Branching Out Blueprint

Trees and their value chain

THE OPPORTUNITY FOR TARANAKI, NEW ZEALAND

venture TARANAKI
Te Puna Umanga

A blueprint for the future of food and fibre

Branching Out is a project that has been initiated and led by Venture Taranaki. It is underpinned by funding from the Ministry for Primary Industries' Sustainable Food and Fibre Futures fund (SFFF). It is supported by local sponsors as well as the region's three district councils – New Plymouth District Council, South Taranaki District Council and Stratford District Council. The project has identified a number of innovative, commercially viable food and fibre value chain opportunities for Taranaki. This work supports the region's strategy and long-term vision for a resilient, high-value, and low-emissions economy built on inclusivity and sustainability, as articulated by Tapaue Roa and Taranaki 2050 – the guiding strategic documents for the region, co-created with the people of Taranaki.

Branching Out aims to strengthen and diversify the Taranaki economy and has taken input from a wide range of industry participants, from landowners to interested growers, manufacturers to food & fibre entrepreneurs and potential investors. Through a process of investigation, a shortlist of eleven feasible ventures have been selected. Crown Research Institutes and universities, including Massey and Lincoln, were engaged to provide robust research that underpins each venture selection. Work has also been undertaken with commercial partners to support the development of prototypes with significant market potential, and a core focus on sustainability and waste reduction.

The investigations, collaborations, and potential commercial pilot opportunities for the region that have been explored as part of this project are being presented as Venture Blueprints. These blueprints aim to build investor confidence and serve as an informative and inspirational roadmap to kick-start complementary land-based activities and associated value chain enterprises in Taranaki.

The blueprints focus on traditional methods of assessing value, determined by comparing inputs (land, animals, machinery, time) and outputs (milk, meat, wool, other products). However, consumer expectations and an increased awareness of environmental degradation mean that thought should also be given to how the natural environment can be protected and what value this action can add to a developing sector.

TE TAIAO

In 2020, the Primary Sector Council released their Food and Fibre Strategy, Fit for a Better World. This strategy adopted the Te Taiao framework, acknowledging that Te Taiao is all of the natural world that contains and surrounds us (land, water, air, and biological life). It is a uniquely New Zealand perspective that is underpinned by three guiding principles:

- Our land, water, air, and biological life must be able to thrive without over-use
- Any use is a privilege, not a right
- If something is not healthy or well, we must fix it.

Developing or participating in a new value chain is an opportunity to consider your business's relationship with Te Taiao. It is a chance to farm, produce and engage in a way that safeguards the mana and integrity of the natural world. If the whenua (land), and the entities that are connected to it, are to be nourished and thrive, then it must be cared for and protected. Each blueprint opportunity should be considered with Te Taiao in mind.

DISCLAIMER

This document, produced by Venture Taranaki, provides an overview of opportunity for commercial production and processing of trees in Taranaki, and an indication of potential returns. It does not constitute investment advice. Professional advice should be sought if you wish to explore this opportunity further. This blueprint is correct to our knowledge and based on the best information we could access as of June 2022. However, this work is ongoing, and we welcome new or emerging information about this opportunity. For more information or for input, please contact branchingout@venture.org.nz.

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venture TARANAKI Te Puna Umanga

Ministry for Primary Industries Manatū Ahu Matua

Te Kaunihera-ā-Rohe o Ngāmotu New Plymouth District Council

Te Kaunihera ō Taranaki ki Te Tonga South Taranaki District Council

Te Kaunihera ā Rohe o Whakaahurangi Stratford District Council

Cover Photo: Woodspan® PLT Panels

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Trees and Their Value Chain: A snapshot

UNTAPPED POTENTIAL

- The world needs more trees – as the raw material for a wide range of valuable and sustainable products, and to reduce carbon dioxide levels.
- It is predicted that there will be a nearly three-fold increase in global demand for timber by 2050, from 2.2 billion cubic metres to 5.8 billion cubic metres[1].
- Forestry can make productive use of land not suited for agriculture while also capturing CO_2 and helping reduce greenhouse gas emissions.
- New Zealand only produces around 35 million cubic metres per year, just 1.6% of global timber production.

WHY NOW?

- The demand for local and exported wood products is increasing. It is expected that there will be a three-fold increase in global demand for timber by 2050, from 2.2 billion cubic meters to 5.8 billion cubic meters.
- Increased future demand is also likely to result in increased prices for timber.
- The Emissions Trading Scheme has created the opportunity to earn carbon units from new forest.

SECTOR TURNOVER:
National exports of forestry and wood products totaled $5.56 billion in the year to December 2020.

SECTOR TURNOVER:
Log exports through Port Taranaki were just under $147 million in the year to March 2020.

SECTOR TURNOVER:
Exports of $6.15b are expected in 2022.

GROWTH TARGETS:
With a 27-30 year Radiata pine growing cycle, the volume of timber available for local and export markets is closely linked to the trees already in the ground. A gradual increase in exports is expected over the next decade in Taranaki and across New Zealand.

WHY TARANAKI?

Taranaki has existing forestry production and wood processing capabilities.

There is plenty of land in Taranaki, particularly in Eastern Taranaki, where forestry may by the optimal land use, while also contributing environmental benefits such as erosion control and reduced runoff.

There is market potential for biorefining and bioenergy products that could contribute to the transition of the Taranaki energy and manufacturing economy.

Log exports form a vital component of the commercial activities of Port Taranaki.

WHO SHOULD BE INTERESTED?

Taranaki landowners looking to diversify their income stream, achieve a better return from suitable land or implement a more sustainable land use.

Investors seeking potentially attractive returns in a growth industry.

Wood processors wanting to secure their future flow of logs and develop their production capacity and/or capabilities.

Parties committed to green investments.

1 GHGTO2020FINAL.pdf (greshamhouse.com)

IN-REGION INFRASTRUCTURE OPPORTUNITIES

An increase in forestry plantings within the region will create further opportunities for regional support services, post-harvest infrastructure and processing facilities for added value timber products.

VALUE-ADDED OPPORTUNITIES

With only around 40% of New Zealand timber processed in New Zealand there is a great resource for further processing. Options include producing sawn timber for construction, manufacturing engineered timber products such as plywood and laminates, and using timber as a resource for biorefining and a wide range of resulting products. The use of forestry for bioenergy also provides opportunity for the sector to underpin a wide range of other manufacturing industries which require clean energy and/or green carbon dioxide for their operation.

