



# **Afforestation and Deforestation Intentions Survey 2020**

## **Final Report**

MPI Technical Paper Paper No: 2021/14

Prepared for Ministry for Primary Industries  
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ISBN No: 978-1-99-100949-4 (online)  
ISSN No: 2253-3923 (online)

**July 2021**

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# **Afforestation and Deforestation Intentions Survey 2020 Final Report**

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July 2021**



## Disclaimer

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ISBN XX (Print)

ISBN XX (Online)

ISSN XX (Print)

ISSN XX (Online)





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## Executive summary

MPI requires information on afforestation intentions for exotic and indigenous forest, and deforestation intentions for planted forest. Consequently MPI has requested a survey of afforestation and deforestation intentions from a suitable and consistent group to obtain reliable estimates of national and regional afforestation and deforestation up to the year 2030.

The general approach followed was a telephone survey of:

- Large-scale forest owners - generally owners with more than 10,000 hectares of forest
- Forestry consultants and managers
- Other individuals or organisations identified as undertaking afforestation

A telephone survey was adopted to get a good response rate. Respondents were contacted in November/December 2020 (with some follow-up in January to April 2021) and asked about their afforestation and deforestation intentions.

### Exotic afforestation

Exotic afforestation is estimated at 26,300 hectares in 2019 and 33,600 hectares in 2020. Total exotic afforestation is forecast to be 45,300 hectares in 2021 with 77% intended for production and 23% intended for permanent forest. The total area intended for afforestation decreases in subsequent years. However, many respondents only provided a response through to 2021 (or, in some cases, 2022 or 2023). Most of these respondents are focusing on the logistics of implementing 2021 afforestation intentions before turning their attention to subsequent years.

Radiata pine is intended for 88% of exotic afforestation with eucalypts intended for 7%. The remaining 5% includes redwoods, cypress species, attenuata/radiata pine hybrid and Douglas fir. Some 79% of exotic afforestation from 2019 to 2021 is in the North Island with 46% of total afforestation in the eastern regions (East Coast, Hawke's Bay, Southern North Island-East). Survey responses indicate that, as has been the case for recent MPI afforestation programmes, most afforestation is on Land Use Capability classes 6 and 7, often on land which could be marginal for sheep and beef agriculture.

There is uncertainty even for 2021 afforestation with 17% of afforestation (7700 ha) still to be confirmed at the time of the survey in December 2020. Uncertainty about future afforestation arises from:

- Land availability and affordability
- Seedling availability
- Labour availability
- Client confirmation
- Requirement for Overseas Investment Office (OIO) approval
- Government and Local Council regulation

Increasing land price was identified as a key factor in limiting afforestation beyond 2021.

### Indigenous afforestation

Survey estimates of mānuka afforestation are 4,600 hectares in 2019, 4,400 hectares in 2020 and 5,100 hectares in 2021. The 2019 and 2020 estimates align with the MPI nursery survey estimates of 4,800 and 4,255 hectares of mānuka, although the MPI estimates include replanting as well as afforestation.

Survey estimates of tall indigenous tree planting is estimated at 400 hectares in 2019, 500 hectares in 2020 and 700 hectares in 2021. However, the work of Kimberley & Bergin (2020) implies that about 1,000 hectares of afforestation in 2018 includes tall tree species. It appears that the survey is only capturing about half of tall indigenous tree planting.

In addition to the area planted, the survey estimates natural reversion of indigenous species at a level of 300 hectares in 2019, 1,800 hectares in 2020 and 2,100 hectares in 2021.

## Deforestation

Large-scale planted forest owners intend to convert 2,000 hectares of forest between 2020 and 2030. A majority of this is conversion of pre-1990 forests - less than 100 hectares is estimated to be conversion of post-1989 plantations. However as large-scale owners intend planting 600 hectares to offset this, the intended area of deforestation is 1,400 hectares. Assuming a deforestation rate of 3.8%, deforestation by small-scale owners during 2020 to 2030 is projected to be around 10,100 hectares in total. From 2020 to 2030 a total of 11,500 hectares of planted forest deforestation is forecast across both large-scale and small-scale owners. The total deforestation increases to 23,500 hectares for a sensitivity analysis in which a higher deforestation rate of 8.3% is assumed for small-scale owners.

Less conversion and deforestation is intended by large-scale owners compared to the previous 2018 survey. The effect of higher carbon price is both direct, in terms of the cost of units required for surrender, and indirect because of its impact on the cost of land required for offset planting. Conversion by large-scale owners is mainly to infrastructure/mining and dairy (or dairy support). Infrastructure/mining includes forest being acquired for a road corridor and a landfill, as well as small areas being acquired for mining.

# Introduction

## Background

MPI requires information on afforestation intentions for exotic and indigenous forest and deforestation intentions for planted forest. MPI has requested a survey of afforestation and deforestation intentions from a suitable and consistent group to obtain reliable estimates of national and regional afforestation and deforestation up to the year 2030.

This information will be used for government projections of greenhouse gas emissions for future commitment periods, estimating New Zealand's progress towards a low emissions economy, and an initial indication of the effectiveness of recent policy changes to incentivise afforestation. Information on afforestation and deforestation also informs future policy scenarios across MPI and helps to assess the broader impacts of land use change.

## Definitions

The survey covers deforestation for planted forests only but afforestation of exotic and indigenous species by both planting and natural reversion.

### Deforestation

Deforestation is defined in the Marrakesh Accord as "the direct human-induced conversion of forested land to non-forested land".

Deforestation includes:

- A decision not to replant following clearfell with the conversion to another land use.
- Early liquidation of a forest (i.e. removing immature trees with conversion to another land use).

Deforestation excludes:

- Forests harvested and replanted.
- Harvested forests that are not replanted but naturally regenerate back into forest.

For the purposes of the Emissions Trading Scheme (ETS), deforestation is defined in the Climate Change Response Act (2002). Section 179 is reproduced in the Appendix. It legislates that deforestation is deemed to have occurred if:

- a specified stocking has not been achieved within four years of clearing by replanting or regeneration; or
- a specified canopy cover has not been achieved within 10 years of clearing.

The Act was amended by the Climate Change Response (Emissions Trading and Other Matters) Amendment Act 2012 to allow for conversion to not be treated as deforestation in certain cases including, under Section 179A, "in the case of pre-1990 forest land that is the subject of an offsetting forest land application that the EPA has approved under [section 186B](#), the pre-1990 forest land that is cleared may not be treated as deforested if cleared".

Consequently, under the ETS, the area of deforestation is calculated as the area of conversion less the area of offset planting.

### Afforestation

Under the definitions of the Marrakesh Accord, "both afforestation and reforestation refer to direct, human-induced conversion of land to forest from another land use. The definitions do not include replanting or regeneration following harvest or natural disturbance, because these temporary losses of forest cover are not considered deforestation. Harvest followed by regeneration is considered a forest management activity. The distinction between afforestation

and reforestation is that afforestation occurs on land that has not been forest for at least 50 years, while reforestation occurs on land that has been forest more recently, though not since 31 December 1989”.<sup>1</sup>

This survey is concerned with the afforestation/reforestation of post-1989 forest land<sup>2</sup>; i.e.

“Land which meets the forest land criteria, and:

- was not forest land on 31 December 1989; or
- was forest land on 31 December 1989 but was deforested between 1 January 1990 and 31 December 2007; or
- was pre-1990 forest land that was deforested on or after 1 January 2008, and any ETS liability has been paid.”

