

Data Description

Thank you for downloading our ForestInsights layers. The layers are prepared as ESRI shapefiles and include layer files (ESRI and QGIS) that allow you to visualise, age class and harvest year information.

Also included is an assessment by region of our plantation age class estimates.

1. ForestInsights data schema

The data schema has been standardised across each layer in a way that allows further analysis and integration. The information provided for each layer is documented in the table below.

Attribute	Field description	Data layer		
		Forest Boundaries	Harvest Year	Age Class
admin_1	Country	X	X	X
admin_2	Region or state	X	X	X
area_uid	Unique feature ID for each area feature	X	X	X
age_uid	Unique feature id by age for each age feature			X
spp	Species	X	X	X
yoe	Year of establishment			X
age_class	Age class bands			X
detect_rot	Planted forest where harvest has been detected = True else likely greenfield planting ¹			X
harv_uid	Unique feature id by age for each age feature		X	X
harv_year	Harvest year (YYYY)		X	X
area_ha	Area hectares	X	X	X

Recent harvest detection

The most recent forest harvest activities are detected using Sentinel-2 composites that use images captured as close to the end of year as possible.

¹ In New Zealand, this separates detections made from optical sensors and predictions based on LiDAR. Outside of New Zealand, this separates recent detections using Sentinel-2 and those made using Landsat, which includes both gain and loss (growth and harvest) detections

New Zealand

New Zealand's plantation estate is one of the most well-developed and intensively managed in the Southern Hemisphere, primarily consisting of radiata pine (*Pinus radiata*), which makes up around 90% of the total plantation area. This dominance is due to radiata pine's fast growth, versatility, and suitability for a wide range of wood products, including sawlogs, structural timber, and pulp. Other species include Douglas fir, eucalyptus, and various cypress species, but these represent only a small portion of the total estate.

The plantations are largely located in the central and northern regions of the North Island, such as the Central North Island and in the northern part of the South Island, particularly in regions like Nelson and Canterbury. Rotation lengths vary depending on end-use, with radiata pine typically harvested at 25–30 years for structural timber, while shorter rotations of around 20 years are used for lower-grade or pulpwood logs.



Forest boundaries

Forest boundaries are produced by [Scion BSI](#). Note that aerial capture dates vary by region – for a list of the currently used aerial imagery, see the data credits. Where stands are very young at the time of capture (less than 5 years post planting) they may not be captured. This will be possible to address by including detections from later aerial imagery, which will be processed over time.

Accuracy of plantation age estimate

For each region, we analyse randomly distributed points to determine the accuracy of our plantation age estimates.

We manually compare the estimated age against available satellite data at each point to make the best possible assessment. Some very small features, e.g. shelter belts, cannot be age-classed accurately, and a lack of suitable imagery may mean not all check points can be assessed. Unless otherwise apparent, planting is assumed to occur within 1 year of harvest detection.

In some locations where LiDAR is not available (for instance, central Manawatu-Whanganui), and where no harvest activity has been detected post 2000, it may not be possible to estimate beyond 'pre-2000'. Where the only LiDAR available is old, some features may not be able to be age classed below a certain age. This will be expressed as x years or younger. Note that the regions described are according to the LiDAR captures, and will vary compared to regional council boundaries etc.

Age class accuracy is expressed as the proportion of points that fall within a given number of years of the reference value. The following summary provides an overview of each region's age class estimation results. This information indicates how well our plantation age estimation model predicts plantation age.

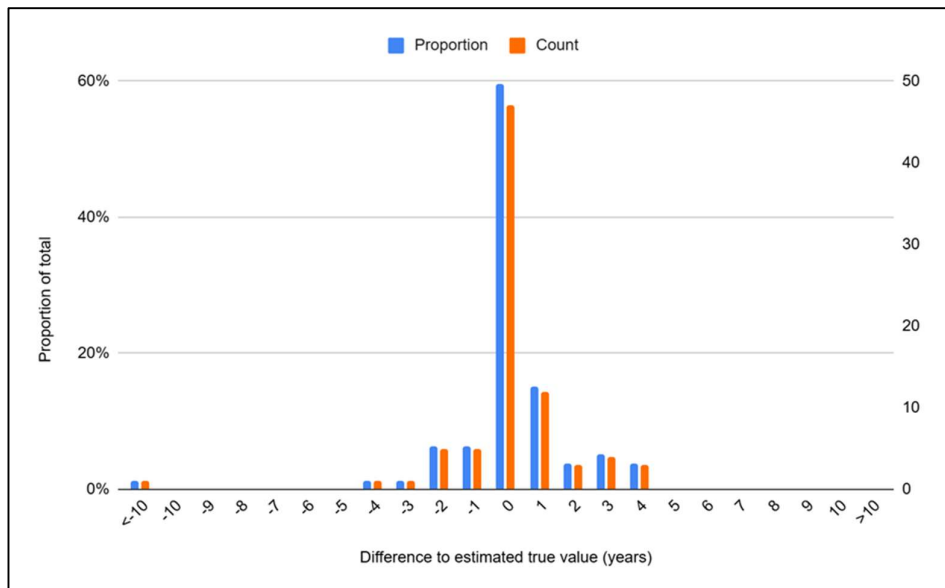
NZ Regional summary: Age class accuracy results

Region	No points	Planted age results					No result
		Proportion of points within planted year				mean absolute difference	
		1	2	3	4+	(years)	
Gisborne	100	78%	88%	94%	100%	0.9	18
Auckland	100	80%	85%	91%	100%	1.3	5
Hawkes Bay	100	78%	84%	93%	100%	1.1	5
Waikato	150	91%	94%	96%	100%	0.8	12
BOP	100	81%	94%	95%	100%	1.0	6
Wellington	100	76%	84%	94%	100%	1.4	30
Taranaki	100	59%	84%	93%	100%	2.0	29
Northland	100	82%	87%	91%	100%	1.0	7
Tasman	100	79%	85%	89%	100%	1.6	4
Manawatu-Whanganui	100	75%	86%	89%	100%	1.7	24
Marlborough	100	72%	81%	86%	100%	1.4	10
Nelson	40	92%	97%	100%	100%	0.4	1
West coast	In progress						
Canterbury	In progress						
Otago	In progress						
Southland	In progress						