BLUEPRINT SCOPE

This Blueprint focuses on growing exotic trees for commercial wood production and/or for earning carbon units. It also discusses various processing options for harvested timber.

It does not cover:

- trees grown for horticulture (e.g., avocados) and other food related purposes (e.g. mānuka for honey).
- non-commercial tree growing activities such as for riparian planting or growing trees on land that has been set aside for biodiversity protection.
- indigenous/native trees grown primarily for earning carbon credits. More information about this is available upon request from Venture Taranaki.

FARM FINANCIALS[2]

	Unpruned	Pruned	Pruned and thinned
Initial Capital Investment per ha	$2,600	$2,600	$2,600
Total revenue per ha	$4,650	$4,660	$4,932
Estimated time to 100% yield	27 years	27 years	27 years
Time to Cash positive	5 years	5 years	5 years

POTENTIAL RETURNS FOR ONE SCENARIO OF PINE FORESTRY IN TARANAKI

An additional 10,000ha of plantation forestry in Taranaki appears a viable scenario. This is around a 30% increase on the current area in plantation forestry.

Based on the financial model prepared for Venture Taranaki by the Agribusiness Group, an additional 10,000ha of Radiata pine in Taranaki would provide:

- Total revenue for growers averaging $42-45m per year.
- Net returns average $15-17m per year.

Such an increase would provide significant positive impacts on employment in planting, managing and harvesting the forest; and it would underpin the opportunity for investment in further wood processing in the region.

TARANAKI BRANCHING OUT SCORECARD

Opportunity rating
1 = low, 5 = high.

This scorecard is intended to act as a quick comparison between blueprint opportunities. These scores are subjective and based on information available at the time of publishing. Further professional investment advice should still be sought.

Development Opportunity	
Suitable growing conditions for forestry	**5**
Suitable land available at reasonable cost	**4**
Existing investment interest	**4**
Local development experience and support services	**4**
Established local, domestic and international demand (for raw logs)	**5**
Product Opportunity	
Large and growing demand for high quality valued-added products	**5**
New Zealand products differentiated in key markets (e.g., Radiata pine Clearwood from pruned forests)	**4**
Established sustainable growing practices	**3**
Reduced greenhouse gas emissions compared to existing land uses	**5**
Postharvest and Processing Opportunity	
Processing facilities available now in Taranaki	**4**
Opportunities for development of value-added products, particularly from waste products	**5**

2 *Based on a financial model provided in 2022 by The Agribusiness Group.*

New Zealand's forestry industry by numbers

The production and processing of wood is a large industry. These figures are as of 2020/21.

The forestry and wood processing sector contributes

1.6%

of New Zealand's GDP.

Employs

35,000

people.

Around 20% of the workforce is involved in the forest growing activities, while the other 80% are involved in wood processing.

The average harvest age was

29.5 yrs

The average age of standing forest was 18.25 years.

19,000ha

of new forest was planted.

41,207ha

was replanted[5].

Exports in the year to Dec 2020 were

$5.56 b

Of total exports, 80% are raw logs, meaning there is considerable potential for further processing of wood products within New Zealand.

Radiata pine comprises

90%

of the total planted area in New Zealand (1.49 million hectares in 2019).

According to the New Zealand Farm Forestry Association Radiata pine is so widely planted as "It is easily managed, grows quickly, produces useful timber, makes strong wood pulp; and tolerates a wide range of sites from coastal sand dunes to sub-alpine gravels."

A range of other plantation species are also grown such as Douglas-fir (98,380 ha), eucalyptus species (21,485 ha), cypress species (9,987ha), other softwoods (24,295 ha) and other hardwoods (12,662 ha). Native timber makes up less than 0.03% of the total harvest.

34.47m m^3

of timber was harvested in the previous year.

The planted standing volume of timber was

501m m^3

1.67 mil

hectares of productive plantation forest in New Zealand[3].

Around 75% of wood from New Zealand's production forests is exported *"including logs, wood chips, sawn timber, engineered wood products, pulp and paper and further manufactured wooded products."* The other 25% of wood is used within New Zealand[4].

China

was the main destination for exports with total value of $2.97b in 2020. Australia was next with $517m followed by South Korea ($367m), Japan ($335m), India ($157m) and the USA ($289m). Several other Asian markets took exports of between $100m and $200m.

3 *Facts and Figures 2020/21, New Zealand Forest Owners Association*
4 *Invest in New Zealand Wood processing, New Zealand Trade and Enterprise (NZTE), 2020*
5 *Facts and Figures 2020/21, New Zealand Forest Owners Association*

The following diagram from Facts and Figures 2020/21 (p24) shows the relative log flows (in m^3) for various end uses in the New Zealand forestry industry:

Facts and Figures 2020/21 (p32) also summarised the actual exports by category for 2018-2020 and forecasts for 2021 and 2022. This is shown in the table below. There was a decline in 2020 due to the impacts of Covid-19 but growth was forecast to resume in 2021 and 2022:

Year to 30 June	2018 (Actual in $m)	2019 (Actual in $m)	2020 (Actual in $m)	2021 (Forecast in $m)	2022 (Forecast in $m)
Logs	3,337	3,806	2,877	3,230	3,330
Sawn timbers & sleepers	890	936	809	930	950
Pulp	828	812	646	630	630
Paper & paperboard	491	491	492	460	440
Panels	501	514	438	460	500
Chips	56	67	56	50	60
Other forest products	281	257	222	240	240
Total	**6,382**	**6,883**	**5,539**	**5,990**	**6,150**
Y/Y % change	+16.4%	+7.9%	-19.5%	+8.1%	+2.7%

Facts & Figures 2020/21 (p34) summarised a transformation scenario for the forestry industry involving greater processing within New Zealand. This scenario included **15 new primary sawmills** and reduced exports of raw logs:

	Log exports (million m^3)	Logs processed for export (m m^3)	Logs consumed in NZ (m m^3)	Process residue (m m^3)
2020	22	9	5	6
2030	12	16	7	10

INDUSTRY TRANSFORMATION

An Industry Transformation Plan for the forestry and wood processing sector is currently under development by the Ministry for Primary Industries (MPI).