#### **Production forest vs Permanent forest**

For the purposes of this survey:

- Production forest is forest that is intended for harvest and wood production.
- Permanent forest is not intended for harvest and wood production. Note that this does not necessarily mean that growers who adopt permanent forestry will choose the ETS permanent forestry option.

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<sup>1</sup> Section 4.2.5 – Intergovernmental Panel on Climate Change – Good Practice Guidance for Land Use, Land-Use Change and Forestry.

<sup>2</sup> <https://www.mpi.govt.nz/dmsdocument/6991/direct>

# Approach

The general approach followed was a telephone survey of:

- Large-scale forest owners - generally owners with more than 10,000 hectares of forest
- Forestry consultants and managers
- Other individuals or organisations identified as undertaking afforestation

When interviewed, respondents were also asked to identify other known afforestation (actual or intended) in their region. Information was also sought from other sources (for example, regional councils, mānuka honey producers and seedling suppliers) about known afforestation activity.

A telephone survey was adopted to get a good response rate. Respondents were contacted in November/December 2020 (with some follow-up in January to April 2021) and asked about their afforestation and deforestation intentions. Results from individuals were aggregated.

## Afforestation

Respondents were asked for the area that they had afforested in 2019 and 2020 and the area that they intended to afforest each year from 2021 to 2030. Information was obtained on:

- Area
- Species
- Wood Supply Region
- Type of land
- Whether land availability (and other resources required) has been confirmed

## Deforestation

Respondents were asked for the area that they had converted to a non-forestry land-use in 2019 and 2020 and the area that they intended to deforest each year from 2021 to 2030. Information was obtained on:

- Area
- Wood Supply Region
- Land-use that area will be converted into
- How much area of offset planting they would undertake – the 2012 amendments to the ETS enable offsetting; i.e., landowners are permitted (without incurring any liability) to convert area provided that they afforest/reforest a carbon-equivalent area elsewhere in New Zealand

### Year of conversion

In this report the conversion of forest to a non-forest land use is reported as occurring in the year in which the clearfelling activity occurred on that area of land, which is consistent with international LULUCF and Kyoto Protocol reporting and accounting. However this does differ from the definition used in the ETS where the year of deforestation is determined at the point of land use change, rather than the point of clearfell, but with deforestation liabilities (if any) calculated at the time the forest was cleared.

# Limitations

## Incomplete information

The general response to the telephone survey was very good. All individuals contacted were willing to provide information. However, in some cases, the information provided was incomplete because the company was not able to provide details. For example:

- Most respondents have a long-term plan for afforestation and deforestation. However some are focusing on the logistics of afforestation in 2021 and are still developing plans for subsequent years
- Some forests are grown on land under a single rotation lease. As such the replanting decision will be made by the land-owner rather than the current crop-owner.

## Current intentions

Estimates are based on intentions surveyed over December 2020 to April 2021. These reflect perceptions about land-use economics, Government policy implementation, carbon price and other factors as they exist at the time of the survey. Clearly intentions are subject to change due to changes in drivers.

The survey was carried out at a time when the carbon price was near \$38/NZU.

# Results - Afforestation

## Exotic afforestation

Total afforestation for exotic species is estimated to be 45,300 hectares in 2021 with 77% intended for production and 23% intended for permanent forest (Table 1 and Figure 1). The apparent decline in afforestation after 2021 arises because many respondents only provided a response through to 2021 (or, in some cases, 2022 or 2023). Most of these respondents are focusing on the logistics of implementing 2021 afforestation intentions before turning their attention to subsequent years.

The total afforestation intended for 2021 is a step up from 2020 which in turn is an increase on 2019. The estimate of 26,300 hectares for 2019 is larger than the 19,000 hectares reported by MPI<sup>3</sup> in the NEFD published in April 2020.

The proportion of permanent forestry intended for afforestation in 2021 is higher than the current proportion of post-1989 forest that is permanent forest. Manley<sup>4</sup> (2018) found that overall some 6.1% of post-1989 forest is not intended to be harvested, although the percentage was higher (11.9%) for owners of larger (>1000 ha) forests.

It should be noted that there is uncertainty about the split between production and permanent forestry after 2021 to the extent that no split has been made from 2024 on. Although intended afforestation is included in this total, the future split for organisations primarily interested in carbon will depend on land availability:

- permanent forestry is more likely if they can continue to acquire freehold land,
- production forestry is more likely on leasehold land where land-owners prefer to harvest.

**Table 1: Afforestation intentions for exotic species split between production forests and permanent forests**

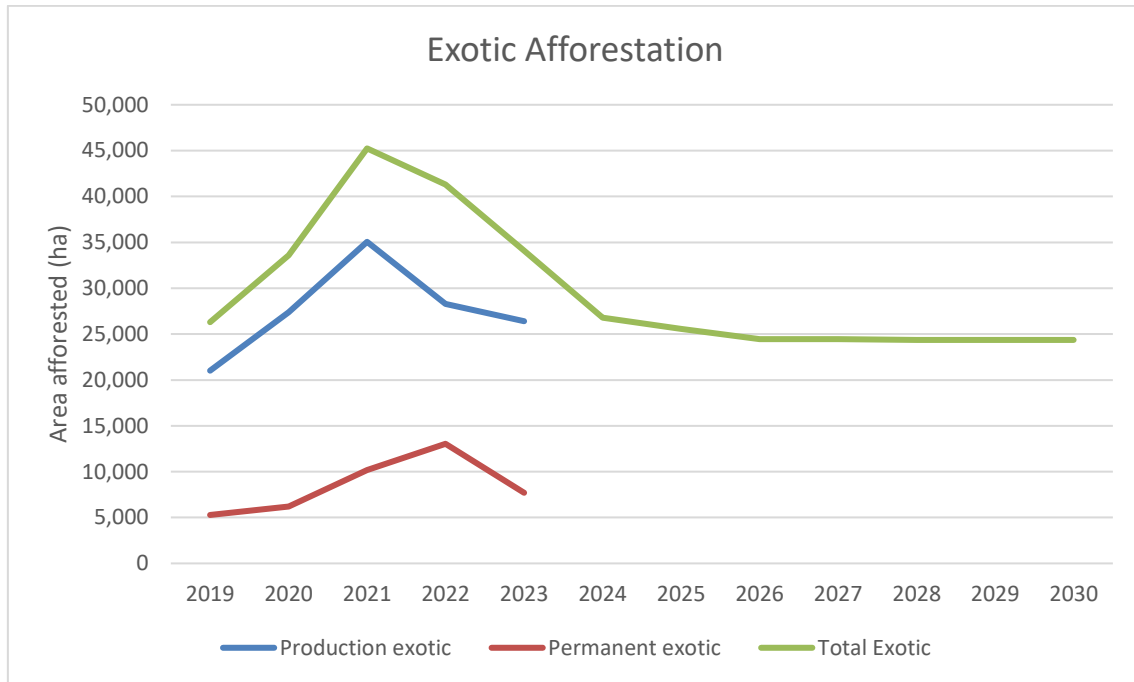
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Production	21,000	27,400	35,100	28,300	26,400							
Permanent	5,300	6,200	10,200	13,000	7,700							
Total	26,300	33,600	45,300	41,300	34,100	26,800	25,600	24,500	24,500	24,400	24,400	24,400

## Transition of permanent forests to native

Although afforestation in the permanent exotic category uses exotic tree species, the stated objective for some organisations is to transition to an indigenous forest over time. Active management is intended to encourage the reversion to indigenous forest.

<sup>3</sup> MPI. 2020. National Exotic Forest Description as at 1 April 2020. Ministry for Primary Industries, Wellington, NZ.