Regional analysis

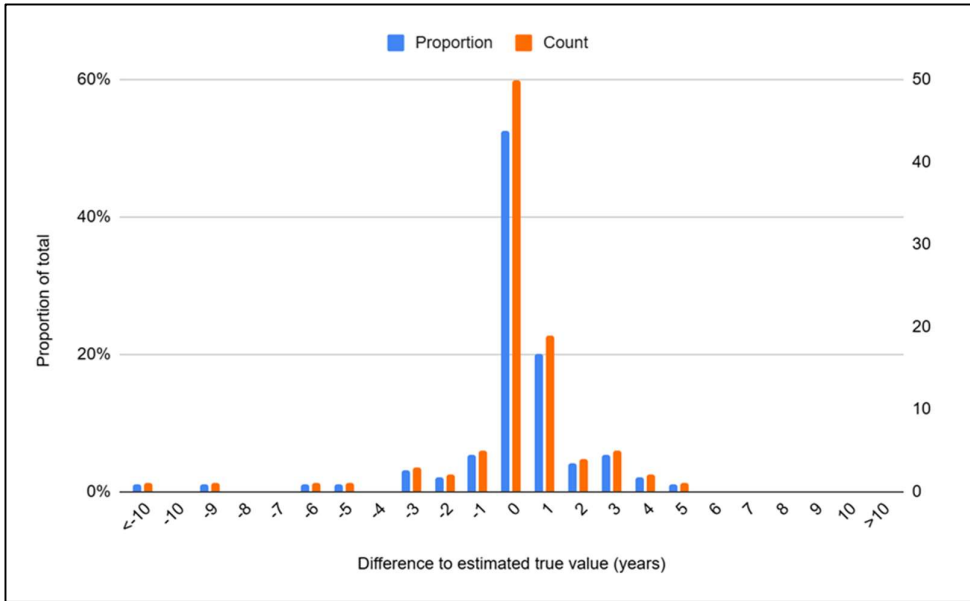
Gisborne region

Of the 100 points tested, 18 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 82, 64 (78%) were within 1 year of the assumed true value, 72 (88%) were within two years, and 77 (94%) were within 3 years. The mean absolute difference was 1 year.



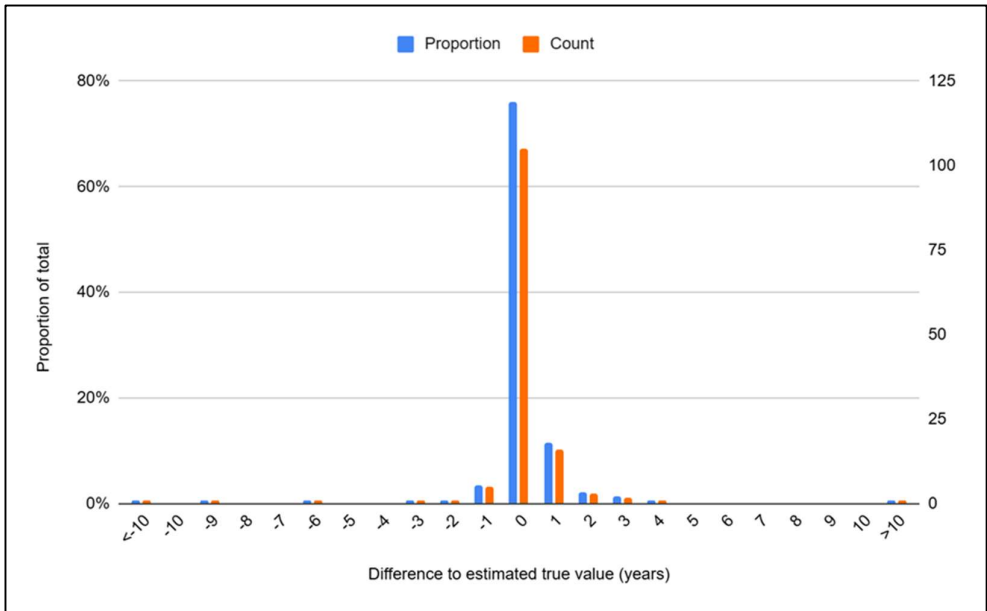
Hawkes Bay region

Of the 100 points tested, 5 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available. These were likely to be planted before 2000). Of the remaining 95, 74 (78%) were within 1 year of the assumed true value, 80 (84%) were within two years, and 88 (92%) were within 3 years. The mean absolute difference was 1.1 years. Notably, a significant proportion of the accuracy points with poor accuracy values were shelterbelt plantings, which complicates the age detection process.



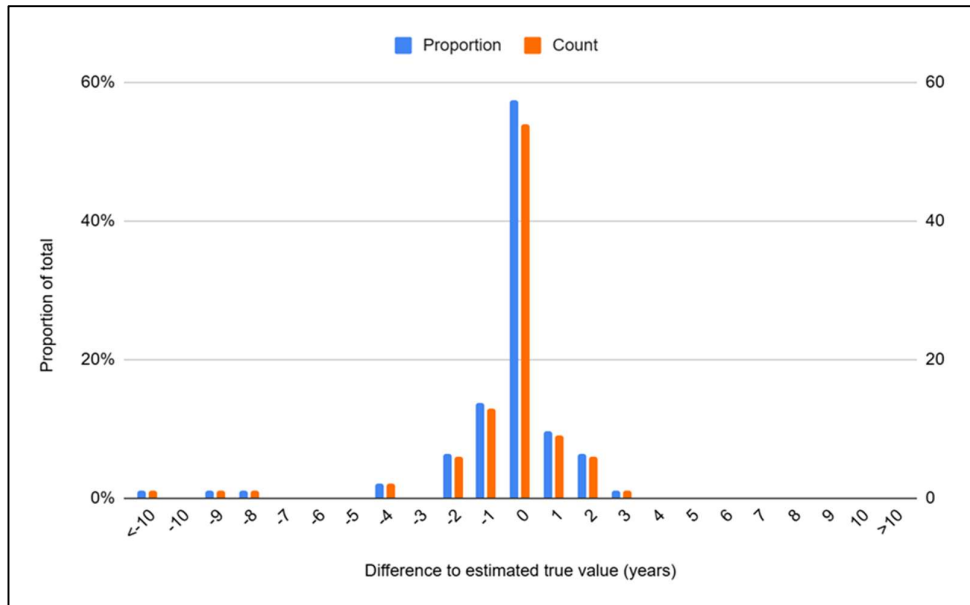
Waikato region

Of the 150 points tested, 12 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 138, 126 (91%) were within 1 year of the assumed true value, 130 (94%) were within two years, and 133 (96%) were within 3 years. The mean absolute difference was 0.75 years.