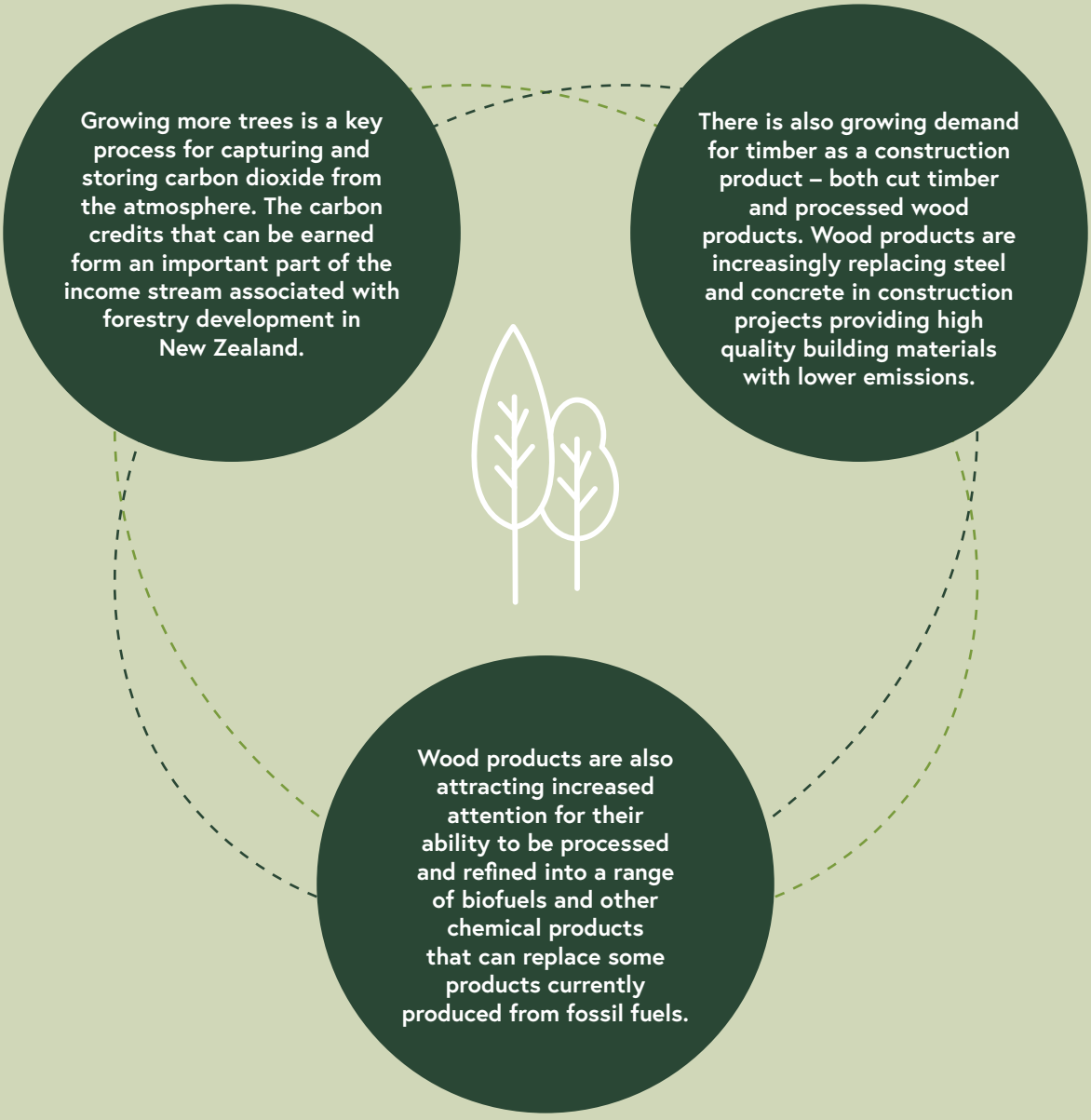
The process for the development of the industry transformation plan is outlined in Te Uru Rākau – New Zealand Forest Service's Future of Forestry document. There are several related recent initiatives which have underpinned the Industry Transformation Plan:

- The Wood Fibre Futures Project outlines a vision of using commercial trees to catalyse the development of a low carbon economy by using the wood biomass that is left over when trees are processed for timber. The project has a focus on biocrude oil, liquid biofuels, gaseous fuels, solid fuels, coke for steelmaking and bioplastics and bio composites
- The Timber Design Centre initiative which will act as a catalyst to accelerate the use of low carbon wood products in buildings across New Zealand.
- The Forestry and Wood Processing Workforce Action Plan which "aims to support the development of a workforce that meets the current and future needs of the forestry and wood processing sector."
- The One Billion Trees Fund. This fund (which is now closed) offered grants for new planting.

Achieving the goals of this industry transformation requires investment in production and processing of timber plus associated research and development.

Drivers of growth

The closely associated businesses of growing trees and processing wood and timber products has several key drivers.



The Taranaki opportunity

Commercial production and processing of Radiata pine and the export of raw logs are established industries in Taranaki. In 2015 the Taranaki Regional Council reported there was 27,278ha of exotic forestry in Taranaki (1.6% of the national area).

New production forests can also be planted and earn income from carbon units captured during the first production cycle. This is currently providing an additional incentive. This new forest can be large standalone blocks or smaller blocks in conjunction with farming operations.

There are also opportunities in the region, especially on land not suited to farming or production forestry, for permanent carbon farming – this is under consideration by the government. Professional advice should be sought.

There are accompanying opportunities for associated supply chain businesses that support planting, plantation management and harvesting.

While it is likely that Radiata pine will be the focus of forestry expansion in Taranaki there are other tree crops with commercial potential.

These production and processing opportunities can be developed by individual landowners, by syndicates of investors, or by partnerships with customers for the resulting wood products.

In addition to the commercial returns there are other benefits from forest development including riparian planting for control of nutrient runoff, erosion control, biodiversity enhancement, honey production, shelter for stock and enhancement of recreational opportunities. While not the focus of this document, these other benefits may enhance the investment opportunity.

The forestry industry supply chain

While the central North Island is the centre of the New Zealand forestry industry, the industry operates throughout the country.

Forestry ownership is relatively concentrated. The Facts and Figures 2020/21 publication noted (p12) that twenty-four companies owned and/or managed around 72% of plantation forest.

The production of commercial timber involves a wide range of businesses including:

- Nurseries to grow and supply seedlings or cuttings.
- Earthmovers to prepare tracks and roads for site access.
- Contractors to plant and prune trees.
- Contractors to harvest trees.
- Transport companies to move logs for processing and/or export.
- Timber mills and wood processing companies.
- Port and shipping companies which export timber and wood products.

There are also many other forest-related business opportunities:

- Forestry management advisory services.
- Carbon farming measurement and management advisory services.
- Training providers.
- Health & safety advisory services.
- Investment advisors to package opportunities and raise funding.

