

The Product

Durable timber

–

properties and potential markets

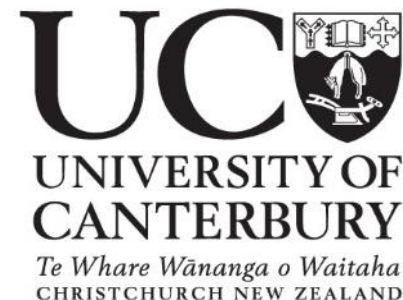
Clemens Altaner

School of Forestry | Te Kura Ngahere

Workshop: Developing a sustainable hardwood industry in the Wairarapa

Memorial Hall, Tinui, Nr Masterton

17th of February 2021





NEW ZEALAND DRYLAND FORESTS INITIATIVE
breeding tomorrow's trees today

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The NZ Dryland Forests Initiative (NZDFI) is a collaborative research and development programme. Our vision is to develop a sustainable multi-regional hardwood industry based on planting genetically improved **durable eucalypt forests** from 2020 to 2050.



RESEARCH



GROWER INFORMATION



RESOURCES

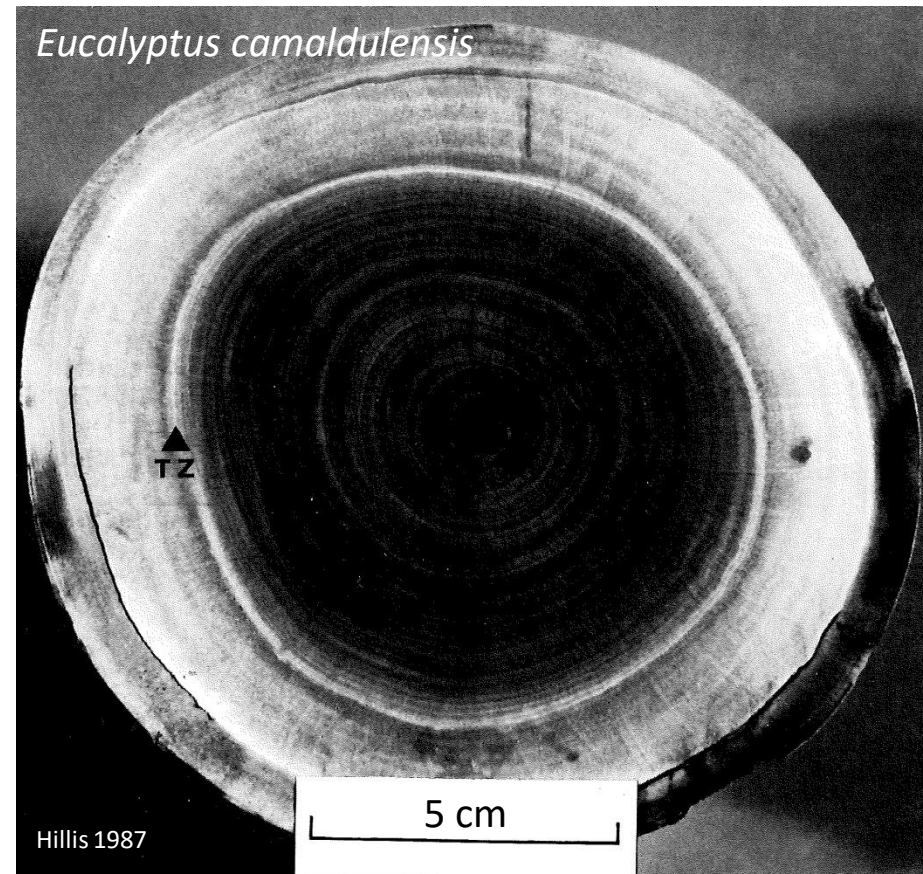
Naturally durable wood

- Natural resistance against bio-degradation
 - Insects
 - Fungi
 - Marine 'borers'
- **Note: still a bio-degradable material**



Naturally durable wood

- Natural resistance against bio-degradation
 - Fungi
 - Insects
 - Marine 'borers'
- Heartwood of some species