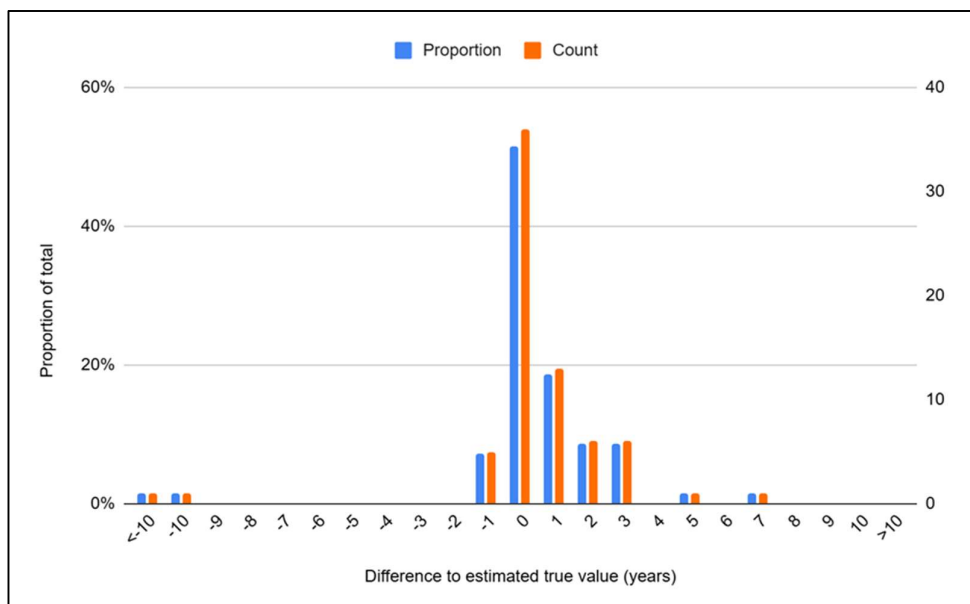
Bay of Plenty region

Of the 100 points tested, 6 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 94, 76 (81%) were within 1 year of the assumed true value, 88 (94%) were within two years, and 89 (95%) were within 3 years. The mean absolute difference was 1 year.



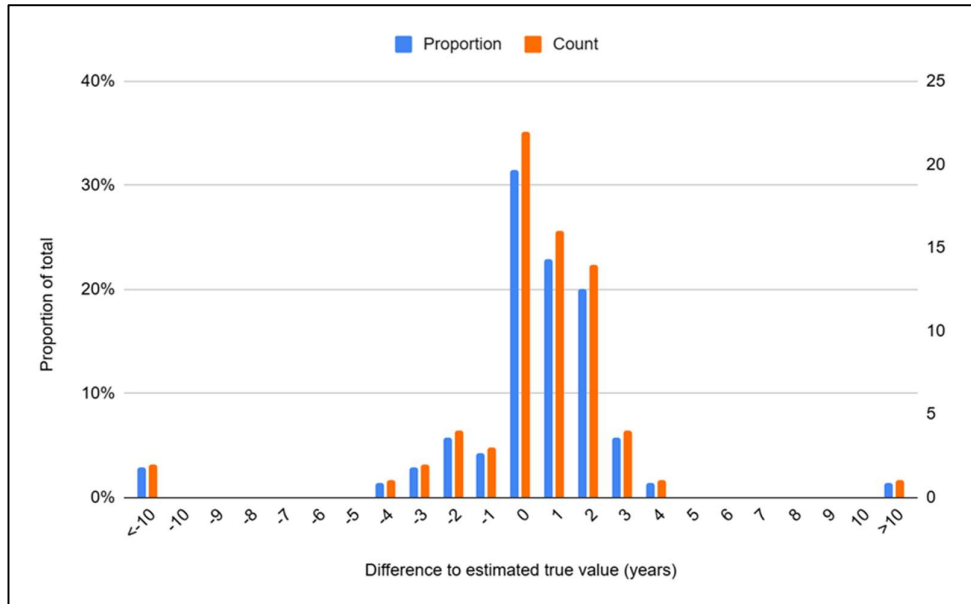
Wellington region

Of the 100 points tested, 30 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 70, 53 (76%) were within 1 year of the assumed true value, 59 (84%) were within two years and 66 (94%) were within 3 years. The mean absolute difference was 1.4 years. Note that some younger features were not able to be age classed beyond age 14 and some additional was not able to be completed due to the age of the underlying LiDAR dataset.



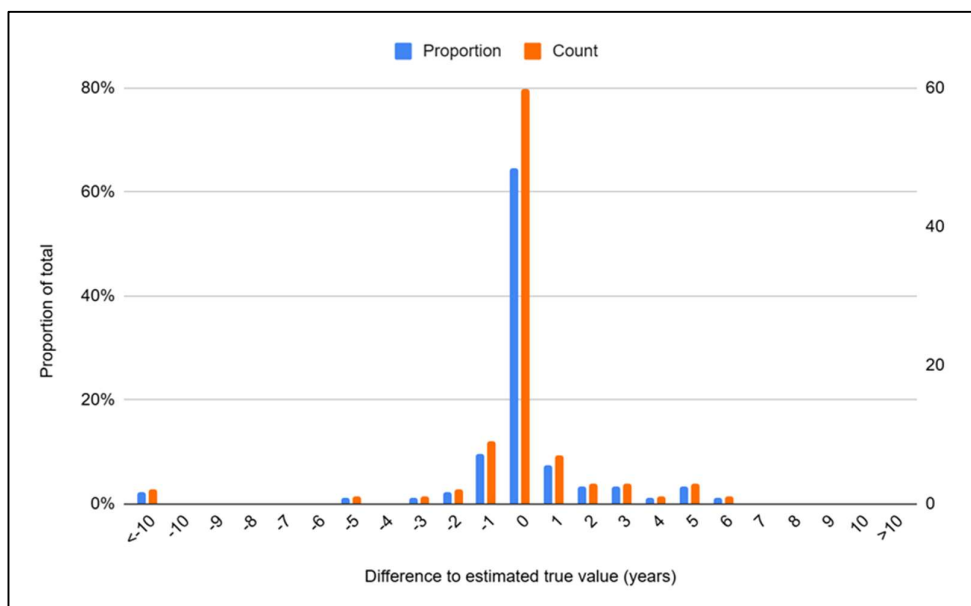
Taranaki region

Of the 100 points tested, 30 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 70, 41 (59%) were within 1 year of the assumed true value, 59 (84%) were within two years, and 65 (93%) were within 3 years. The mean absolute difference was 2 years. It is worth noting that there were a large number of detections of very small woodlots and shelter belts in this region.