FORESTRY AND WOOD PROCESSING IN TARANAKI

The Taranaki Regional Council noted in 2015 there was 27,278ha of exotic forestry in Taranaki. Some of this is in large plantations such as the 3,500ha Te Wera Forest (land owned by Ngāti Maru, crop owned by China Forestry Group New Zealand) while some is in smaller blocks. Around half of Taranaki plantings of exotic trees in 2015 (14,738ha) were established on erosion-prone land in eastern Taranaki.

There are several Taranaki businesses involved in log harvesting and transporting it to end-users for processing or to Port Taranaki for export as raw logs.

Photo: Woodspan® PLT Panels

Port Taranaki exported 921,746m³ of logs[6] in the year ended March 2020 with total value of $147m. Some of these logs are from the Whanganui region. Log exports are a significant part of the Port's business.

Since 1993 the TRC has also managed a riparian planting programme in the region. This has resulted in around 7 million native plants being planted near stream banks. This programme has also supported the operation of native plant nurseries in the region.

Timber is processed in Taranaki, notably by Taranakipine which processes 100,000 tonnes of logs a year from Te Wera. Taranakipine CEO Tom Boon made a presentation at Venture Taranaki's "Trees and their value chain" workshop in July 2021. He noted that Taranakipine purchases $24m of logs and timber and sells $65m of finished products. The company has been encouraging more planting of Radiata pine in Taranaki since at least 2015 when he suggested the region will be facing a timber shortage in the 2030s.

There are several other sawmill and timber processing operations in Taranaki including:

- Clelands Timber Products
- Kaimata Sawmills
- Inglewood Timber Processors
- Value Timber Supplies
- Mangorei Plus
- Pukeho Sawmills
- Taranaki Bark Products
- Timpack Industries

Waverley Sawmills closed in 2019. At the time its owners were considering a $20m-30m investment to install a new state-of-the-art sawmill on the site. While the site has since been sold this gives an indication of the investment required to establish a new sawmill.

Taranaki is also a good location for other timber processing facilities such as biorefineries (which is being investigated by crown research institute Scion). The investment required for these opportunities is also likely to be significant. This will need to be assessed on a case-by-case basis and will depend on the type of processing involved and the volume of wood processed.

GROWING RETURNS

The forestry industry has long attracted investment interest and provided solid returns to investors. This investment interest is continuing at present with forestry development occurring throughout the country.

This development is in part being encouraged by the returns from carbon units which provide an incentive for new forestry in addition to the returns from timber.

There is also considerable interest in expanding local timber processing, and in developing new timber products and products that can be extracted from timber.

6 *While it is not an exact and consistent conversion 1m³ of Radiata can be considered roughly equivalent to 1 tonne.*

The key trees for forestry

The key exotic forestry trees are:

- The Radiata pine (*Pinus radiata* or the Monterrey Pine) which dominates commercial forestry in New Zealand with 90% of production. It can be grown productively throughout the country including in Taranaki.
- Redwoods are the next largest forest crop in the wider Taranaki region. These trees grow particularly well in the local soils and climate.
- Douglas-fir is also widely grown in New Zealand, particularly in cooler and more elevated sites and it suits parts of Taranaki. It makes up 5.9% of plantation area across New Zealand.
- A range of eucalyptus species comprise 1.4% of the planted area in New Zealand. Some varieties are suitable for production in Taranaki.
- A range of cypress species including macrocarpa and lawsoniana also grow well in Taranaki.

There are many other species of tree which have niche market opportunities.

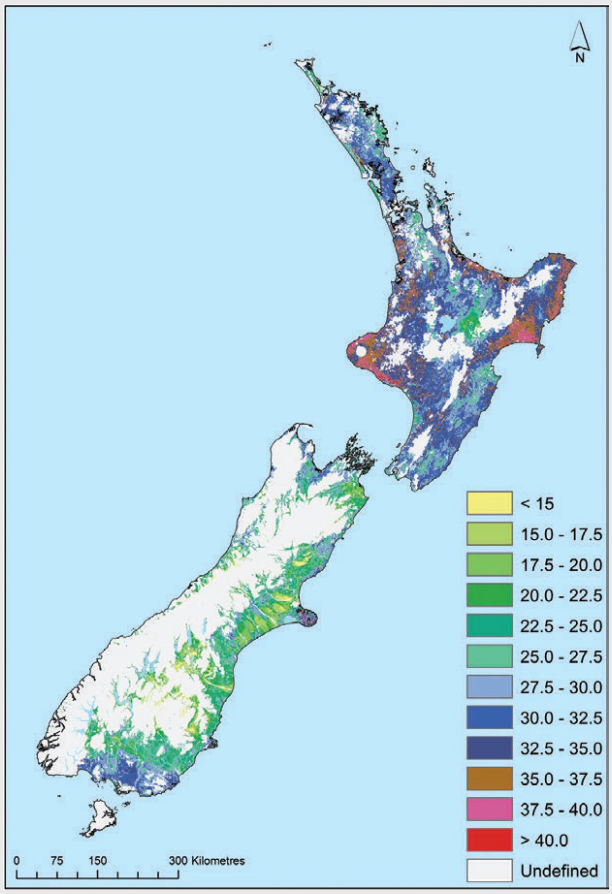
Research should be carried out and/or professional advice sought to assess the suitability of tree varieties for specific locations.

The Taranaki Regional Council (TRC) provides information sheets on a range of trees they consider suitable for agroforestry in Taranaki including: Radiata Pine, Douglas-fir, Eucalyptus species (plus a general guide to eucalyptus), Australian Blackwood and Poplars and willows for fodder.

Radiata Pine is the dominant species grown for commercial production in Taranaki and there appears to be ready markets for its timber (depending on the quality of wood produced).

Radiata pine can be grown in a wide range of conditions though care still needs to be taken in assessing the suitability of specific sites. Wind damage can be a problem for Radiata pine in Taranaki.

The 300 index for Radiata pine is a measure of stem volume/age and is an indication of productivity. Data suggests parts of Taranaki are amongst the most productive regions in New Zealand for Radiata pine[7].



The 300 Index

The TRC suggests a typical cycle from planting to production for Radiata pine in Taranaki hill country is 28 years. This will vary depending on planting and management regimes.

Douglas-fir is slower growing (45-55 year rotation) than Radiata pine but is well suited to higher and cooler areas of New Zealand. It can suffer badly from salt burn and is not suited to coastal locations. Douglas-fir is primarily used for structural grades of timber. The TRC suggests that when harvested at 45 years of age an average recoverable volume of 720m^3/ha can be expected from Douglas-fir.

