the global significance of dialogue about tree plantations.

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7. APPENDICES

TPL Co-Chairs reports from Durban, Chile, and Brazil

- ➔ **Durban:** https://theforestdialogue.org/sites/default/files/impf2_scoping_dialogue_co-chairs_summary_0.pdf
- ➔ **Chile:** https://theforestdialogue.org/sites/default/files/2016_3008_cochair_chilerrr.pdf
- ➔ **Brazil:** https://theforestdialogue.org/sites/default/files/tpl_brazil_2018_co-chairs_summary.pdf

NZ Third Country Report to Montreal Process C&I

- ➔ <https://www.montrealprocess.org/documents/publications/general/2015/NewZealandThirdReport-MontrealProcess.pdf>

NZ Forest Facts & Figures

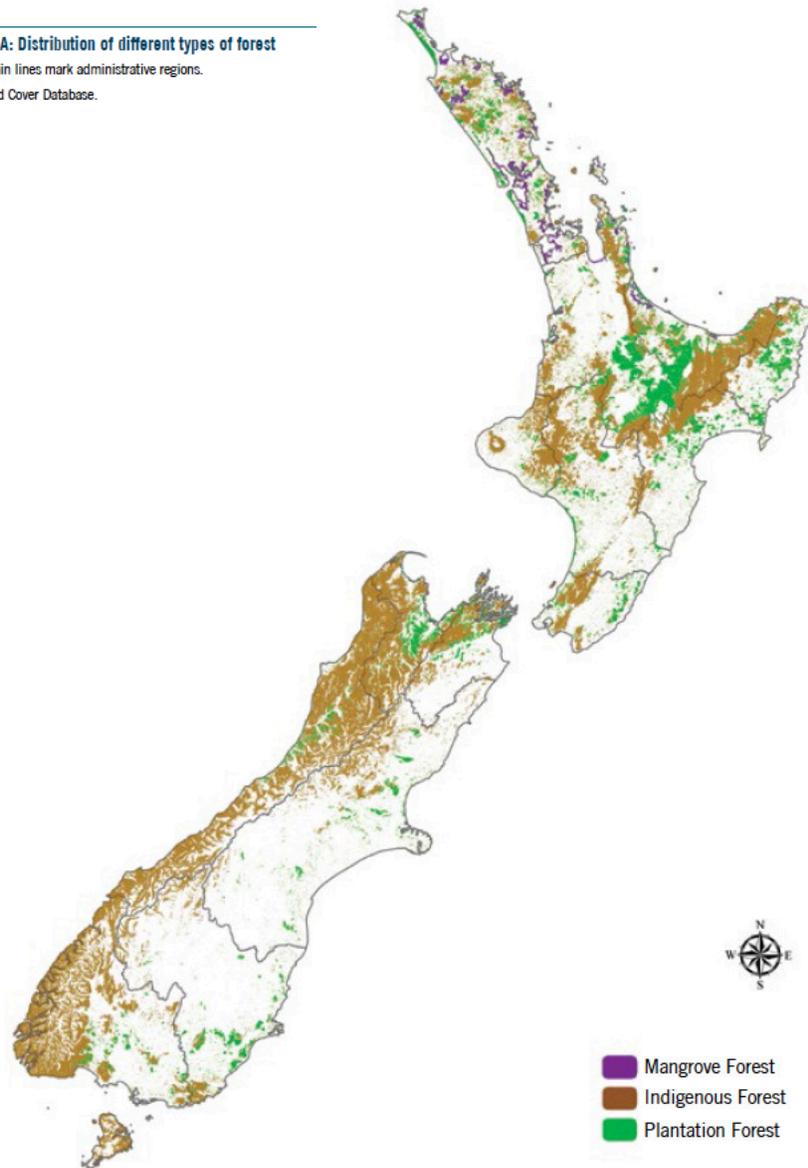
- ➔ <https://www.nzfoa.org.nz/resources/publications/facts-and-figures>

FIGURE 1 – NEW ZEALAND'S FORESTS

Figure 1.1A: Distribution of different types of forest

Note: The thin lines mark administrative regions.

Source: Land Cover Database.



Source: Reproduced from NZ Third Country Report to Montreal Process C&I (Figure 1.1A)

FIGURE 2. NEW ZEALAND FOREST PRODUCTS EXPORTS – TOP 10 DESTINATIONS



Source: Reproduced from Ministry of Primary Industries. 2018. *Situation and outlook for primary industries*. June 2018. p 29

FIGURE 3. OVERVIEW OF NEW ZEALAND FORESTRY VALUE CHAINS



Source: Reproduced from NZFOA. 2017. *Facts and Figures 2016/7. New Zealand Plantation Forest Industry*. p 23