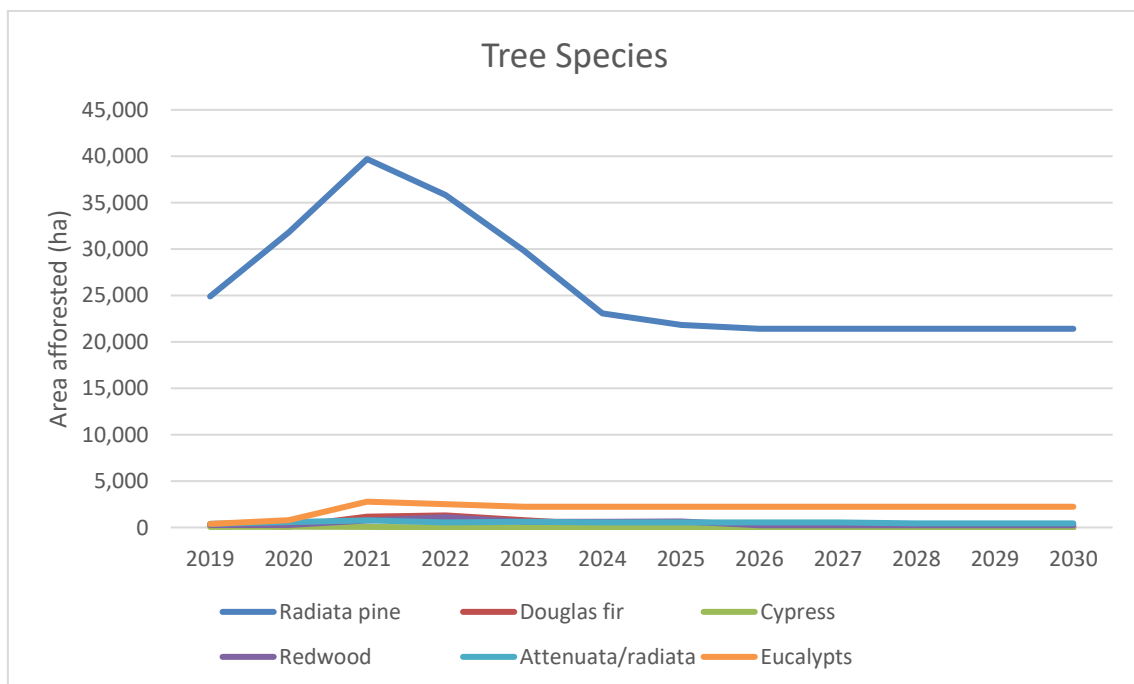
<sup>4</sup> Manley, B. 2018. Intentions of forest owners following harvest of post-1989 forests. MPI Technical Paper No. 2018/55.



**Figure 1: Afforestation intentions for exotic species split (for 2019 to 2023) between production forests and permanent forests**

### Which species are being used for exotic afforestation?

Radiata pine dominates exotic afforestation (Figure 2 and Table 2) with eucalypts the only other group to exceed 5%.



**Figure 2: Afforestation intentions by species**



**Table 2: Percentage of intended afforestation between 2019 and 2030 by species**

Species	% afforestation
Radiata pine	88.5
Attenuata/radiata hybrid	1.8
Douglas fir	1.2
Cypress	0.1
Redwood	1.5
Eucalypts	6.9

### Where is exotic afforestation occurring?

Afforestation intentions were collected by National Exotic Forest Description (NEFD) wood supply region or, in the case of Nelson/Marlborough, Otago/Southland and Southern North Island (SNI), by sub-region. SNI was split into West and East using the Ruahine, Tararua and Remutaka ranges.

Some 79% of afforestation from 2019 to 2021 is in the North Island with 46% of total afforestation being in the eastern regions (East Coast, Hawke's Bay, Southern North Island - East) (Table 3). Beyond 2021 there is uncertainty about the percentage of area that will be afforested by region. Some respondents provided forward intentions on a national basis with region yet to be determined.

**Table 3: Percentage of afforestation of exotic species by NEFD wood supply region. (Column totals might not add to 100% because of rounding)**

Area	% afforestation			
	2019	2020	2021	2019-2021
Northland	20	10	8	12
Central North Island	11	9	14	12
East Coast	9	8	15	12
Hawke's Bay	12	23	14	16
SNI East	24	19	14	18
SNI West	6	11	9	9
Marlborough	3	4	4	4
Nelson	2	1	1	1
West Coast	0	0	1	0
Canterbury	3	7	6	5
Otago	4	3	6	5
Southland	6	4	9	6
Total	100	100	100	100

There are regional differences between production forestry and permanent forestry. From 2019 to 2021, the majority of permanent forestry is in East Coast and SNI-East (Table 4).

**Table 4: Percentage of 2019 to 2021 afforestation of exotic species by NEFD wood supply region separated by production and permanent forestry. (Column totals might not add to 100% because of rounding)**

Area	Production	Permanent
Northland	14	3
Central North Island	12	11
East Coast	7	31
Hawke's Bay	20	3
SNI East	12	41
SNI West	10	6
Marlborough	5	0
Nelson	1	1
West Coast	1	0
Canterbury	6	4
Otago	6	0
Southland	8	0
Total	100	100

### What type of land is being planted?

Respondents provided a general description about the type of land being planted. Some comments:

- “95% of land is class 6, 7 or 8. We sell off better land in a purchased property.”
- “Mostly scrubby, weedy country that is cleared and planted.”
- “Land not suitable for agriculture – too dry with no summer grazing.”
- “New planting is mostly by farmers wanting to retire poorer land.”
- “We are retiring marginal land – most is LUC 6 or 7 on ESC (Erosion Susceptibility Classification) red or orange zone.”
- “We are planting for a station owner - 70% of the planted area is LUC 6 with the rest LUC 4/5.”
- “Planting rough sheep & beef land which is steep with shallow soils and weedy.”
- “Almost all planting is on drystock land of LUC 6. One block is on better land – the Council is involved and wants to reduce nitrogen going into the lakes.”
- “Some blocks are part of a succession plan for a farm – continue to farm better parts but grant a forestry right for poorer parts.”
- “Most planting is on rough sheep & beef land.”
- “Land is LUC 6/7 – have given up farming on the land with weeds (gorse/broom).”

Spatial information was not collected in the survey. In order to quantify the anecdotal information obtained summary data was provided by MPI from different afforestation programmes:

- Emissions Trading Scheme (ETS)
- One Billion Trees Programme (1BT)
- Erosion Control Funding Programme (ECFP)
- Hill Country Erosion Programme (HCEP)
- Afforestation Grant Scheme 1 (AGS1)
- Afforestation Grant Scheme 2 (AGS2)

A common feature (Table 5) is that at least 89% of exotic afforestation under these schemes has been on LUC classes 6, 7 and 8. The main difference is the split of the area afforested between LUC classes 6 and 7.

**Table 5: Percentage of exotic planting from under MPI afforestation programmes by LUC class.**

Programme	Area (ha)	Period	LUC Class							
			1	2	3	4	5	6	7	8
ETS	45512	2011-20	0	0	2	7	0	56	34	1
1BT	12357	2018-20	0	0	3	6	1	73	15	2
ECFP	6968	2011-20	0	0	0	0	0	31	68	1
HCEP	12779	2011-20	0	0	2	7	0	56	34	1
AGS1	9804	2008-14	0	0	3	7	1	54	34	0
AGS2	1755	2016-20	0	0	2	7	0	83	6	2

As a further indicator of the type of land being afforested an analysis was done of area sold in 2019 for conversion to forestry in Taranaki District. A spatial analysis was carried out on the properties identified by the Taranaki District Council. The results (Table 6) are similar to those presented in Table 5 for the MPI afforestation programmes. The majority of the area in the properties that were sold is LUC classes 6 and 7.