Naturally durable wood

- Natural resistance against bio-degradation
 - Fungi
 - Insects
 - Marine 'borers'
- Heartwood of some species
- Durability classes

AS5604: Timber - Natural durability ratings

Class	Probable in-ground life expectancy (years)	Probable above-ground life expectancy (years)
1	Greater than 25	Greater than 40
2	15 to 25	15 to 40
3	5 to 15	7 to 15
4	0 to 5	0 to 7

Why naturally durable wood

- Highest value



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33 Iversen Terrace, Waltham,
Christchurch 8011 New Zealand
<http://www.onestopdeckshop.co.nz/>

Deck Price Guide 2018

Hardwood Decking			
140x19	Solid Kwila Premium	\$11.70	per LM (\$83.60m2)
90x19	Solid Kwila Premium	\$7.10	per LM (\$78.90m2)
140x19	FJ Kwila Premium	\$11.70	per LM (\$83.60m2)
90x19	FJ Kwila Premium	\$7.10	per LM (\$78.90m2)
140x19	Garapa Premium	\$11.70	per LM (\$83.60m2)
90x19	Garapa Premium	\$7.10	per LM (\$78.90m2)
90x19	Heavy Hopea Premium	\$7.25	per LM (\$80.60m2)
140x19	Cumaru	\$11.95	per LM (\$85.40m2)
140x21	Purple Heart	\$14.50	per LM (103.60m2)
90x21	Purple Heart	\$9.25	per LM (102.80m2)
Pine/Macrocarpa Decking			
90x21	Nature Deck Premium ACQ H3 Dry	\$3.91	per LM (\$43.40m2)
140x32	Nature Deck Premium ACQ H3 Dry	\$8.98	per LM (\$64m2)
88x32	Nature Deck Premium ACQ H3 Dry	\$5.60	per LM (\$62m2)
90x21	Pine Economy Wet	\$1.80	per LM (\$20m2)
95x35	Macrocarpa Decking UT Air Dried	\$5.76	per LM (\$64m2)
140x35	Macrocarpa Decking UT Air Dried	\$9.12	per LM (\$65m2)

Conversion from lineal metres to square metres
140mm = 7.14 metres per square metre
90mm = 11.11 metres per square metre



Why naturally durable wood

- Highest value
- Mostly tropical species
- Often unsustainably harvested



Why naturally durable wood

- Highest value
- Mostly tropical species
- Often unsustainably harvested
- International demand

A seized shipment of Rosewood



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FOR IMMEDIATE RELEASE

Monday, August 6, 2012

Gibson Guitar Corp. Agrees to Resolve Investigation into Lacey Act Violations

Gibson Guitar Corp. entered into a criminal enforcement agreement with the United States today resolving a criminal investigation into allegations that the company violated the Lacey Act by illegally purchasing and importing ebony wood from Madagascar and rosewood and ebony from India.

The agreement was announced today by Assistant Attorney General Ignacia S. Moreno of the Justice Department's Environment and Natural Resources Division, Jerry Martin, U.S. Attorney for the Middle District of Tennessee and Dan Ashe, Director of the Department of the Interior's U.S. Fish & Wildlife Service.

The criminal enforcement agreement defers prosecution for criminal violations of the Lacey Act and requires Gibson to pay a penalty amount of \$300,000. The agreement further provides for a community service payment of \$50,000 to the National Fish and Wildlife Foundation to be used to promote the conservation, identification and propagation of protected tree species used in the musical instrument industry and the forests where those species are found. Gibson will also implement a compliance program designed to strengthen its compliance controls and procedures. In related civil forfeiture actions, Gibson will withdraw its claims to the wood seized in the course of the criminal investigation, including Madagascar ebony from shipments with a total invoice value of \$261,844.

In light of Gibson's acknowledgement of its conduct, its duties under the Lacey Act and its promised cooperation and remedial actions, the government will decline charging Gibson criminally in connection with Gibson's order, purchase or importation of ebony from Madagascar and ebony and rosewood from India, provided that Gibson fully carries out its obligations under the agreement, and commits no future violations of law, including Lacey Act violations.