7 *From NZ Farm Forestry - Radiata pine for the next generation (nzffa.org.nz)*

The TRC suggests there is a wide variety of eucalyptus species suitable to different environments in the region. The Council guides on eucalyptus summarise the various options. No single eucalyptus species will thrive across as many different Taranaki environments as Radiata pine. Some are good for timber while others are suited for firewood production.

The TRC suggests that Australian Blackwood is well suited to parts of Taranaki and produces high value decorative timber.

There are other varieties of trees that will grow well in Taranaki and offer commercial potential.
Native varieties of some trees may be an option.

Scion have information on diversifying commercial forestry and provide a guide to choosing the right tree. They suggest it will help with *"considering the opportunities and risks of choosing either well-established species or less common timber species that provide access to smaller, specialty markets."*

Some other options for information on varieties and help with making your decisions include:

- The New Zealand Farm Forestry Association including the associated Farm Forestry Timbers Society which provides information and market development for specialty timbers
- New Zealand institute of Forestry Registered Consultants.

The TRC suggests that Australian Blackwood is well suited to parts of Taranaki and produces high value decorative timber.

Opportunities for adding value

There are a wide range of value-added uses for New Zealand grown trees and many new uses being explored.

Scion's "Right Tree, Right Place, Right Purpose" strategy[8] focuses on:

- High-value timber manufacturing and products.
- Bio-based manufacturing and products.

Processed timber products such as plywood, fibreboards and laminates are likely to form an important component of high-value timer processing[9].

Bioenergy is increasing in importance. For example, wood pellets are being used by Fonterra to replace the use of coal for drying milk powder.

Scion is exploring opportunities for wood to be used for bio-refining to produce a range of valuable and sustainable products. Some of these products will replace those produced from fossil fuels.

The bioenergy and biorefining opportunities may utilise currently wasted wood such as the "slash" removed from trees during harvesting contributing to reduced waste and the development of a circular economy.

There may be specific opportunities in Taranaki from biorefining of wood resources that take advantage of the region's skills and capabilities in the energy and industrial chemicals sector.

An opportunity that may develop and is of particular relevance to Taranaki is the production of green CO_2. In 2018 the H2 Taranaki Roadmap was released which outlined opportunities for the production of green hydrogen using renewable electricity to split water into H_2 and O_2. Green hydrogen can, in turn, be used as feedstock for production of important industrial chemicals such as urea and methanol which are currently manufactured in Taranaki using fossil fuels. Manufacturing these products from green hydrogen requires one other key feedstock – green CO_2. One of the best sources of green CO_2 may be by capturing it when wood is burnt for bioenergy. Provided the wood is sourced from forests that are replanted there is no net impact on the atmosphere from CO_2 produced and captured in this way. This combination of bioenergy and carbon capture ("BECC") for industrial chemicals production is an opportunity that could be developed in partnership with the energy sector.

Trees may also be an important source of biomass for production of other energy products including various biofuels. Scion continues to research these opportunities.

Traditional added value wood products are likely to continue as an important part of the sector:

- Sawn timber continues to be a vital construction material in New Zealand and is produced in Taranaki.
- While most sawn timber is pine there is also a range of higher value uses for other sawn timbers, including natives, such as in joinery and furniture making.
- There is a market for firewood often from waste timber or small lots of trees. Some varieties of trees are also suited to dedicated production for firewood.
- The pulp and paper industry remains an important sector for New Zealand but is reducing in scale as the use of paper in printed publications declines. For example, the Kawerau Mill has closed.

Photo: Woodspan® PLT Panels

8 Scion_strategy_4web.pdf (scionresearch.com)

9 Resins used in these products are produced in Taranaki by AICA New Zealand.

THE OPPORTUNITY FOR EARNING CARBON UNITS

Due to the complexity of these regulations, it is recommended that growers of new forest receive professional advice from multiple sources on the ETS and its implications. The Emissions Reduction Plan released by the government in May 2022 indicated further regulatory changes to the ETS to achieve the right type and scale of forests, in the right place[10].

In addition to the production and processing opportunities outlined above, qualifying new forestry has opportunity to earn income from carbon units.

The opportunity for forestry to capture carbon units is an outcome of New Zealand's 2008 Emissions Trading Scheme. Under the scheme net emitters of greenhouse gases (unless they have exemptions or are allocated free units by the Government[11]) are required to offset the amount they emit (their unit liabilities) against carbon units earned by parties which have removed greenhouse gases.

Forestry is currently the most cost-effective large-scale method of removing CO_2 from the atmosphere. This has encouraged the business of carbon farming – growing permanent "new forest"[12] to capture carbon and earn income from the sale of carbon units to emitters. New production forest is also eligible for carbon units during its first cycle of production[13].

MPI administers complex rules around what is considered "new forest" depending on when it was planted. It must also be 1ha in size and have or will have tree crown cover of more than 30% in each hectare from forest species, and with an average width of at least 30m[14].

There are also complex rules around how units are accounted for. These rules require careful consideration. Once registered the owner will have an account with the Environmental Protection Authority and earn units from the date of registration.

The average accounting method is currently optional but is becoming mandatory for forests registered from 1 January 2023. Under this method:

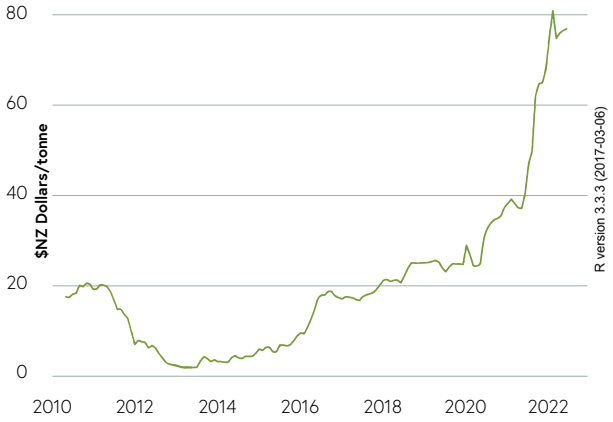
> ***"Forests under averaging earn units for growth and carbon storage in the first rotation up until the forest reaches its "average age". The average age of a forest is the age at which it reaches the average level of carbon it is expected to store over several rotations of growth and harvest.***

For pine forest this average age will usually be about 16-17 years. The species planted and the age of planting affects the volume of carbon credits that can be earned.