**Table 6: Percentage of Taranaki District properties sold for conversion to forestry in 2019 by LUC class. Percentages relate to the full properties – percentages could be different for the area of these properties afforested.**

LUC	1	2	3	4	5	6	7	8
% of area	0	0	6	1	0	60	32	1

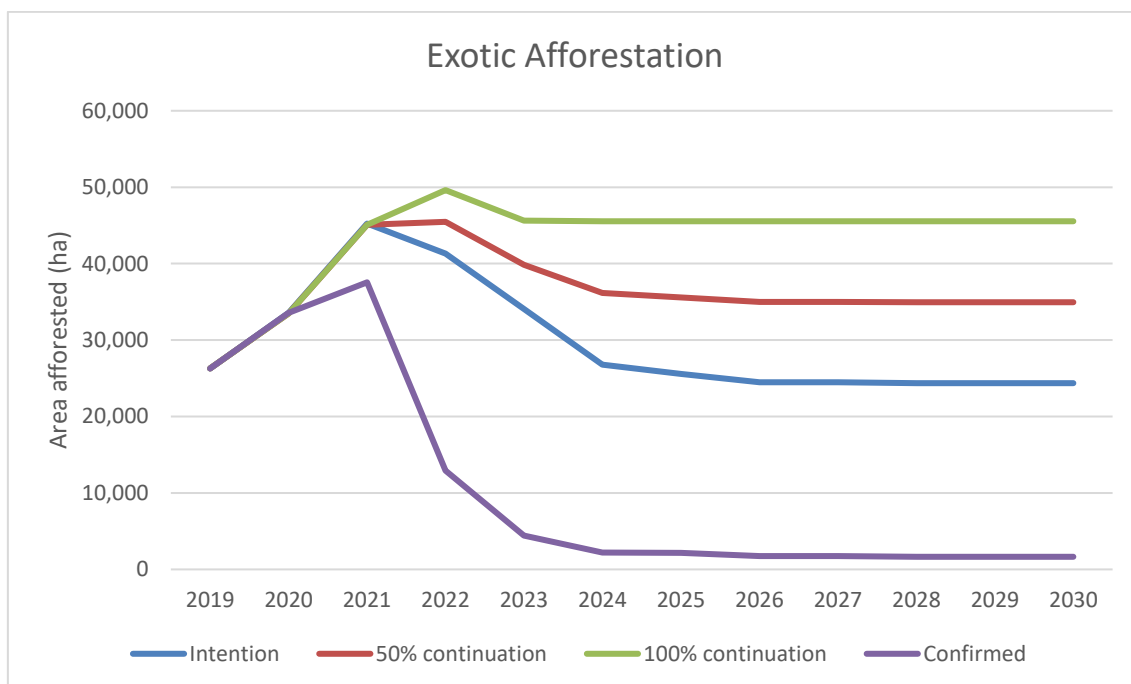
## Uncertainty about future afforestation

There is uncertainty even for 2021 afforestation with 17% of afforestation (7700 ha) still to be confirmed at the time of the survey in December 2020. Uncertainty about future afforestation arises from:

- Land availability and affordability
- Seedling availability
- Labour availability
- Client confirmation
- Requirement for OIO approval
- Government and Local Council regulations

Beyond 2021 there is greater uncertainty with a low proportion of afforestation confirmed (Figure 3). Respondents are focusing on the logistics of implementing 2021 afforestation intentions before turning their attention to subsequent years. Increasing land price was identified as a key factor in limiting afforestation beyond 2021.

Some respondents only provided a forecast for early years, for example some only provided a forecast for 2021 or through to 2022 or 2023. Figure 3 also shows the afforestation rate if, in addition to stated intentions, these respondents continued with afforestation at 100% or 50% of the rate in the last year for which intentions were provided.



**Figure 3: Afforestation intentions for exotic species also showing confirmed afforestation and afforestation if respondents who only provided intentions for early years continued afforestation at 100% or 50% of the rate in the last year for which intentions were provided.**

## Indigenous afforestation

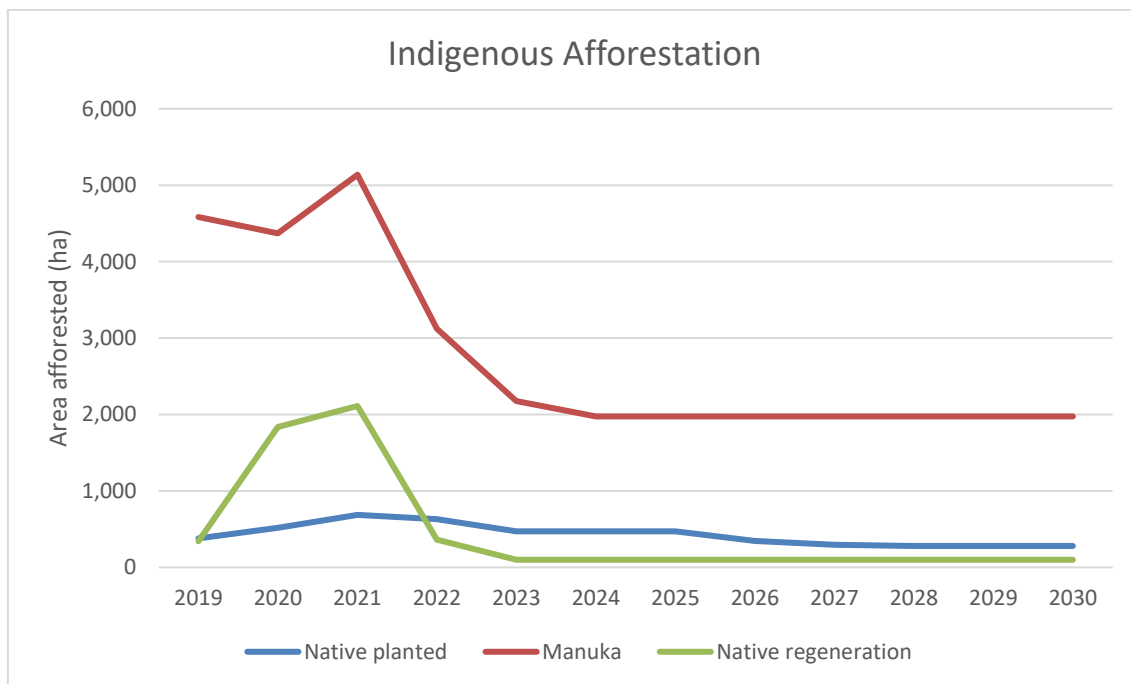
Afforestation estimates are presented in Table 7 and Figure 4. The area afforested is dominated by planted mānuka. The tall planted category refers to afforestation that includes the planting of some tall canopy species, in many cases inter-planted with mānuka. Species identified by respondents include:

- Tōtara
- Kahikatea
- Matai
- Red beech
- Mountain beech
- Rewarewa

The area of indigenous reversion is low in 2019 but higher in 2020 and 2021. Some respondents provided information for the year of grant approval or year of grant payment. These may differ from the year of establishment/afforestation.