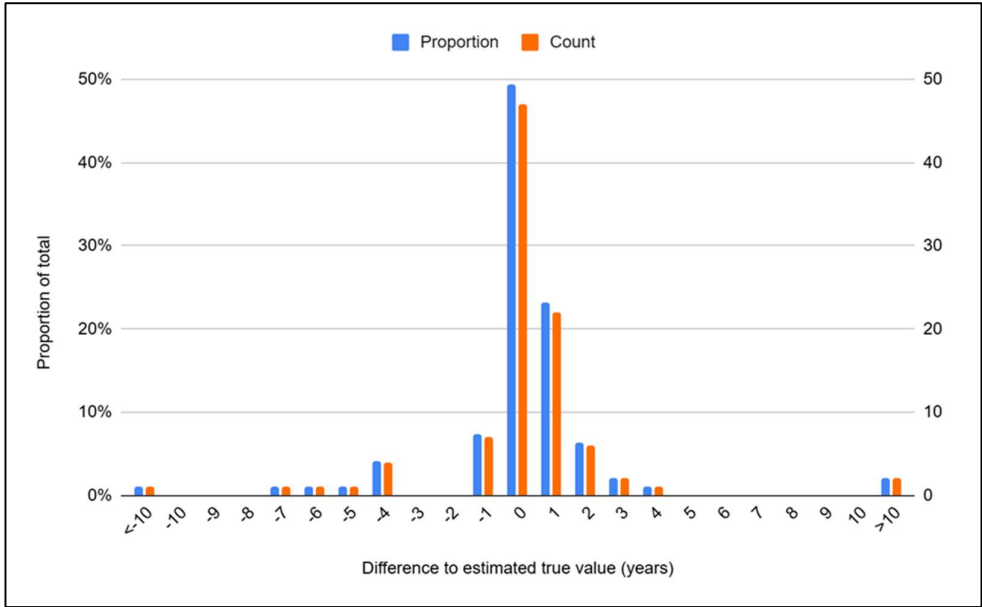
Northland region

Of the 100 points tested, 7 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 93, 76 (82%) were within 1 year of the assumed true value, 81 (87%) were within two years, and 85 (91%) were within 3 years. The mean absolute difference was 1 year. Differences were largely down to the lower growth rates of the sand forest in the far north of the region, which made inferring the correct age difficult using the LiDAR height age relationship.



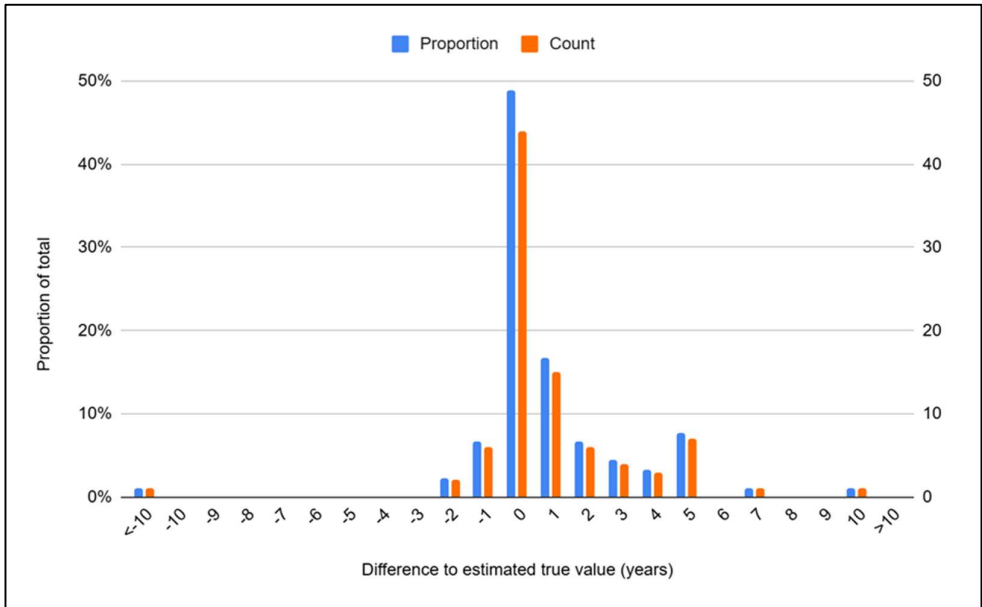
Tasman region

Of the 100 points tested, 4 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 96, 77 (80%) were within 1 year of the assumed true value, 84 (88%) were within two years, and 86 (90%) were within 3 years. The mean absolute difference was 1.6 years. In several cases the plot falling on the boundary of a harvest event resulted in the observed age differences.



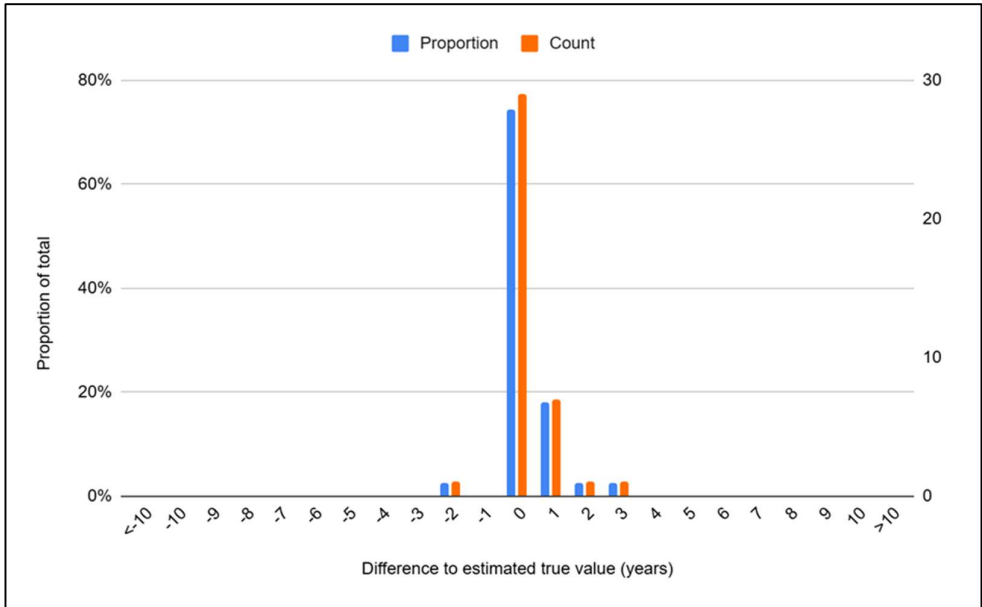
Marlborough region

Of the 100 points tested, 10 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 90, 65 (72%) were within 1 year of the assumed true value, 73 (81%) were within two years, and 77 (86%) were within 3 years. The mean absolute difference was 1.4 years.