The Ministry for the Environment also provides advice on carbon measurement in forestry.

The price of carbon units also has a key impact on the income that can be earned. This has been highly variable though has been on an upward trend in recent years:

NEW ZEALAND UNIT PRICES 2010 - 2022



The value that can be generated from carbon units is an important consideration for landowners considering new forestry.

10 *The Emissions Reduction Plan, Page 279*
11 *As happens with emissions intensive and trade exposed businesses*
12 *There are specific rules around what qualities as new forest.*
13 *While only the first rotation is eligible for carbon units, the income received during the first rotation can help cover the initial costs of long-term infrastructure such as roads and tracks that will continue to be used in future rotations.*
14 *This width restriction cuts out much riparian planting from the ETS. It also encourages shelter belts to be at least 30m wide.*

What's the bottom line?

A financial model[15]

Agribusiness has prepared three models for exotic forestry in Taranaki:

- An unpruned forest.
- A pruned forest.
- A pruned and thinned forest.

Their analysis of the three models over the 28-year rotation resulted in:

	Unpruned	Pruned	Pruned + thinned
Total revenue per ha	$4,650	$4,660	$4,932
Total working expenses per ha	$2,560	$2,615	$2,723
EBITDA[16]	$2,090	$2,045	$2,209
Minimum land required	5 ha	5 ha	5 ha
Time to 100% yield	27 years	27 years	27 years
Time to cash positive	5 years	5 years	5 years
Initial capital investment per ha	$2,600	$2,600	$2,600
Year in which investment is paid back	Year 6	Year 6	Year 6
Net present value	$25,148	$23,158	$23,965
Internal rate of return	35%	31%	30%

Agribusiness observed:

> *"It is interesting to note that using the average yield and price values in this analysis has resulted in there being very little difference between the three management regimes."*

It is important to note that any specific forestry development will have different conditions from the model and will likely produce quite different results. This model is only a general guide and any party considering developing a forest should seek independent professional advice and commission or complete their own forecasting.

15 *Based on a financial model provided in 2022 by The Agribusiness Group.*
16 *Earnings before tax, interest, depreciation.*

Entry requirements

The key requirements for developing a plantation forest are access to suitable land and sufficient capital to fund the development until income is received. It is also important to ensure there is access to seedlings from nurseries and to the contractor support required to establish, maintain, and ultimately harvest the forest.

As plantation forests are typically harvested after 28-30 years, it is not essential to have a customer lined up for the timber when trees are planted. As the forest nears maturity this becomes an important consideration.

Developing a wood processing business can be very capital intensive and takes time to develop a customer base. The production of other timber products such as laminates will also require considerable capital, as will ventures such as bioenergy.

Just as owners of production forests need to secure customers for their logs, these processing businesses need to secure their ongoing supply of logs.

Potential for the region

WHAT AN EXPANDED FORESTRY INDUSTRY IN TARANAKI COULD LOOK LIKE

Forestry already forms an important part of the Taranaki economy. As noted earlier, according to the Taranaki Regional Council, in 2015 there was 27,278ha of exotic forestry in Taranaki.

If a further 10,000ha was developed then, using Agribusiness' financial model and its assumptions, this would produce:

- Revenue averaging $42m-45m per year.
- Net returns averaging $15m-17m per year.

There would be significant impacts on employment in planting, managing, and harvesting the forest and it would underpin the opportunity for investment in further wood processing in the region.

Establishing a forestry plantation – what's required?

In addition to having access to suitable land, capital, and contractors there are a few other important considerations.

YOUR REASONS FOR PLANTING

While the financial return from a forest can be significant, there are a range of reasons for establishing a forest.

MPI provides a summary of issues to think about before you start planting forest on your land. They note the importance of knowing what you want to achieve from planting trees.

MPI suggests tree planting can:

- Help diversify your income from timber, honey, and carbon credits.
- Improve the productivity of your land, especially rough areas that do not grow good pasture.
- Help soil retention on steep slopes.
- Provide windbreaks, and shade for livestock.
- Provide landscape diversity and wildlife habitat.
- Help combat climate change by absorbing carbon.
- Help protect the environment.
- Create jobs.

MPI suggests your location and the characteristics of your land will be important factors in assessing which trees to grow and for what purposes.

THE AREA OF LAND AVAILABLE AND ITS ACCESSIBILITY

The scale will vary depending on the purpose for which you are planting, your financial resources and the access to the site for development, management and harvesting.

The Tupu factsheet on plantation forestry suggests *"A 5ha block can be profitable if it is not too remote, is carefully managed, has a good crop and access for heavy machinery."*

Five hectares is however, a relatively small block and small blocks are not popular with harvesters. When it is time to harvest it is possible owners of smaller blocks may find difficulty securing a harvester.

The Tupu website also notes:

> *"You may be able to lease blocks of 40ha or more to a forestry company to develop. Smaller blocks may be able to collaborate with neighbours to reach commercial scale for leasing.*
>
> *Commercial scale is affected by accessibility. Forestry is one of the few commercial options available to land that can't be converted to cropping or profitable farming easily, so it often appears in small blocks, and in areas of larger blocks that have fewer options because of the terrain or soil properties.*
>
> *However, timber plantations need good access for heavy machinery. Small sites with poor access can be uneconomical to harvest, depending on the value of the timber species being considered. These sites may be better suited to planting a permanent block, with the option of carbon farming or mānuka for honey production."*

This issue of accessibility to suitable local roads and the ability to provide off-road access tracks that are suitable for heavy machinery is a vital consideration when developing land for production forestry.

Growing conditions

Radiata pine is the most likely species to be grown for plantation forestry in Taranaki. Amongst its many attributes as a commercial forestry species is its tolerance of a wide range of climate and soil conditions.

The New Zealand Farm Forestry Association notes:

"Radiata pine is a very site tolerant species, but limitations include:

i. *Wet feet and fluctuating water tables can lead to toppling and root rot. This is the most common limitation for Radiata pine.*

ii. *On high fertility sites, especially high N (nitrogen) sites, trees will have poorer form, larger branches, and lower density wood.*

iii. *Humid sheltered inland sites can have problems with fungal disease, particularly dothistroma and cyclaneusma.*

iv. *Consolidated and impervious subsoils, e.g. papa can cause rooting problems on some skeletal hill country soils.*

v. *The most serious trace element is Boron deficiency in the East Coast of both islands, especially drier parts."*

Other plantation species grown in New Zealand will need to be assessed for their suitability for specific locations in Taranaki. Wind and salt burn may be a risk in some sites.