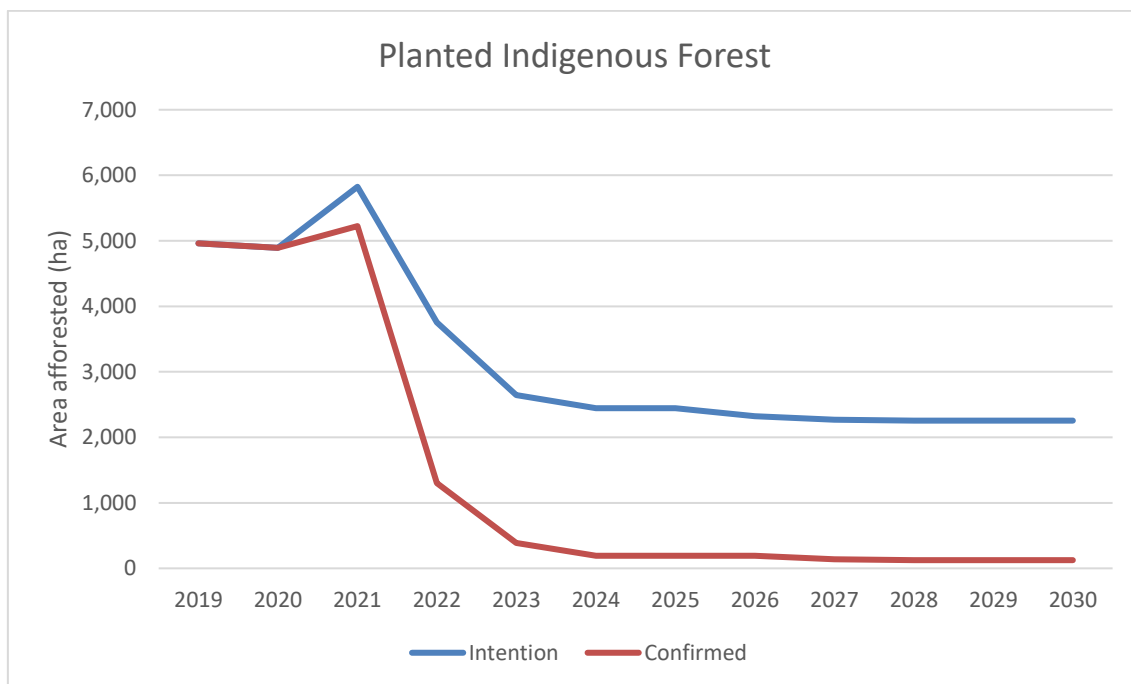
**Table 7: Afforestation intentions for indigenous species**

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Tall planted	400	500	700	600	500	500	500	300	300	300	300	300
Mānuka planted	4,600	4,400	5,100	3,100	2,200	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Reversion	300	1,800	2,100	400	100	100	100	100	100	100	100	100
Total	5,300	6,700	7,900	4,100	2,800	2,600	2,600	2,400	2,400	2,400	2,400	2,400



**Figure 4: Afforestation intentions for indigenous species.**

As was the case with exotic afforestation, there is uncertainty about afforestation intentions, particularly beyond 2021 (Figure 5). Some respondents did not provide intentions beyond 2021 but may continue to afforest. Conversely, some respondents who did provide intentions for later years were relying on receiving grants from the One Billion Trees programme to fund afforestation. With these grants no longer available, some of their previously intended afforestation might not occur.



**Figure 5: Afforestation intentions for planted indigenous species (mānuka and tall tree species combined) also showing confirmed afforestation.**

## How do the estimates compare with other sources?

The survey will have missed some individuals and organisations involved in indigenous afforestation. Consequently alternative sources of information were consulted:

- The MPI nursery survey<sup>5</sup> (2020) estimates that, in 2018, 7.1 million mānuka seedlings were sold resulting in a planted area of 4,600 hectares. For 2019, it is estimated that 6.9 million mānuka seedlings were sold with a planted area of 4,800 hectares. For 2020 the MPI nursery survey<sup>6</sup> (2021) estimates that 5.7 million mānuka seedlings were sold with a planted area of 4,255 hectares. The 2019 and 2020 MPI estimates are similar to the surveyed areas of 4600 and 4400 hectares for 2019 and 2020 which include only afforestation on post-1989 forest land. There has been additional area, not included in the survey, that has been replanted in mānuka including a number of native forest restoration projects where, following harvesting of a radiata pine crop, mānuka has been planted.
- Kimberley and Bergin<sup>7</sup> (2020) estimated that about 10 million native trees and shrubs were planted in 2018. Estimates from three different sources (Trees That Count registered database, One Billion Trees, and NZ Plant Producers Incorporated survey) were all aligned:
  - Trees That Count 9.5 million
  - One Billion Trees 9 million
  - NZPPI 10.6 million
- Using the Trees That Count figure of 9.5 million trees planted, and deducting the MPI nursery survey estimate of 7.1 million mānuka seedlings, leaves 2.4 million non-mānuka seedlings. Using a stocking of 2500 seedlings/ha (David Bergin pers. comm.) suggests that about 1000 hectares of afforestation in 2018 includes tall tree species.

## Where is indigenous planting occurring?

Important regions for indigenous species planting are Central North Island, Southern North Island – West and Hawke's Bay (Table 8). This regional pattern largely reflects the pattern of afforestation by the mānuka honey industry.

**Table 8: Percentage of indigenous forest planting (mānuka and tall canopy species) by NEFD wood supply region. (Column totals might not add to 100% because of rounding)**

Area	% area established			
	2019	2020	2021	2019-21
Northland	6	7	2	5
Central North Island	30	20	12	21
East Coast	2	4	7	5
Hawke's Bay	21	23	31	25
SNI East	7	4	13	8
SNI West	29	35	27	30
Marlborough	2	3	2	2
Nelson	2	1	1	1
West Coast	0	0	1	0
Canterbury	0	2	0	1

<sup>5</sup> MPI, 2020. Provisional estimates of tree stock sales and forest planting in 2019. Ministry for Primary Industries.

<sup>6</sup> MPI, 2021. Provisional estimates of tree stock sales and forest planting in 2020. Ministry for Primary Industries.

<sup>7</sup> Kimberley, M., Bergin, D. 2020. Verification of Trees That Count tree-count register for planted native trees. Trees That Count.

Otago	0	0	1	0
Southland	0	1	3	1
Total	100	100	100	100

### What type of land is being planted?

Summary data provided by MPI from different afforestation programmes was used to understand the class of land being used for indigenous afforestation. As for exotic afforestation, most indigenous afforestation has been on LUC classes 6 and 7 (Table 9).