"As a result of this investigation and criminal enforcement agreement, Gibson has acknowledged that it failed to act on information that the Madagascar ebony it was purchasing may have violated laws intended to limit overharvesting and conserve valuable wood species from Madagascar, a country which has been severely impacted by deforestation," said Assistant Attorney General Moreno. "Gibson has ceased acquisitions of wood species from Madagascar and recognizes its duty under the U.S. Lacey Act to guard against the acquisition of wood of illegal origin by verifying the circumstances of its harvest and export, which is good for American business and American consumers."

Costing the Earth Murder in Cambodia - Peter Hadfield investigates the illegal trade in Siamese rosewood. BBC Radio 4

Why naturally durable wood

- Highest value
- Mostly tropical species
- Often unsustainably harvested
- International demand
- Toxic alternative
(preservative treated)



Lawrence Livermore National Laboratory
Department of Energy's National Nuclear Security
Administration

<https://www-training.llnl.gov/training/hc/EP1006-W/Index/Treated-Wood.html>



Species choice

Species	Lyctid susceptibility of sapwood	Termite resistance of heartwood	In-ground life expectancy (years)	Above-ground life expectancy (years)	Life expectancy in southern waters (years)
<i>Eucalyptus bosistoana</i>	Susceptible	Resistant	>25	>40	21 to 40
<i>Eucalyptus argophloia</i>	Susceptible	ND	>25	ND	ND
<i>Eucalyptus quadrangulata</i>	Not susceptible	Resistant	15 to 25	15 to 40	ND
<i>Eucalyptus sideroxylon</i>	Susceptible	Resistant	>25	>40	41 to 60
<i>Eucalyptus globoidea</i>	Not susceptible	ND	15 to 25	ND	21 to 40

Wood properties

Species	MoE (GPa)	Density (12% MC) (kg/m ³)
<i>E. bosistoana</i>	21	1100
<i>E. argophloia</i>	14+	1055
<i>E. quadrangulata</i>	18	1030
<i>E. sideroxylon</i>	17	1130
<i>E. globoidea</i>	17	880
<i>Pinus radiata</i>	9	480



NEW ZEALAND DRYLAND FORESTS INITIATIVE

breeding tomorrow's trees today



DURABLE EUCALYPTS: A Multi-Regional Opportunity For New Zealand's Drylands

OUR AIM:

To build sustainable regional industries based on high-value, fast-growing hardwood forests

WE WILL SUPPLY:

Genetically improved XG seedlings and clonal plants that thrive in dry conditions

TO PRODUCE:

Certified timber that is naturally durable, strong, and richly coloured for laminated veneer lumber, decking and posts

Properties

- ground durable
- colour
- strong

Products

- posts
- sawn timber
- LVL

Agricultural posts

- NZ: CCA treated pine
- Phased out in organic sector since 2010



- NZ wine industry zero waste to landfill and carbon neutral by 2050



3. Focus areas and organisational commitments

Summaries of work programmes have been organized under our six sustainability Focus Areas (Section 5). These focus areas, and their corresponding goals are:

Focus Area	Goal
 Water	Be a world leader in efficient water use and the protection of water quality
 Waste	NZ wine industry achieves zero waste to landfill by 2050
 Pest and Disease	Understand, reduce, and mitigate impacts of existing and potential pest and disease. Be a world leader in sustainable alternatives.
 Climate Change	NZ wine industry is carbon neutral by 2050
 People	Be an industry of choice for workers
 Soil	Protect and enhance soil health

The Focus Areas encapsulate the specific aspects of sustainability that are most relevant to our industry, our people, our stakeholders and our markets. It is through our work programmes under the Focus Areas that New Zealand Wine demonstrates its commitment to protecting the places that make our famous wines.