Forest management

FOREST DEVELOPMENT AND MANAGEMENT

The development and management of a forest is a complex and long-term commitment – particularly if you are growing for production purposes. There is plenty of specialist information and professional advice available.

The Farm Forestry Association provides a wide range of resources on forest development and management including information leaflets, articles from their Tree Grower magazine and links to other sources of information.

The Forest Owners Association provides a series of Forest Practice Guides available as individual documents on specific operational areas or as a larger consolidated document.

GROWING CYCLE AND MANAGEMENT REGIME

In Taranaki hill country the growing cycle for Radiata pine is typically around 28 years from planting to harvesting.

Cuttings or seedlings should be ordered from a nursery well in advance of the planting date – perhaps a year or more. Cuttings are more expensive but often perform better.

The Taranaki Regional Council suggests that in colder sites planting should occur in late winter or early spring. In warmer and drier sites planting should occur in winter. This gives more time for roots to become established before drier summer conditions.

Important choices need to be made about thinning and pruning.

With regard to thinning Te Ara's introduction to Radiata pine notes:

> *"With a harvest age of 25-35 years, and final tree numbers of around 300 stems per hectare, two thirds of the trees planted are usually cut down during the early stage of the growing cycle to make more room for the others."*

With regard to pruning Te Ara notes:

> *"About five years after planting, the best trees are usually pruned up to a height of 4 metres. At around seven years, the trees may be pruned up to 6.5m. At around 9 years, when the trees are 16 metres high, all the unpruned trees are felled to allow the remainder to grow. This system is designed to produce a substantial yield of valuable knot-free wood in the lower part of the trunk.*
>
> *Some forest management systems aim to grow a high yield of logs with small knots – suitable for structural timber such as house frames, roof trusses and poles. In this case trees aren't pruned, and they are grown closer together (450 stems per hectare) to limit branch growth and keep the knots small."*

The Taranaki Regional Council suggests that a typical regime for Radiata pine in Taranaki hill country is:

Site index	28 metres[17]
Planting stock	Pinus radiata GF[18]
Planting space	1000 stems/ha (5m x 2m)
1st prune to 2.2m	Year 4
1st thin to 500 stems/ha	Year 4
2nd prune to 4.5m	Year 6
2nd thin to 300 stems/ha	Year 7
3rd prune to 6.5m	Year 8-9
Final spacing	300 stems/ha
Rotation length	28 years (average)
Recoverable volume	677 m3/ha (including pulp)

Te Ara notes that:

> ***"No matter what kind of management system is followed, the forest will yield a range of log types. For example, large, pruned logs are used for clear timber and veneer, large knotty logs for structural timber, and small logs from the top of the trees for wood chips, wood pulp, fibreboard and particleboard."***

Te Ara notes harvesting is done by teams who:

- *"Fell the trees using chainsaws or mechanical shears.*
- *Pick up and move the logs using crawler tractors, wheeled skidders, or overhead cable haulers.*
- *Cut the branches of the logs.*
- *Use cranes to load the log onto trucks for transport to log depots, mills, or ports for export."*

Harvesting is a specialised business best managed by well trained and experienced contractors.

HEALTH & SAFETY

Business owners and directors have primary responsibility for the health and safety of their workers and contractors on-site.

The forestry industry has had significant health & safety challenges and the risks remain challenging and require careful management.

Worksafe provides guidance on safety practices for the forestry industry including:

- Roles and responsibilities of businesses and contractors.
- An Approved Code of Practice for safety and health in forest operations.

The Facts & Figures 2020/2021 publication noted (p43) that:

"The Forest Industry Safety Council is a pan-industry initiative to reduce and ultimately eliminate deaths and serious injuries in New Zealand plantation forestry, by;

- *Improving leadership of safety,*
- *providing easy-to-use forest safety resources through https://safetree.nz/ website,*
- *sharing better information on what's causing injuries,*
- *getting companies and workers more competent, and*
- *helping the sector adapt to the Health and Safety at Work Act 2015."*

17 *The mean top height of the 100 largest trees/ha at 20 years of age.*
18 *GF refers to the growth and form classification of the selection of tree. The number 17 refers to its improvement rating*

Labour considerations

While owners of large blocks may employ their own staff, much of the industry's workforce is provided by specialist forestry contractors. As it is an industry with existing scale in Taranaki there are several forestry contracting businesses already in the region.

It will be important to establish a relationship with contractors well ahead of when they are required. This will help them with their workflow planning and help ensure capacity is available when needed.

There are also forestry management businesses that will provide full management of the forest on behalf of owners. Forest managers can also lease land and take complete responsibility for the operation of the forestry business.

The production forestry workforce is a mix of permanent and seasonal. While planting is largely a winter activity, some other activities require drier conditions.

Key activities are:

- Site preparation.
- Planting.
- Thinning.
- Pruning.
- Harvesting.

There may be additional labour requirements related to site access. Road and track construction and maintenance to enable heavy equipment to access the site is an important and potentially expensive component of the process. A landing area for timber processing equipment is also often prepared prior to harvesting.

MPI has developed the Forestry and Wood Processing Workforce Action Plan targeted at producing a skilled, safe, diverse workforce that meets current and future needs.

Detailed planning of all forest operations is vital to ensure activities are completed safely and on time with environmental impacts mitigated.

Around 80% of the country's forestry sector workforce is employed in processing. Workforce development will be required to ensure suitably skilled labour is available for increased processing activities.

Environmental impact

The forestry industry mitigates some environmental impacts while contributing to others.

The positive environmental aspects of forestry include its ability to:

- Remove carbon dioxide from the atmosphere and store it.
- Control erosion and reduce runoff.
- Reduce flooding.
- Provide suitable habitats for some species.
- Be used for bioenergy that replace fossil fuels.
- Produce wood that can replace the use of other structural materials such as steel and concrete that produce more emissions.

The potential negative environmental impacts include:

- Being a monoculture over large areas which can reduce biodiversity.
- The potential to increase erosion and runoff in association with harvesting.
- The challenges of managing slash after harvesting.
- The carbon emissions associated with transport of timber or processed wood products.

While it is widely regarded as having overall positive environmental impact, mitigating the effects of harvesting continues to provide challenges for the industry.

REGULATORY MATTERS

MPI provides an overview of regulatory issues for forest development and management.

They suggest it is important for landowners to contact their local District and/or Regional Council before planting or harvesting trees to find out about rules or regulations under the various plans the Councils administer in relation to the Resource Management Act.