**Table 9: Percentage of indigenous afforestation under MPI afforestation programmes by LUC class**

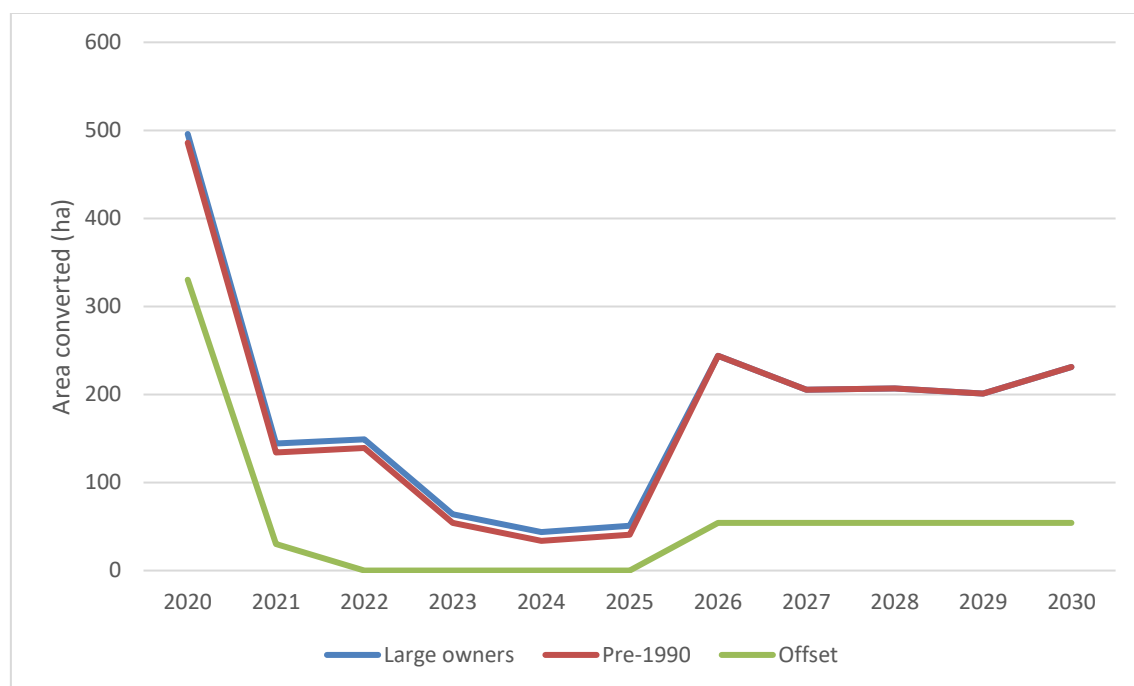
Scheme	Afforestation	Area	Period	LUC class							
				1	2	3	4	5	6	7	8
ETS	Indigenous	3073	2011-20	0	0	1	3	0	36	60	0
1BT	Indigenous Planting	8290	2018-20	0	1	6	11	0	53	28	1
1BT	Indigenous Reversion	2522	2018-20	0	0	1	3	0	59	30	7
ECFP	Indigenous Reversion	1193	2011-20	0	0	0	0	0	15	79	7
HCEP	Indigenous Reversion	1645	2011-20	0	1	2	3	0	11	83	0
AGS1	Indigenous Planting	701	2008-14	0	0	0	0	0	50	45	5
AGS2	Indigenous Planting	2190	2016-20	0	3	5	14	0	38	39	1

## Results – Deforestation of planted forests

Aggregated conversion intentions of large-scale owners are shown in Figure 6. From 2020 to 2030, 2,000 hectares of conversion is forecast. The majority of this is conversion of pre-1990 forests - less than 100 hectares is estimated to be conversion of post-1989 plantations.

### Intention to use offset planting

Some respondents who intend to convert pre-1990 forest also plan to do offset planting. They intend using the flexible land-use provision and plant a carbon-equivalent area of new land to offset the conversion of over 600 hectares of existing forest land between 2020 and 2030. The intention is to do offset planting for 32% of conversion on pre-1990 forest land (see Figure 6).



**Figure 6: Forecast of conversion from forest to another land-use for New Zealand plantations (large-scale owners only).** The 'Large owners' line shows the total intended conversion by large-scale owners while the almost identical 'Pre-1990' line shows their intended conversion of pre-1990 forests. Some of this conversion will be matched by 'Offset' planting. The area of pre-1990 forest to be deforested is the difference between pre-1990 and offset.

### Impact of carbon price

The survey was carried out at a time when the carbon price was around \$38/NZU. At this carbon price, the quantum of the deforestation liability (and the reduced opportunity for cost-effective offset planting) is such that the ETS is having an impact on the level of conversion.

Table 10 summarises the results of the last 6 surveys. It clearly shows how an increasing carbon price is associated with a reduction in the area of post-1989 forest intended for conversion by large-scale owners between 2020 and 2030 as well as the intended use of offset planting. Since 2016 the level of deforestation has been in the range 1,100 to 2,300 hectares. The key difference in the 2020 survey is the reduced use of offset planting and reduced level of conversion. It has become uneconomic to either deforest or convert using the offset provision due to the combination of high emissions liability and the cost of purchasing land to offset.



**Table 10: Area of conversion, offset planting and deforestation intended for pre-1990 forests from 2020 to 2030. Results are presented for deforestation intention surveys from 2014 to 2018 and 2020 with the carbon price prevailing at the time of the survey.**

Survey year	Carbon price (\$/NZU)	Conversion (ha)	Offsetting (ha)	Deforestation 2020-30 (ha)
2014	4.30 to 5.50	17,200	0	17,200
2015	7 to 7.50	16,800	4,200	12,600
2016	17 to 18	6,300	5,200	1,100
2017	19 to 20	7,100	5,000	2,100
2018	25	7,600	5,300	2,300
2020	38	2,000	600	1,400

### Where is most conversion occurring?

Some 49 % of conversion by large-scale owners during 2020 to 2030 is forecast to take place in the Northland Wood Supply Region while 34 % is in the Central North Island.

### What land-uses are areas of formerly forested land being converted to?

Based on the information provided, it is possible to make a broad estimate of the land-use into which land is being converted (Table 11). Conversion by large-scale owners is mainly to infrastructure/mining and dairy (or dairy support). Infrastructure/mining includes forest being acquired for a road corridor and a landfill, as well as small areas being acquired for mining. Intentions for these projects have remained unchanged from 2018 whereas many projects involving conversion to agriculture have ceased. Consequently the ranking of land-uses has changed from 2018 when 45% of intended conversion was to sheep and beef agriculture and 34% to dairy.

**Table 11: Land-use into which area is being converted in 2020-2030 by large-scale owners (refers to 2000 hectares of conversion).**

Forest converted to	%
Infrastructure/Mining	53
Dairy	31
Residential/Lifestyle	10
Sheep & Beef	6

### What are small-scale forest owners doing?

Forestry consultants and managers throughout New Zealand provided information about conversion by small-scale forest owners. Some overall patterns emerged:

- In most cases all land being harvested is being replanted.
- Most replanting is into radiata pine although some mānuka is being planted.
- In some regions a small proportion of land is being converted to dairy or sheep and beef agriculture. Typically these are small blocks where forestry wasn't profitable because of size, or the owner has other land use plans.
- A small proportion of area is being left to revert either deliberately or by default. This includes area that is not being actively converted but left to lie fallow. Sometimes this is inter-generational with the parents harvesting but the children not wanting to spend money on replanting.

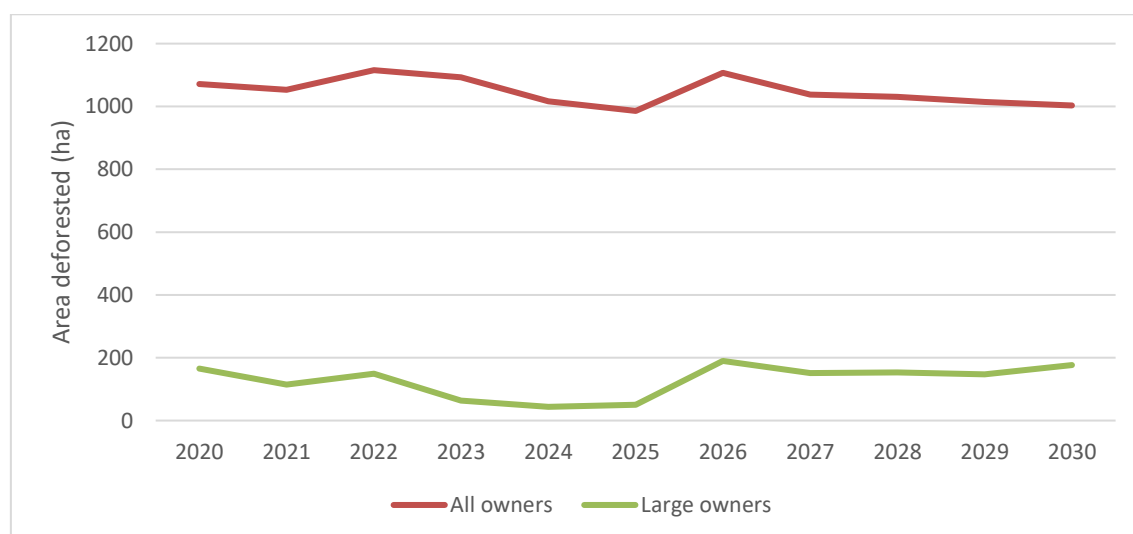
Manley (2018<sup>8</sup>) carried out a survey of the intentions of forest owners following harvest of post-1989 forests. The survey was carried out at a time when the carbon price was in the range \$20-22/NZU. Overall results (Table 12) indicate that 2.6% of area is intended to be converted while another 6.6% of area will be sold in cutover state following harvest, returned to its owner, or there is uncertainty about intentions. Results for the first three size classes are most relevant for small-scale owners. These indicate that 2.0 to 8.3% of area will be converted. The average value for the three categories with area under 1000 ha, on an area-weighted basis, is 3.8% conversion.