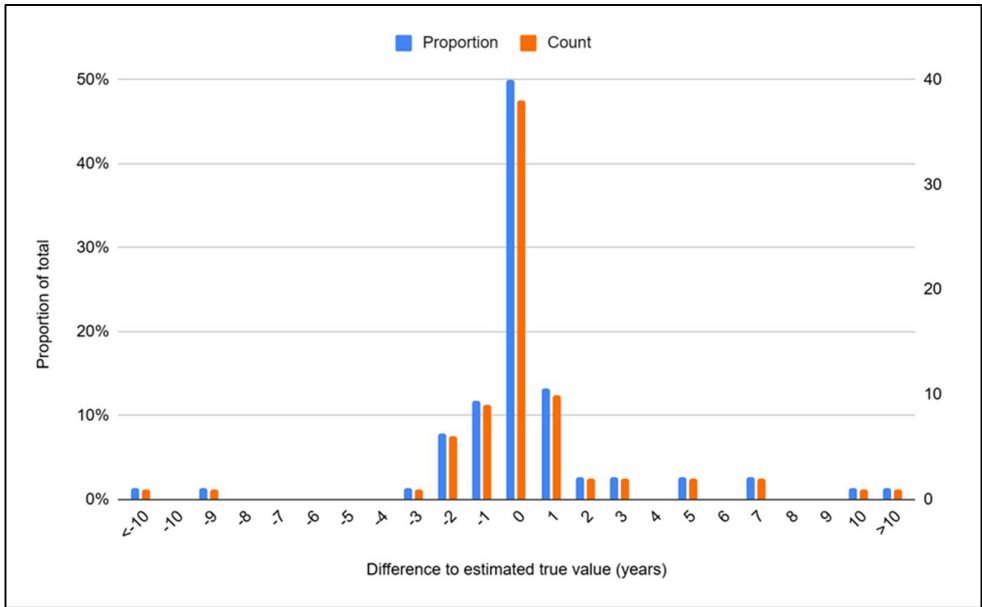
Nelson region

Of the 40 points tested, 1 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 39, 36 (92%) were within 1 year of the assumed true value, 38 (97%) were within two years, and 39 (100%) were within 3 years. The mean absolute difference was 0.4 years.



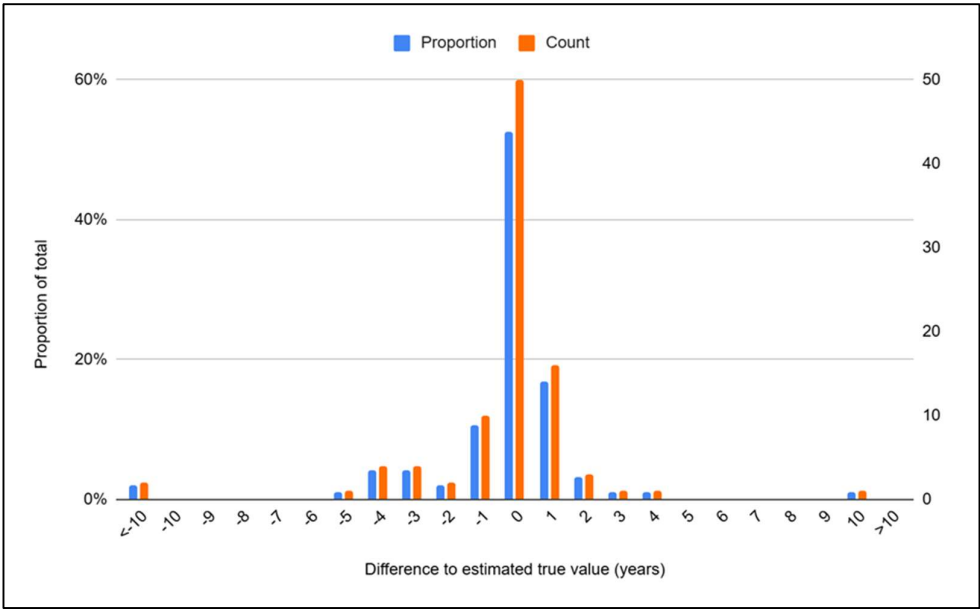
Manawatu-Whanganui region

Of the 100 points tested, 24 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 76, 57 (75%) were within 1 year of the assumed true value, 65 (86%) were within two years, and 68 (89%) were within 3 years. The mean absolute difference was 1.7 years. Due to a lack of LiDAR coverage, some results were unable to have an age estimate generated – these have been marked as ‘assume pre 2000’.



Auckland region

Of the 100 points tested, 5 did not have an age class attributed due to a lack of imagery evidence (i.e. no planting or re-planting images were available, likely planted before 2000). Of the remaining 95, 76 (80%) were within 1 year of the assumed true value, 81 (85%) were within two years, and 86 (91%) were within 3 years. The mean absolute difference was 0.4 years.

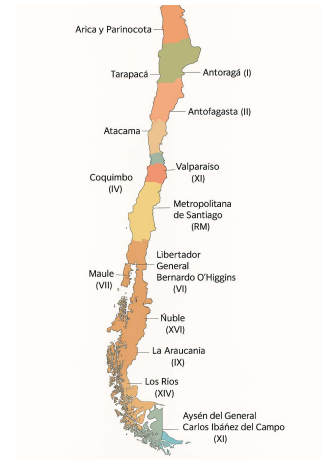


Chile

Chile's plantation estate is primarily composed of two main species: radiata pine, which accounts for 56% of the total area, and eucalyptus, which represents 37%. Radiata pine is mainly cultivated for clearwood and managed under a longer rotation of 25 to 30 years, while eucalyptus is grown on a shorter rotation of 10 to 15 years, primarily for pulpwood production.

The majority of these plantations are concentrated in the central regions of Chile, particularly in Biobío and La Araucanía. One of the most significant risks faced by forest owners in these areas is forest fire, with the fire season extending through the driest summer months, from October to April.

Note in some cases imagery after the 31st of December was required due to cloud coverage and conditions



Accuracy of plantation age estimate

The following summary provides an overview of each region's age class estimation results. This information indicates how well our plantation age estimation model predicts plantation age.