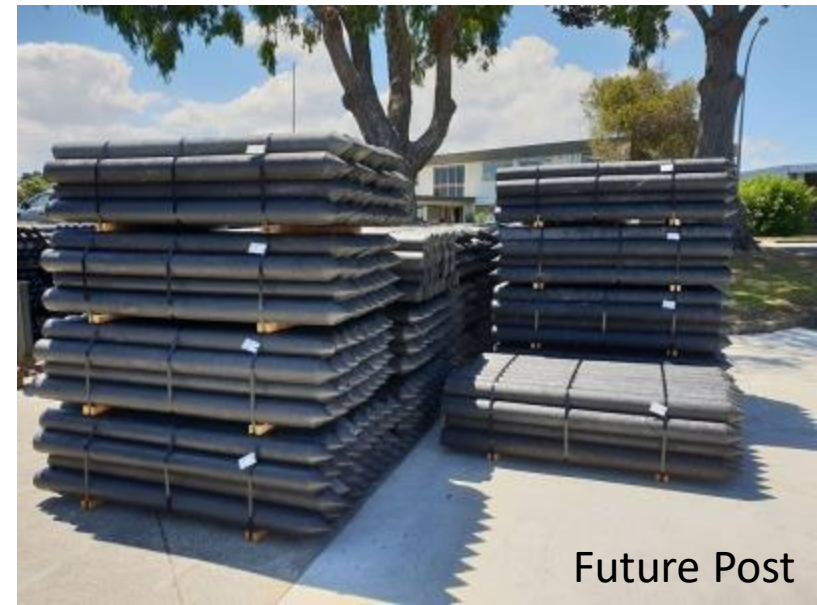
Agricultural post market

- CCA treated pine
- 700-800 \$NZ/m³ (retail)
- 270,000 – 320,000 m³ (van Bruchem 2020)

m³/yr	Whole sector
Vineyards	25,730
Kiwifruit	5,530
Apple	8,620
Pastoral	246,010
Total	285,890

Alternatives to CCA treated pine

- Steel
- Concrete
- Plastic
- **Naturally durable wood**





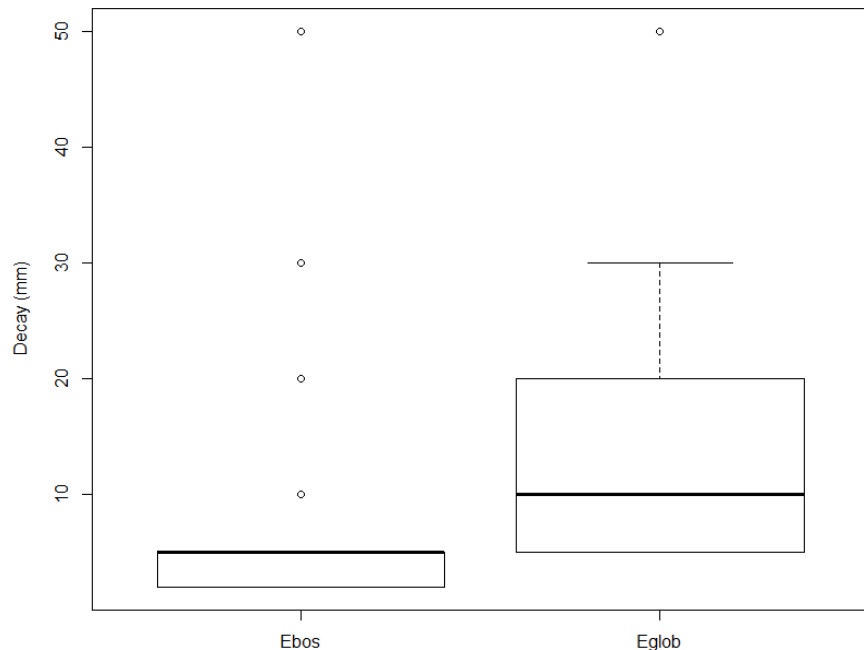
Naturally durable timber posts performing well

Paul Millen, Clemens Altaner and Harriet Palmer

Since 2003, Marlborough-based Vineyard Timbers Ltd has been working to develop an industry based on home grown, naturally durable timber posts for use in vineyards. Between 2006 and 2009, around 1,400 posts were supplied to six vineyard owners in Marlborough's lower Wairau Valley to see how the posts were performing in service. The vineyard owners were keen to trial an alternative to the radiata pine posts treated with copper-chrome-arsenic and which are commonly used in New Zealand's vineyards.