**Table 12. Summary of intentions after harvesting for all post-1989 owners [Table 14 of Manley (2018)]**

	<40 ha	40-99 ha	100-999 ha	>1000 ha	Total
Replant/ mānuka /regenerate	81.2	81.1	90.9	97.2	90.8
Convert	8.3	5.1	2.0	0.3	2.6
Return/Sell/Unknown	10.5	13.8	7.1	2.5	6.6
Total	100.0	100.0	100.0	100.0	100.0

Based on available information, a 3.8% rate of conversion has been used for the small-scale forest estate. An estimate of the area to be harvested by small-scale owners in 2018 to 2030 was generated based on the New Zealand Wood Availability Forecasts (MPI, 2016<sup>9</sup>). Applying the 3.8% conversion rate to this area gives an estimate of 10,100 hectares of deforestation by small-scale owners during the period 2020 to 2030.

Figure 7 shows the forecast of deforestation for all owners. From 2020 to 2030 a total of 11,500 hectares of deforestation by all owners is forecast<sup>10</sup>.



**Figure 7: Forecast of deforestation from forest to another land-use for New Zealand plantations (all owners). Large-scale owner intentions are based on converted area less offset area while small-scale owner deforestation assumes 3.8 % deforestation rate.**

<sup>8</sup> Manley, B. 2018. Intentions of forest owners following harvest of post-1989 forests. MPI Technical Paper No. 2018/55.

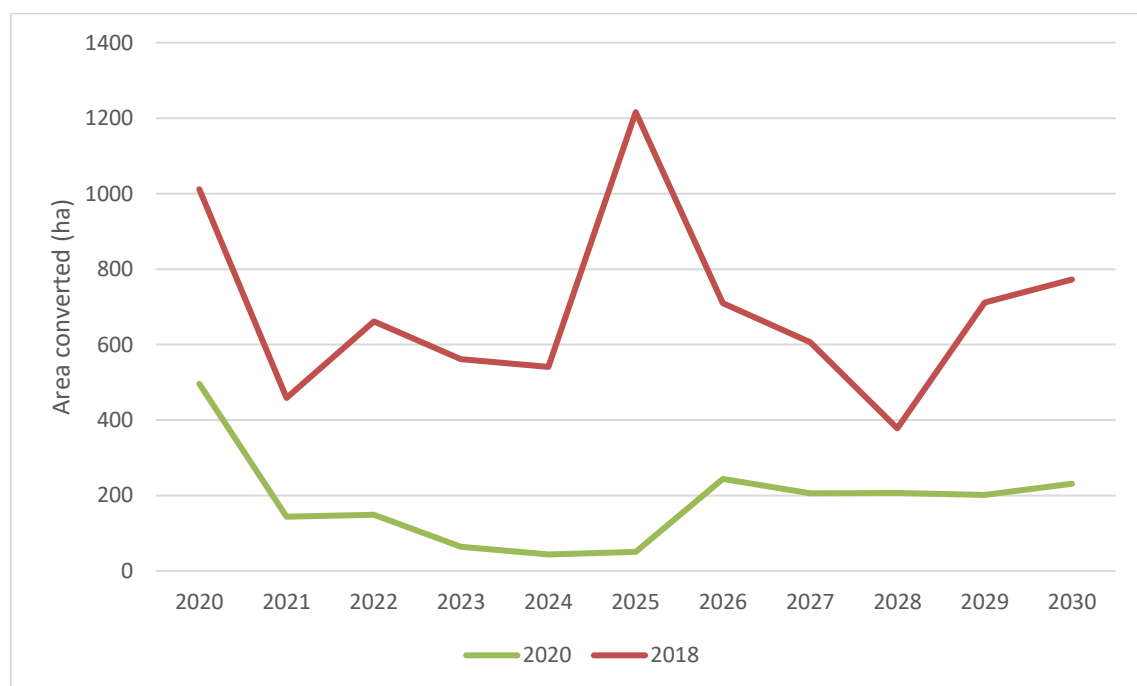
<sup>9</sup> New Zealand Wood Availability Forecasts 2014-2050, Prepared for Ministry for Primary Industries by Indufor Asia Pacific Limited, 2016.

<sup>10</sup> Further analysis to provide the sensitivity of deforestation estimates will be provided in subsequent iterations of this survey.

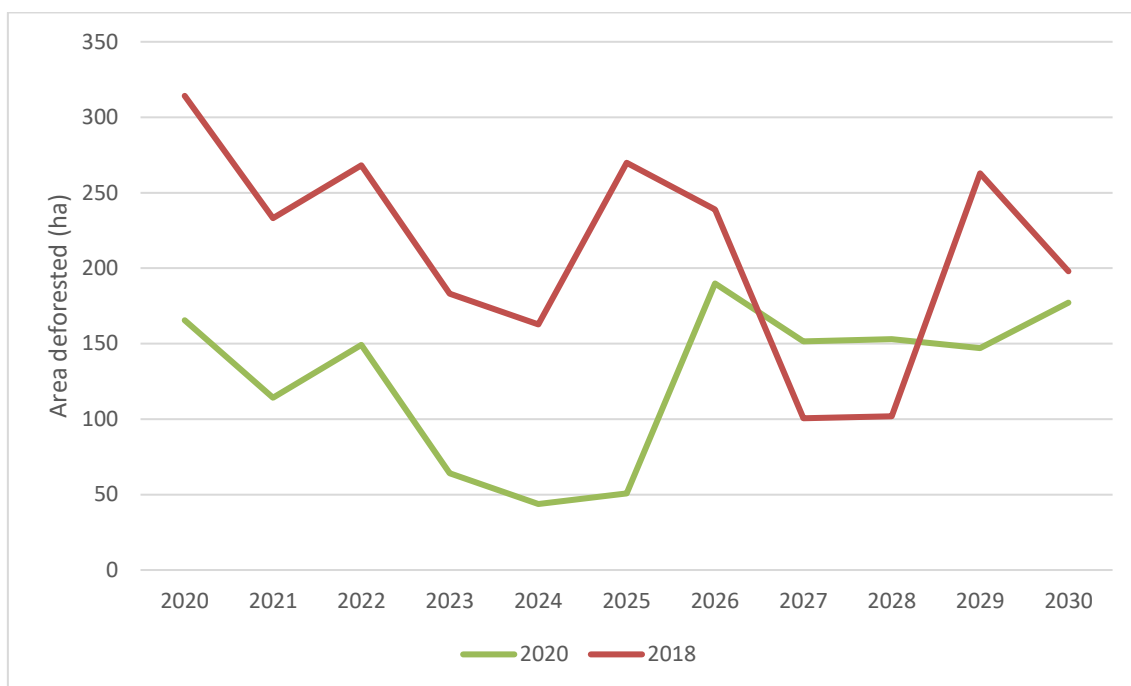
## Comparison with 2018 Deforestation Intention Survey