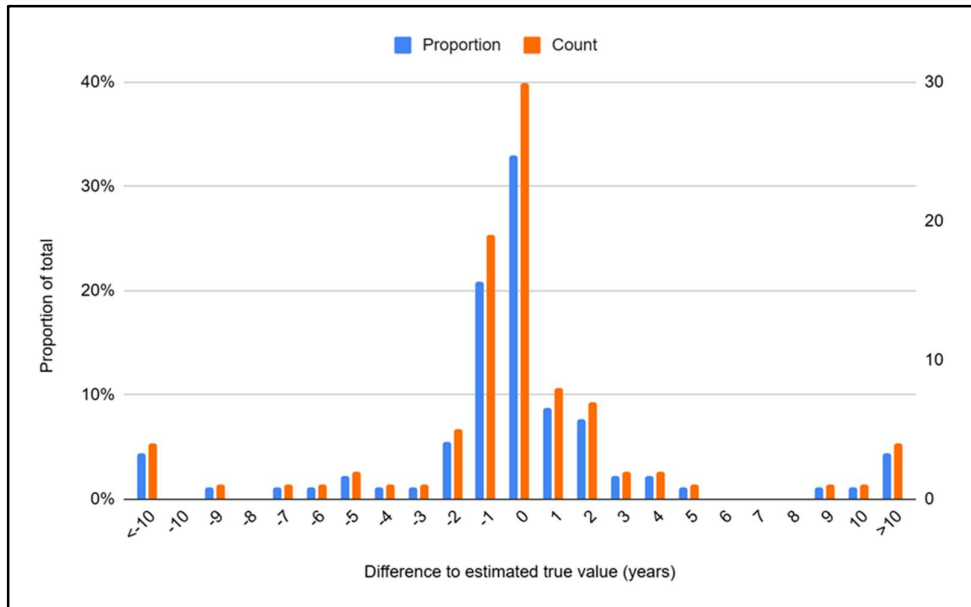
Regional summary: Age class accuracy results

Region	No points	Planted age results					No result
		Proportion of points within planted year				mean difference	
		1	2	3	4+	(years)	
Maule (VII)	89	63%	76%	79%	100%	2.5	2
Ñuble (XVI)	93	66%	74%	77%	100%	2.7	1
Biobío (VIII)	94	73%	77%	78%	100%	2.9	1
La Araucanía (IX)	95	81%	84%	85%	100%	2.3	0
Los Ríos (XIV)	In progress						

Regional analysis

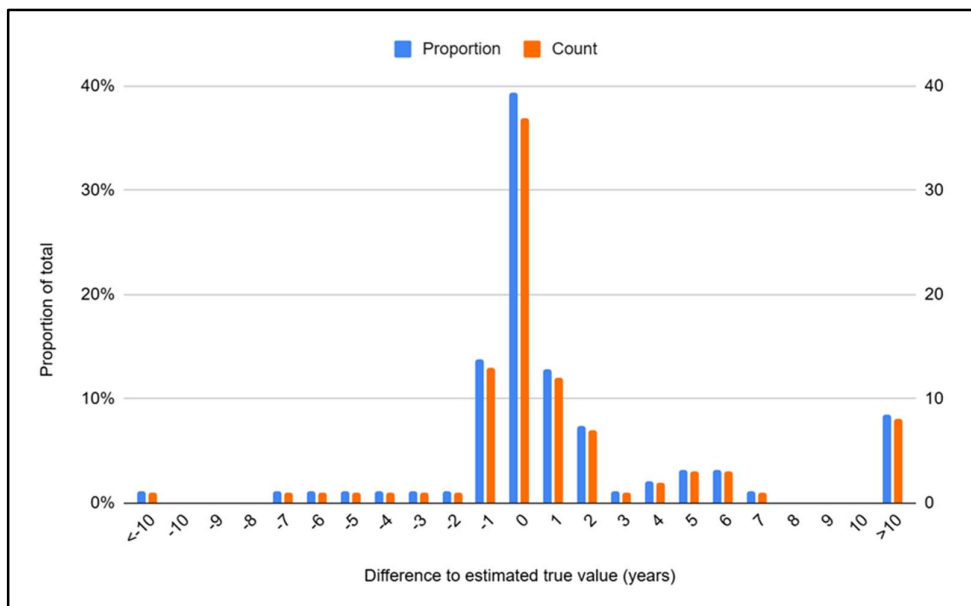
Maule

91 points were assessed for age class accuracy, of which 89 had age class predictions. 57 were within 1 year (63%), 69 were within two years (76%) and 72 were within three years (79%). 124 points were assessed for classification (of which the age classed points were a subset) and 109 were found to be correct (88%).



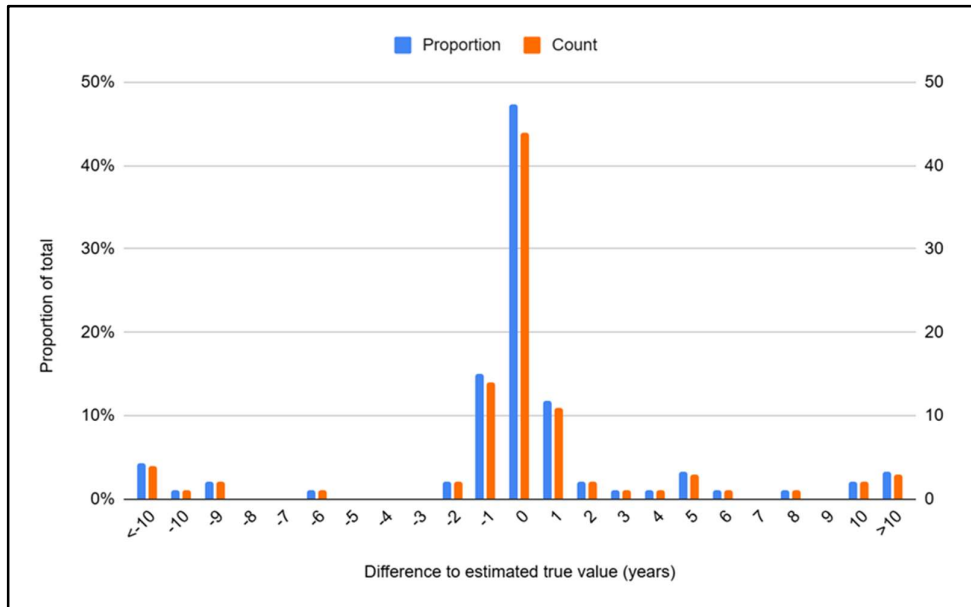
Nuble

94 points were assessed for age class accuracy, of which 93 had age class predictions. 62 were within 1 year (66%), 70 were within two years (74%) and 72 were within three years (77%). 112 points were assessed for classification (of which the age classed points were a subset) and 102 were found to be correct (91%).