Millen, Altaner, Palmer (2018) New Zealand Tree Grower **39** 24-26

Posts purchased	Species	Installation date	Posts in service	Posts broken	Posts failed from decay	Posts in storage	Posts unaccounted for	Posts assessed in the ground
288	E. bosistoana	May 2007	267	8	0	13	0	50



Naturally durable post market

- Retail price ~1,400 \$NZ/m³

EU

- Chestnut (coppice, class 2)
- Robinia (invasive species, class 1/2 (4))

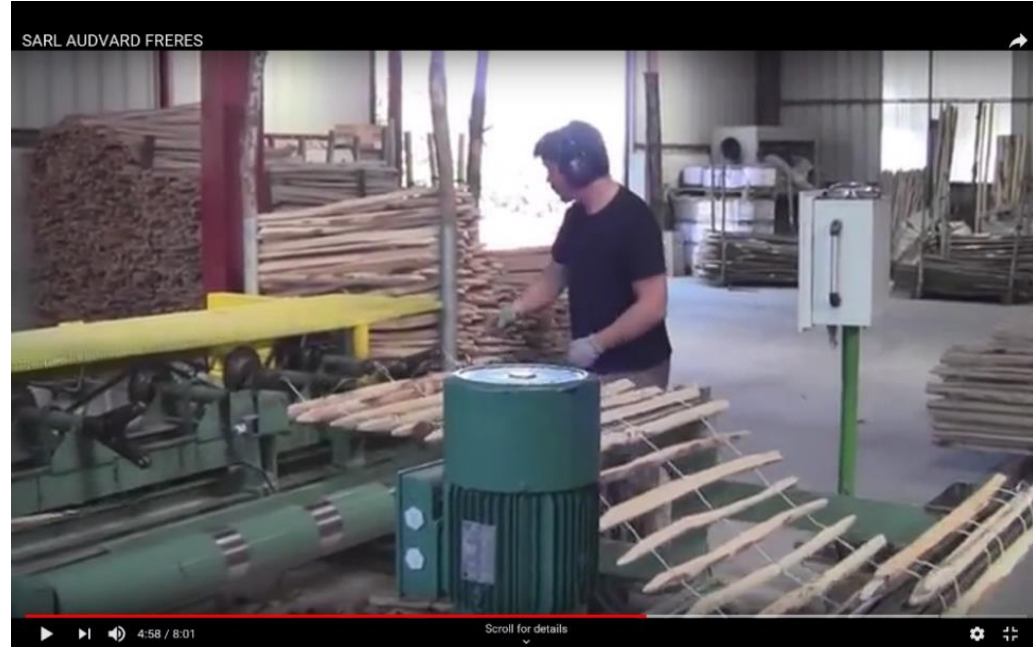
Australia

- Eucalypts (supply shortage)



Value added products

- Fences
- Playgrounds
- ...