Results for large-scale owners from the 2020 survey are compared with those of the 2018 survey in Figure 8 (area converted) and Figure 9 (area deforested; i.e. area converted less area of offset planting). There is much less conversion forecast for the period 2020-2030 in this 2020 survey than in the 2018 survey – 2000 hectares in 2020 compared to 7600 hectares in 2018. There is also less deforestation forecast for the period 2020-2030 in this 2020 survey than in the 2018 survey – 1400 hectares in 2020 compared to 2300 hectares in 2018. The reduction is not as great because the intended offset planting area is also much reduced (600 hectares in the 2020 survey compared to 5300 hectares in the 2018 survey).

There were changes in nine different projects resulting in a large reduction in intended conversion. In all of these there is now no intention to convert land within the period 2020 to 2030. In two of these projects, delays in the Treaty settlement process mean that any conversion will be pushed out beyond this period. In the other seven projects, the change in intentions is primarily because of a higher carbon price. The effect of carbon price is both direct, in terms of the costs of units required for surrender, and indirect because of its impact on the cost of land required for offset planting.



**Figure 8: Comparison of the area converted in the 2020 survey with the 2018 survey – large-scale owners only**



**Figure 9: Comparison of the area deforested (converted less offset) in the 2020 survey with the 2018 survey – large-scale planted forest owners only**

# Concluding remarks

## Afforestation

This survey will have missed afforestation projects – particularly smaller projects that are implemented directly by the land-owner rather than through a forestry consultant or manager. In the case of exotic afforestation, the total area of the missed projects is not expected to be material. The additional area is likely to offset some of the reported afforestation area being gross area rather than the net stocked area that will be achieved. Of some relevance here, Manley et al.<sup>11</sup> (2003) found that the net stocked area achieved in 42 afforestation projects was 93% of the area estimated to have been planted by the owner. Given the lower level of indigenous afforestation and the many small projects involved it is likely that the reported areas are under-estimates. Certainly the Kimberley & Bergin (2020) analysis indicates that the survey has missed some of the area planted in tall indigenous species.

## Deforestation

The increase in carbon price has reduced the intended deforestation by large-scale owners since the last deforestation intentions survey in 2018. Large-scale forest owners have estates that are predominantly pre-1990 forests. Not only has the carbon price directly increased any deforestation liability, it has also resulted in the price of land increasing to a level that reduces the economic viability of offset planting.

In contrast most of the small-scale estate is post-1989 forest. A key determinant of deforestation will be the level of log prices and the rate of return achieved in the current rotation. As is the case for large-scale forests, most small-scale forests are currently being replanted after harvest.

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<sup>11</sup> Manley, B., Somerville, O., Turbitt, M., Lane, P. 2003. Review of new forest planting estimates. New Zealand Journal of Forestry 48(3): 34–37

# Appendix - Deforestation definitions in the CCRA

## Climate Change Response Act (2002)

### 179 Forest land to be treated as deforested in certain cases

- (1) Without limiting paragraph (a) of the definition of deforest in [section 4\(1\)](#), a hectare of forest land must be treated as deforested for the purposes of this Act if the forest species on that hectare have been cleared and,—
  - (a) 4 years after clearing, the hectare has not—
    - (i) been replanted with at least 500 stems of forest species; or
    - (ii) regenerated a cover of at least 500 stems of exotic forest species; or
    - (iii) been replanted with at least 100 stems of willows or poplars in a manner consistent with managing soil erosion; or
    - (iv) regenerated predominantly indigenous forest species growing in a manner in which the hectare is likely to be forest land 10 years after the hectare was cleared; or
  - (b) 10 years after clearing,—
    - (i) predominantly exotic forest species are growing, but that hectare does not have tree crown cover of at least 30% from trees that have reached 5 metres in height; or
    - (ii) predominantly indigenous forest species are growing, but that hectare is not forest land; or
  - (c) 20 years after clearing, predominantly indigenous forest species are growing, but that hectare does not have tree crown cover of at least 30% from trees that have reached 5 metres in height.
- (1A) Subsection (1)(a)(iii) applies only if the EPA is satisfied that the relevant local authority has determined that the soil erosion risk of the land is at least moderate.
- (2) If forest land is to be treated as deforested under subsection (1),—
  - (a) the deforestation is to be treated as having been carried out 4 years, 10 years, or 20 years, after the clearing of the forest species, as the case may be; but
  - (b) the liability in respect of the deforestation must be calculated by reference to the age and forest species of the trees cleared 4 years, 10 years, or 20 years earlier, as the case may be.
- (3) Nothing in this section limits the EPA's ability to exercise powers under [section 121](#) in respect of the deforestation of a hectare of forest land whenever the EPA considers that—
  - (a) the hectare has been converted to land that is not forest land; and
  - (b) any obligations imposed under this Act in respect of the deforestation have not been complied with.

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### 179A Forest land may not be treated as deforested in certain cases

- (1) Despite [section 179](#) and the definition of deforest in [section 4\(1\)](#),—
  - (a) in the case of pre-1990 forest land, pre-1990 forest land that is cleared may not be treated as deforested for the purposes of this Act if the cleared land is exempt land or—
    - (i) is contiguous with the edge of pre-1990 forest land that existed on 31 December 2007; and
    - (ii) is an area that is less than 1 hectare or that is less than 30 metres wide at its widest point; and
    - (iii) is required to be or remain cleared to implement New Zealand's best practice forest management; and
    - (iv) is used only for the purpose of implementing New Zealand's best practice forest management;
  - (b) in the case of pre-1990 forest land that is the subject of an offsetting forest land application that the EPA has approved under [section 186B](#), the pre-1990 forest land that is cleared may not be treated as deforested if cleared,—
    - (i) in the case where the land is converted to a use other than forest land (for example, dairy), in the period—
      - (A) beginning on the date that the approval is given; and
      - (B) ending with the earlier of 2 years after the date that the approval was given or 4 years after the date that the pre-1990 forest land was cleared; or
    - (ii) in the case where the land is not converted to another land use and remains forest land, in the period—
      - (A) beginning on the date that the pre-1990 forest land was cleared; and
      - (B) ending 4 years after the date that the pre-1990 forest land was cleared;
  - (c) in the case of post-1989 forest land, the post-1989 forest land that is cleared may not be treated as deforested if the cleared land—
    - (i) is contiguous with the edge of post-1989 forest land that existed on the date of registration; and
    - (ii) is an area that is less than 1 hectare or that is less than 30 metres wide at its widest point; and
    - (iii) is required to be or remain cleared to implement New Zealand's best practice forest management; and
    - (iv) is used only for the purpose of implementing New Zealand's best practice forest management.
- (2) Subsection (1)(b) does not apply if the EPA revokes its approval of an offsetting forest land application under [section 186G\(1\)](#).
- (3) This section applies to land that was cleared before, on, or after the commencement of this section.

Section 179A: inserted, on 1 January 2013, by [section 73](#) of the Climate Change Response (Emissions Trading and Other Matters) Amendment Act 2012 (2012 No 89).