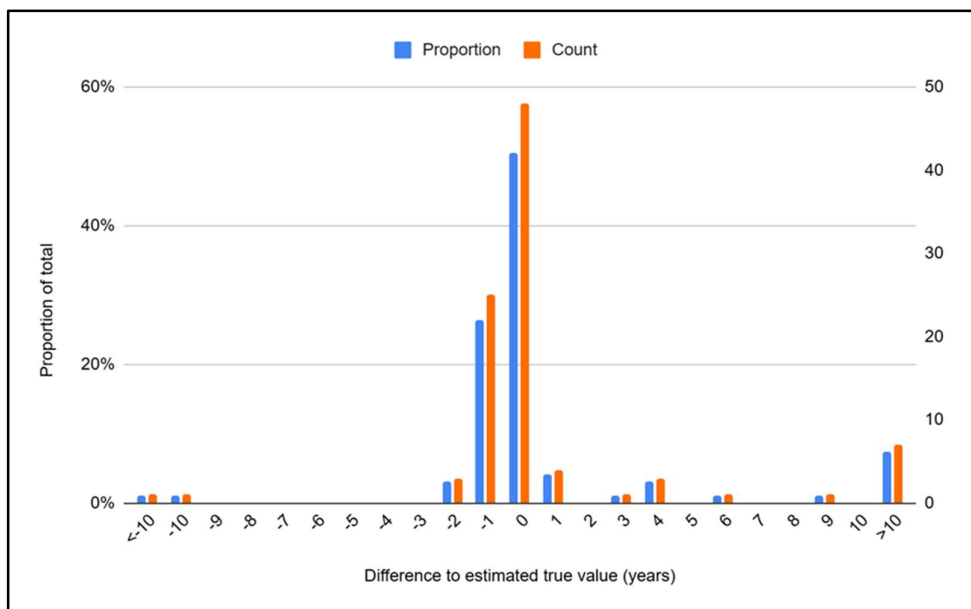
Biobío

95 points were assessed for age class accuracy, of which 94 had age class predictions. 69 were within 1 year (73%), 73 were within two years (77%) and 74 were within three years (78%). 128 points were assessed for classification (of which the age classed points were a subset) and 100 were found to be correct (89%).



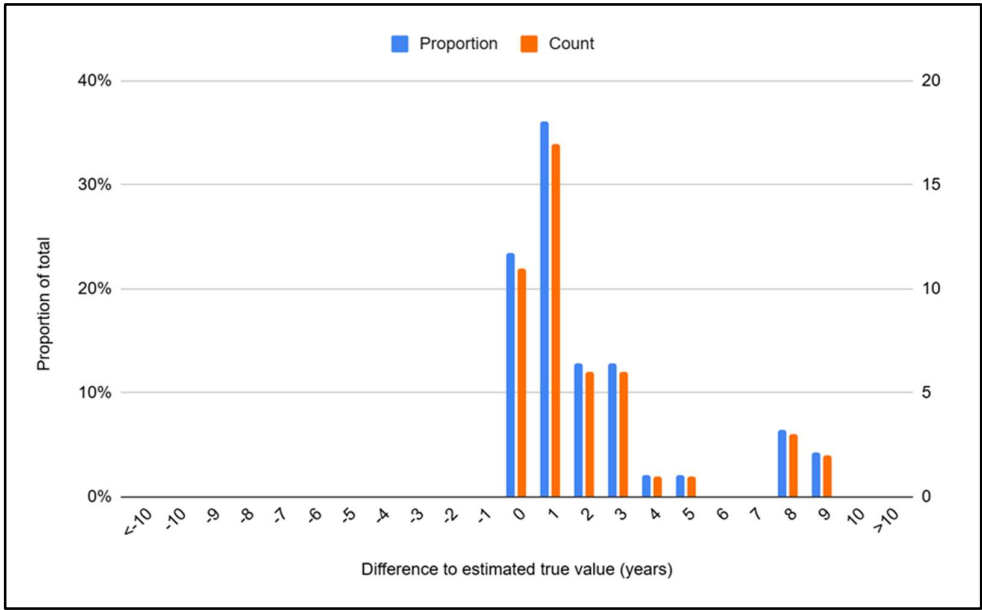
La Araucanía

95 points were assessed for age class accuracy. 77 were within 1 year (81%), 80 were within two years (84%) and 81 were within three years (85%). 118 points were assessed for classification (of which the age classed points were a subset) and 104 were found to be correct (88%).



Cambodia

55 points were assessed as Rubber plantation, with 48 correctly classified (producers accuracy Of 87%). Users accuracy was similar, at 89%. Very young rubber was assessed separately and was excluded due to confusion with other classes. Age class accuracy was assessed over these 55 points, with all but one able to have an estimated establishment year manually derived using Landsat, Sentinel and Google Earth imagery. Of these 54, 28% were predicted within 1 year of the assessed value (52%), 34 within two years (63%) and 40 within three years (74%). 7 did not have predictions.



Data credits

Our ForestInsights are created using third-party data, these are available for reuse under the [Creative Commons Attribution 4.0 International](#) licence or are otherwise open access. Links to the datasets or their respective terms and conditions are listed below.

All locations

European Space Agency (ESA): [Sentinel Data Legal Notice](#). Contains modified Copernicus Sentinel data, 2018 to 2025, processed in Google Earth Engine.

Landsat 4, 5, 7 and 8 data is provided courtesy of the U.S. Geological Survey.

Global forest change dataset as described in [Hansen, M., et al. \(2013\)](#), reused under [CC-BY-4.0](#). Data was modified.

Hansen/UMD/Google/USGS/NASA

Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science* 342 (15 November): 850-53. Data available on-line from: <https://glad.earthengine.app/view/global-forest-change>.

Cloud masking of Sentinel-2 uses the Cloud Score+ harmonised dataset, reused under [CC-BY-4.0](#).

Pasquarella, V. J., Brown, C. F., Czerwinski, W., & Rucklidge, W. J. (2023). Comprehensive quality assessment of optical satellite imagery using weakly supervised video learning. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition* (pp. 2125-2135).

New Zealand

Land Information New Zealand aerial and LiDAR data layers

LINZ hosts these layers, which have been distributed under [Creative Commons V4.0](#). These data have been captured by various entities and used in our analysis. A complete list of data sources by region is available [here](#).

Aerial capture credits:

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LiDAR capture credits:

Gisborne District Council, LINZ (2021). Gisborne, New Zealand 2018-2020. Collected by Aerial Surveys, distributed by OpenTopography and Land Information New Zealand (LINZ). <https://doi.org/10.5069/G92V2D9X>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Gisborne District Council. Accessed via the [NZ elevation AWS bucket](#).