Zip wire



Hanging bridges / bridges



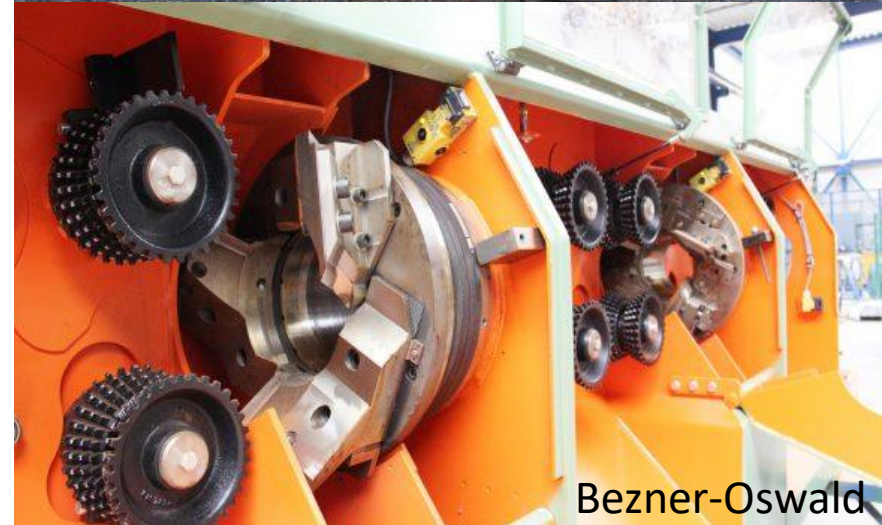
Sports and Games



Benches, Tables and Shelters

Post production

- Mature technology
- Small to large scale
- Mobile units
 - Easy entry
 - Small estate
- Exiting businesses
 - Durable eucs could be and additional opportunity for pine post producers
 - 'By-product' of rotary veneer peeling



Plantation estate

2.4 m long; 80 mm diameter heartwood posts Improved *E. bosistoana* (good site)

- Small scale (62.500 posts per year)

Log supply	Available trees / ha	Number of trees / year	Annual planting area (ha / year)	Sustainable plantation area (ha) – good site
Post regime – clear-fell at 20 cm DBH	600	24,500	40.8	408
Post regime – clear-fell at 30 cm DBH	600	9,500	15.8	237
Peeler/saw log regime - commercial thinning (20 cm DBH)	400	24,500	61.3	613

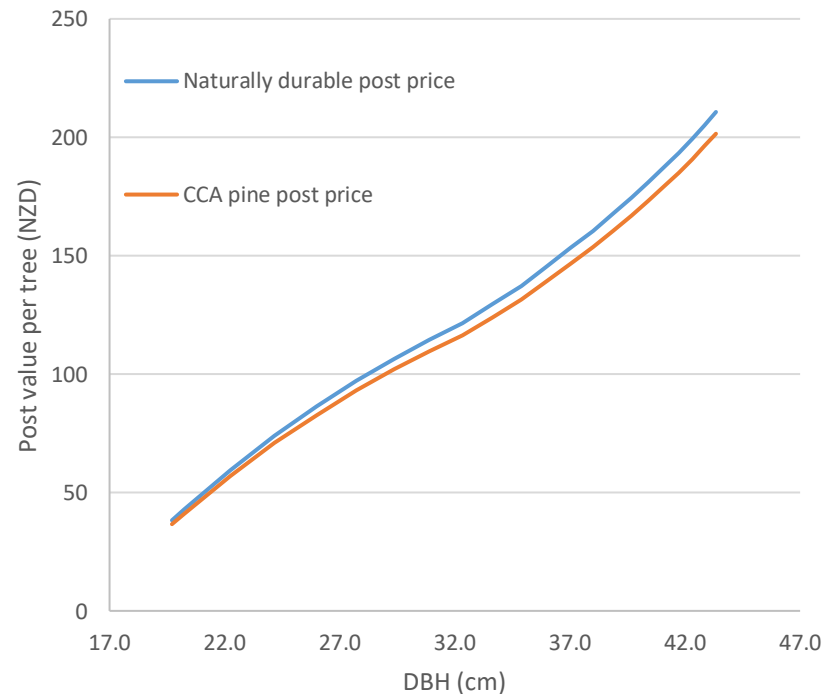
- Large scale (500,000 posts per year)

Log supply	Available trees / ha	Number of trees / year	Annual planting area (ha / year)	Sustainable plantation area (ha) – good site
Post regime – clear-fell at 20 cm DBH	600	195,000	325	3,250
Post regime – clear-fell at 30 cm DBH	600	75,000	125	1,875
Peeler/saw log regime - commercial thinning at 20 cm DBH	400	195,000	488	4,875