Related to the Resource Management Act are the National Environment Standards for Plantation Forestry. These provide a nationally consistent set of rules for plantation forests and are also implemented by regional and district councils.

The Forests Act 1949 has rules applying to harvesting existing native or regenerating timber on private land. If you plant a new native forest, you should get a certificate to confirm its status and you will need a permit under the Act to harvest it.

The Emissions Trading Scheme provides a range of regulations around the management of carbon units from Forestry. As noted earlier this is a specialist area and professional advice is recommended.

Next steps

YOUR SUPPORT TEAM IN TARANAKI

As an existing industry of scale there is considerable professional and technical support available to develop new forests or processing businesses. Getting good advice will reduce investment risk. The following companies have a presence in Taranaki, or already work in the region:

- Forestry 360
- Forme Forest Industry Consultants
- John Turkington Forestry Ltd
- NZ Forestry Ltd
- P.F. Olsen
- Transglobal Connections Ltd
- TAML Forestry

Risk will also be reduced if relationships are developed with partners in other parts of the industry value chain. Developers of new forest will need support from a range of contracting businesses from planting, through thinning and pruning, and on to harvesting. Forest owners will need customers for their timber and processors will need suppliers of timber.

FUNDING OPPORTUNITIES

The source or sources of funding for development of a forestry plantation or wood processing opportunity will depend on the circumstances of the party or parties carrying out the development and the structure of the proposed investment.

- Forestry developments may be part-funded by the landowner – perhaps using equity and cashflow from an existing farming or other business operation that continues in conjunction with the forestry development.
- New Zealand banks will have personnel with experience in assessing forestry opportunities and providing loans for developments.
- There are also developments funded by syndicators where equity is provided from multiple investors.
- Other sources of funding may also be available for specific activities such as R&D. Venture Taranaki can advise on whether there are other such funding opportunities.

CHECKLIST AND ACTION GUIDE FOR INTERESTED INVESTORS

If you are a/an:

- [ ] Taranaki landowner – with 5+ hectares suitable for forestry development.
- [ ] Timber processor – with an interest in developing or expanding operations in Taranaki.
- [ ] Investor – with an interest in supporting new forestry development in Taranaki.
- [ ] Syndicator (either production forestry or carbon farming) – with an interest in packaging a development and investment opportunity in Taranaki.
- [ ] Register your interest with Venture Taranaki.

REVIEW FURTHER INFORMATION

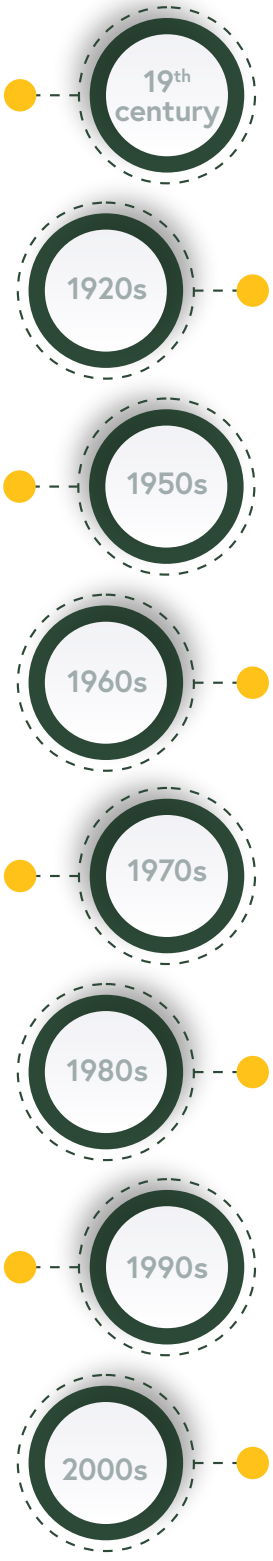
There are many sources of further information including:

- Ministry for Primary Industries: New Zealand Forest Service
- Te Uru Rākau's "Future of Forestry" (2020)
- Forest Owner's Association including their Practice Guides
- NZTE's 2020 Prospectus "Invest in New Zealand Wood Processing"
- Ministry for Primary Industries Forestry in the Emissions Trading Scheme.

Get in touch, email branchingout@venture.org.nz

Appendices

APPENDIX A: THE HISTORY OF FORESTRY IN NEW ZEALAND



Forestry was a very important industry including in Taranaki. Large volumes of native timber were used for construction, fencing, and railway sleepers. Firewood was also an important use.

Radiata pine was first introduced to New Zealand and used for construction. While it had a restricted habitat in its native California, Radiata pine thrived in New Zealand.

The State Forest Service was established along with some controls on felling native timber. Interest in exotic timbers, particularly Radiata pine, also developed.

Major Radiata pine plantations were established in the central North Island on land that was thought to be unsuitable for farming.

As those original pine forests matured, pulp and paper mills were set up at Kinleith and Kawerau to make use of the flow of timber.

Breeding programmes for Radiata pine also started in the 1950s leading to improved trees and timber quality.

Methods of treating pine to resist rot were developed. As a result, the use of pine in construction also grew strongly, replacing the use of native timbers.

More exotic timber was being harvested than native.

A second wave of pine plantings occurred (including in other regions) and new techniques for thinning plantations and pruning trees were introduced.

Forests were also planted to control erosion on land that was unsuitable for farming.

Concerns over felling native timber increased and conservation of native forests especially on public land, became more widespread.

The Forestry Service was disbanded. The large exotic forests became privatised (and ultimately often foreign-owned) while state-owned native forests passed to the Department of Conservation.

Sustainable management policies were implemented which allows some felling of native species on private land – mostly single trees or small groups of trees.

Since the introduction of the Emissions Trading Scheme in 2008 an important new use for forest has developed – capturing carbon units.

Demand for timber products has continued to increase in New Zealand – including for structural timber, processed products such as laminates and for bioenergy.

Forestry is one of New Zealand's major industries. Large quantities of raw logs are exported while smaller, but still significant, quantities of wood are processed within New Zealand for local and export markets. R&D continues to explore new opportunities including biorefining.

ABOUT VENTURE TARANAKI

Venture Taranaki is the regional development agency for Taranaki. The organisation is responsible for regional development strategy, enterprise and sector development, investment and people attraction, and major project initiatives which contribute to the inclusive and sustainable growth of the region. Venture Taranaki is a registered charitable trust and a New Plymouth District Council Controlled Organisation, supported by the three District Councils of the Taranaki region.

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