Hawke's Bay Regional Council, Wairoa District Council, Hastings District Council, Napier City Council, Central Hawke's Bay District Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2023). Hawke's Bay, New Zealand 2020-2021. Collected by Ocean Infinity, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9S75DH2>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Hawke's Bay Regional Council. Accessed via the [NZ elevation AWS bucket](#).

Waikato Regional Council, Waikato District Council, Hauraki District Council, Thames Coromandel District Council, Matamata Piako District Council, Ōtorohanga District Council, South Waikato District Council, Taupō District, Waipā District Council Council, Waitomo District Council, Lincoln Agritech, Waikato River Authority, Mercury NZ Ltd, EQC Earthquake Commission, Environmental Research Institute, WEL Networks, Toitū Te Whenua Land Information New Zealand (LINZ) (2024). Waikato, New Zealand 2021. Collected by Ocean Infinity, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9ZC8136>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Waikato Regional Council. Accessed via the [NZ elevation AWS bucket](#).

BOPLASS Limited, Toitū Te Whenua Land Information New Zealand (LINZ) (2023). Bay of Plenty, New Zealand 2019-2022. Collected by Aerial Surveys, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9W66J0Z>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by BOPLASS Ltd. Accessed via the [NZ elevation AWS bucket](#).

Wellington, New Zealand 2013-2014. Distributed by OpenTopography. <https://doi.org/10.5069/G9CV4FPT>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Greater Wellington Regional Council. Accessed via the [NZ elevation AWS bucket](#).

Taranaki Regional Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2022). Taranaki, New Zealand 2021. Collected by AAM, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9JM27VZ>. CC BY 4.0. Copyright in the underlying dataset from which this

work has been derived is owned by Taranaki Regional Council. Accessed via the [NZ elevation AWS bucket](#).

Northland Regional Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2022). Northland, New Zealand 2018-2020. Collected by RPS Group, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9BR8QDQ>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Northland Regional Council. Accessed via the [NZ elevation AWS bucket](#).

Ministry for the Environment, Regional Software Holdings Limited, Toitū Te Whenua Land Information New Zealand (LINZ) (2025). Manawatū - Whanganui, New Zealand 2024. Collected by Woolpert NZ Ltd, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9P8494X>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by the Regional Software Holdings Limited (RSHL). Accessed via the [NZ elevation AWS bucket](#).

Ngā Tāngata Tiaki o Whanganui, Toitū Te Whenua Land Information New Zealand (LINZ) (2025). Manawatū-Whanganui - Whanganui River Catchment, New Zealand 2025. Collected by Landpro Ltd, distributed by LINZ. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by the Ngā Tāngata Tiaki o Whanganui. Accessed via the [NZ elevation AWS bucket](#).

Tasman District Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2023). Tasman, New Zealand 2020-2022. Collected by Aerial Surveys, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9S46Q5N>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Tasman District Council. Accessed via the [NZ elevation AWS bucket](#).

Tasman District Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2024). Abel Tasman and Golden Bay, Tasman, New Zealand 2023. Collected by Aerial Surveys, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G94M92SX>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Tasman District Council. Accessed via the [NZ elevation AWS bucket](#).

Tasman District Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2024). Motueka River Valley LiDAR, Tasman, New Zealand 2024. Collected by Aerial Surveys, distributed by LINZ. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Tasman District Council. Accessed via the [NZ elevation AWS bucket](#).

Tasman District Council, Toitū Te Whenua Land Information New Zealand (LINZ) (2023). Tasman Bay, Tasman, New Zealand 2022. Collected by Aerial Surveys, distributed by OpenTopography and LINZ. <https://doi.org/10.5069/G9N29V5H>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Tasman District Council. Accessed via the [NZ elevation AWS bucket](#).

LINZ (2018). Golden Bay, Tasman, New Zealand 2017. Collected by AAM New Zealand Limited, distributed by OpenTopography and Land Information New Zealand (LINZ). <https://doi.org/10.5069/G9N877WS>. CC BY 4.0. Copyright in the underlying dataset from which this work has been derived is owned by Tasman District Council. Accessed via the [NZ elevation AWS bucket](#).

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Scion

Spatial projections of the height productivity or [site index](#) of radiata pine (*Pinus radiata*) developed at a 25 m resolution. As described in [Watt, M., et al. \(2021\)](#). Scion's spatial projections of the volume productivity of radiata pine or 300 Index of (*Pinus radiata*) developed at a 25 m resolution. The displayed productivity is defined by the 300 Index which is the mean annual volume increment at age 30 normalised to a stand density of 300 stems/ha, with units of m³/ha/yr. As described in [Kimberley, M., et al \(2005\)](#)

Chile

Forest cover for Pine and Eucalyptus plantations was assessed using a Random Forest classification within areas defined by the CONAF 'Plantación' SUBUSO boundaries. Sentinel-2 imagery was employed for two distinct periods (end of 2021 and end of 2024) to detect recent harvesting and planting activities. Image composites from Sentinel-2 were specifically selected to minimize cloud cover (2021/12/24–2022/03/09 and 2024/11/18–2025/01/27).

The Random Forest model was trained using a combination of data sources, including:

- CONAF data
- Internal data
- Visual interpretation across 10 classes (including Pine, Eucalyptus, and non-forest classes).

Areas identified as mixed or labeled as "Plantation with Wild Exotics" were excluded from analysis. Post-classification consolidation yielded an overall accuracy of **87%** and a kappa coefficient of **82%**.

Subsequently, areas identified as Pine, Eucalyptus, or recently harvested were isolated. To estimate plantation ages, annual Landsat imagery from 1998 to 2024 was analyzed using time-series methods to detect historical planting and harvesting events. Sentinel-2 imagery for the most recent three years was prioritized over Landsat results for detecting harvesting events.

Where no planting or harvesting event could be clearly identified, plantations were classified as having been established **before 2000**.

Data credits

Contains data from the CONAF Territorial Information System (SIT) Vegetational Cadastre Fact Sheets, accessed via <https://sit.conaf.cl/>. Data was modified.

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Boundary data sourced from La Biblioteca del Congreso Nacional de Chile (BCN) via the U.N OCHA Human Data Exchange and licensed for reuse under CC BY-IGO.

Cambodia

Rubber plantation area was assessed using 2021 and 2022 Sentinel-2 composites, augmented by Sentinel-1 SAR data and SRTM elevation data. Age class estimates were derived from a LandTrendr model using all available Landsat imagery, from 1992 to 2022. Where no planting or harvesting event could be clearly identified, plantations were classified as having been established **before 2000**.

Boundaries sourced from Department of Geography of the Ministry of Land Management, Urbanization and Construction via the U.N. OCHA Humanitarian Data Exchange database and licensed for reuse under CC BY-IGO.

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