Economy of post-production

30 cm DBH *E. bosistoana*

- Stumpage (IRR 8%) \$NZ 21 – 56
(Millen et al. 2019)
- Post value (whole sale) \$NZ 105
- Difference need to cover
 - harvesting,
 - transport,
 - post-production
 - manufacturer profit



Note:
radiata 150 mm
eucalypt 80 mm (heartwood)

LVL (laminated veneer lumber)

NZ Radiata LVL Products	MoE (GPa)
CHH: truFRAME®, hySPAN®	8, 13.2
Nelson Pine: LVL8, LVL11, LVL13	8, 11, 13.2
JNL: J-FRAME LVL8; LVL10	8, 10
Competitive LVL Products	MoE (GPa)
Pollmeier: BauBuche GL75	16.8

NZ

- Largely low stiffness (value) product

Competition

- Comparable to steel

BauBuche Beech laminated veneer lumber
Product profile



350 m all wooden skyscraper



Sumitomo

Existing large scale NZ LVL industry

Spare capacity

- need of stiff veneer

Quality veneers

- *E. bosistoana*
- *E. quadrangulata*
- *E. globoidea*



Spindle less lathes

- Small logs
- Small scale possible

MARKETING FOCUS

Benefits and shortcomings: China plywood industry tour

A RECENT tour of Chinese plywood mills provided participants with an understanding of the wood resource used in plywood production, manufacturing capabilities as well as typical plywood products available in the Chinese market.

The tour included time in Linyi, known as the 'wood panel capital of China', as well as Shandong Province, north of Shanghai, and Guangxi Province, near the Vietnam border.

While there are some positive



On the straight and very narrow ... small diameter logs in China ready for processing through spindle-less lathes.

These arrangements make it very difficult to control moisture variability which is so critical to reliable bonds.

The disjointed manufacturing layouts, significant amounts of manual handling and small log resource result in veneers that are shorter and narrower than the finished plywood sheet. The result is a substrate beneath the overlay that is a patchwork of pieces of veneer. Discontinuous layers create a weakness in the final product, particularly when they align through the thickness of the product.



Value



Veneer	\$NZ/m ³ (wholesale)
unusable	55
F5 - 6.9 GPa	360
F7 - 7.9 GPa	390
F11 - 10.5 GPa	405
F13 - 11.3 GPa	420
F17 - 14.0 GPa	420
F22 - 16.0 GPa	420
F27 - 18.5 GPa	420
F34 - >21.5 GPa	420

Growing costs vs value of *E. bosistoana* tree

Growing costs incl. 8% IRR (NZD)

E. bosistoana 30 cm DBH

21 – 56

Veneer (and posts) from trees exceed growing costs (incl. 8% IRR)

Difference need to cover harvesting, transport, production and manufacturer profit

Plantation estate

20,000 m³ usable dry veneer (10% NZ LVL production)
Improved *E. bosistoana* (good site)

Log supply	Available trees / ha	Number of trees / year	Annual panting area (ha / year)	Sustainable plantation estate (ha) – good site
Post regime – clear-fell at 20 cm DBH	600	445,000	740	7,400
Post regime – clear-fell at 30 cm DBH	600	94,000	157	2,350
Peeler/saw log regime – commercial thinning (20 cm DBH)	400	445,000	1,110	11,100

Sawn timber - colour



E. bosistoana



E. camaldulensis

E. bosistoana (NZ) cross arms



1500+ \$NZ/m³

E. cloeziana (China)



UC team

- Clemens Altaner
- Luis Apiolaza
- David Evison
- Bruce Manley
- Euan Mason
- Justin Morgenroth
- Tara Murray

- Bill Heffernan
- David Lueng
- Pieter Pelser
- Minghao Li

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Nick Davies
Fei Guo
Yanjie Li
Gayatri Mishra
Serajis Salekin
Huimin Lin
Ebenezer Iyiola
Seoljong Kim
Daniel Boczniewicz
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Tobias McLaughlin
Jack Burgess
Saturo Kuwabara
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Roger May

Harriet Palmer

Proseed

Shaf van Ballekom

Paul Schroeder

Marie Cresswell

Seed collectors