ENDNOTES

- ¹ a) SCION New Zealand; b) The Australian National University. The views expressed are those of the authors, not their institutions. <http://newgenerationplantations.org>
- ² In the IMPF2 Co-Chairs Summary, the term “forest plantations” was used in the headings of Boxes 1 & 2. This term has been changed to “tree plantations” to be consistent with the retitled TPL Dialogue. Use of the term “plantation forests” has been retained in the body of Box 1, as that text was negotiated at the Scoping Dialogue.
- ³ <http://theforestdialogue.org/publication/co-chairs-summary-scoping-dialogue-intensively-managed-planted-forests-2>
- ⁴ http://theforestdialogue.org/sites/default/files/tfd_impf2_background_paper_24aug15.pdf
- ⁵ 4th International Congress on Planted Forests: <http://icpf2018.com>
- ⁶ See <http://newgenerationplantations.org/en>
- ⁷ See <http://www.iufro.org/>
- ⁸ See <http://www.forestpeoples.org/background/about-forest-peoples-programme>; <http://globaljusticeecology.org/>; <http://wrm.org.uy>
- ⁹ A summary report of the 3rd International Congress on Planted Forests is available at: http://www.efi.int/files/attachments/icpf_report_summary/14-congress-summary-report-final-2013-07-03.pdf;
- ¹⁰ See <http://theforestdialogue.org/initiatives/FPIC>; <http://theforestdialogue.org/initiatives/4Fs>; <http://theforestdialogue.org/initiative/understanding-deforestation-free-udf>; <http://theforestdialogue.org/initiatives/GMT>; <http://theforestdialogue.org/initiatives/ILCF>; <http://theforestdialogue.org/initiatives/forest-certification>
- ¹¹ See <http://www.fao.org/forestry/plantedforests/67508/en/>
- ¹² See <https://sustainabledevelopment.un.org/sdgs>
- ¹³ https://theforestdialogue.org/sites/default/files/background_paper_supplements_all.pdf
- ¹⁴ <https://theforestdialogue.org/initiative/tree-plantations-landscape-tpl>
- ¹⁵ Sources other than those specifically noted: <https://www.newzealand.com/au/history/>; <https://blogs.loc.gov/law/2016/11/indigenous-rights-in-new-zealand-legislation-litigation-and-protest/>; <https://www.newzealand.com/au/Māori-culture/>; <https://www.stats.govt.nz/topics/population>
- ¹⁶ <https://www.newzealand.com/au/feature/new-zealand-people/>
- ¹⁷ OECD 2017. *OECD Economic Surveys: New Zealand. June 2017*. p 16.
- ¹⁸ <https://minorityrights.org/minorities/Māori/>
- ¹⁹ Source: <https://www.newzealandnow.govt.nz/living-in-nz/history-government/central-government>
- ²⁰ OECD Environmental Performance Reviews: New Zealand 2017: <http://dx.doi.org/10.1787/9789264268203-en>
- ²¹ Sources: Agfirst. 2017. *Analysis of barriers and drivers to land use change*. Report for Ministry of Primary Industries; NZFOA. 2017. *Facts and Figures 2016/7. New Zealand Plantation Forest Industry*.
- ²² Sources: *Sustainable Management of New Zealand’s Forests: New Zealand’s 3rd Country Report on the Montreal Process Criteria and Indicators* (<https://www.mpi.govt.nz/growing-and-harvesting/forestry/overview/montreal-process/>); <http://www.nzplantedforests.org>; <https://www.mpi.govt.nz/teururakau/>; <https://www.nzfoa.org.nz/resources/file-libraries-resources/agreements-accords>
- ²³ Sources: McDermott, C., Cashore, B. & Kanowski, P. (2010). *Global Environmental Forest Policies: An*

international comparison. Earthscan: London. (Ch 7 – Oceania); Roche, M. 2017. Forest governance and sustainability pathways in the absence of a comprehensive national forest policy — The case of New Zealand. *Forest Policy and Economics* 77: 33–43.

- ²⁴ NZFOA. 2017. *Facts and Figures 2016/7*. New Zealand Plantation Forest Industry. <https://www.nzfoa.org.nz>
- ²⁵ Thorp, G. 2014. The outlook for plantation ownership by Māori. *New Zealand Journal of Forestry* 58(4): 3–7.
- ²⁶ Forman, M. 2014. Iwi involvement in forestry ownership. *New Zealand Journal of Forestry* 58(4): 19-21.
- ²⁷ NZFOA, *ibid*
- ²⁸ www.nzplantedforests.org
- ²⁹ Ministry of Primary Industries. 2018. *Situation and outlook for primary industries*. June 2018.
- ³⁰ Roche, *ibid*.
- ³¹ <https://www.teururakau.govt.nz/teururakau/>
- ³² NZFOA, *ibid*
- ³³ Key sources include various papers in *New Zealand Journal of Forestry* 58(4), 2014.
- ³⁴ See <http://www.gcff.nz>
- ³⁵ Sources: Lania Holt, SCION, pers. comm; <https://www.scionresearch.com/work-with-us/partnering-with-maori>
- ³⁶ Source: Julie Collins, Te Uru Rakau; <https://www.radionz.co.nz/national/programmes/ninetonoon/audio/2018660163/1bn-trees-natives-to-leave-exotics-in-the-shade>
- ³⁷ IPCC. 2018 *Global Warming above 1.5oC. Summary for Policymakers*. p 23. <https://www.ipcc.ch/report/sr15/>