Tāne's Tree Trust Native Trees for the Future Newsletter
September 2007

Newsletter No. 12
ISSN 1176-1245

Timber trees of the future

KANUKA *(Kunzea ericoides)* — *Ian Barton*

Note:

The uses of kanuka and manuka *(Leptospermum scoparium)* are somewhat interchangeable although manuka does not grow very large and most larger wooden items would have been made of kanuka. Manuka probably has more uses in the pharmaceutical area.

History:

The Maori used kanuka for a wide range of uses, particularly those requiring a hard, strong timber. It was the most favoured wood for the making of agricultural implements – mainly different types of digging sticks. Another important use was for weapons – taiaha, tewhatewha, and koikoi (a double pointed spear). The bark was often used as an insulating material between the inner and outer walls of whares, especially in the Wanganui area. Of course kanuka is the premier fuel wood in New Zealand and, being readily available and regenerating easily, was greatly used by both Maori and European. It is likely that it was the main fuel used in Auckland and would have been carted quite long distances. For example in the diary of T. Harris, Sir George Grey's manager on Kawau Island, he notes that kanuka fire wood was shipped from Sir George's property to Auckland at the rate of 40 tons per month. Other European uses were as house blocks, fencing and wheel spokes but with indifferent results. There is now renewed interest in its use for impact handles.

Medicinally the leaves can be used to make a "tea" which, when strong has emetic qualities; when weak can be a replacement for conventional tea. The shoots and capsules when chewed will relieve dysentery while the inner bark can be boiled and used as a mouthwash and to treat mouth and eye troubles.

Distribution:

Kanuka is found throughout the North and South Islands but mainly on forest margins. It acts as a nurse plant for many species -especially kauri and Podocarps- and, being light demanding, is eventually replaced by these species.

Tree size and growth:

Size according to most authorities is up to 15 metres tall and 60 cm diameter. However on some sites it will grow up to 25 metres, when drawn up by other species. Diameters in excess of 130 cm have been recorded. Growth is quite fast, up to one metre height annual when young, however the species tends to be multi-stemmed from the ground so, if being managed to produce single stems, needs to be close spaced initially and pruned if required. Best growth seems to be on easy slopes and high river terraces, it does not grow well on wet sites and hard clays, giving way to manuka in this situation.

Timber:

Timber characteristics, with *P radiata* figures shown in brackets for comparison, are as follows: -

Density (green)	? kg/ m^3	(930 kg m^3)
" (dry)	757 kg/ m^3	(500 kg/m^3)
Tangential shrinkage		
- green to 12% m.	?	(4.7%)
Radial shrinkage	?	(2.2%)
Modulus of rupture	127 Mpa	(90 Mpa)
Modulus of elasticity	12.5 Gpa	(9 Gpa)

Only northern and southern rata, black maire, puriri and probably pohutukawa are denser than kanuka while kowhai, southern rata, hard beech & rewarewa are stronger. The wood is

hard, heavy and finely textured but it is slow to dry and prone to checking. It is not ground durable.

Potential

Kanuka is a multi purpose species and can be used in the following ways: -

- As a nurse for kauri and podocarps it can be managed for removal as firewood or better stems retained for timber production.
- It can be grown for the production of honey and essential oils (mainly p-cymene and a-pinene). Kanuka yields more oil than manuka.
- It can be grown for timber.

Research requirements:

Research is needed into most aspects of kanuka establishment although it is fairly easy to handle and solving problems here should not be difficult. Of greater difficulty will be the establishment and management of kanuka plantations for oil production on a commercial basis and on growing it for specialist timber production. Crop & Food Research have done considerable work on oil production but, as far as is known, have not attempted to establish production plantations.

References:

Allan H H. 1961. *Flora of New Zealand Vol. 1* Government Printer Wellington

Brooker S G, Cambie R C & Cooper R C 1981. *New Zealand Medicinal Plants.* Heinmann

Burstal S W & Sale E V. 1984. *Great Trees of New Zealand*

Clifton N C. 1990. *New Zealand timbers*

Crop & Food Research. 2000. Essential oil production from kanuka and manuka. Broadsheet No. 116. www..crop.cri.nz/home/products-services/publications/broadsheets/essentialoilmanuka_kanuka.pdf

Wahaika carved from kanuka

Editorial

Indigenous forest research

One of the most important aspects of work with indigenous species is research and a large part of the Trust's activities are geared toward obtaining new information and making this available to people involved in growing natives. Last March we were involved in a workshop about indigenous forestry research in Christchurch and it is hoped that from this will come the setting up of an Advisory Group which can have input into research activities.

It was with considerable alarm that, early in August, the Trust heard rumours that there were to be staff layoffs at Scion; with the position of at least one of the two people still involved in indigenous research likely to go. Although this was an internal matter we were told that we could make submissions to the C.E.O which we did, setting out the range of reasons why indigenous research should not only be continued at the same level but increased. By the end of the month it was all over and we were relieved to find that both indigenous research jobs were to be retained.

However we must continue to pursue this matter and, in particular, seek to work with Scion to improve the funding of indigenous research. This is the key to this issue for funding has to compete with all of the other demands on the Nation's research budget. What we have to do, and that means everyone associated with the Trust, is to take every opportunity to promote indigenous forestry. So when next you are speaking with your local M.P. or anyone else with mana, raise the issue of research funding and emphasise how important it is.

For its part Trust will work to get the Indigeous Advisory Group set up and through that, work to update the indigenous forest policy published by the Farm Forestry Association in 1999, as well as determining research priorities and lobbying for funding.

Ian Barton

Trust activites

(July to September 2007)

Sustainable Farming Fund

Ministry of Agriculture and Forestry
Te Manatu Ahuwhenua, Ngaherehere

Several of our Sustainable Farming Fund projects are complete or nearly so.

The workshops project is complete and we have been successful in getting a new one year grant from the Sustainable farming Fund for the 2007 / 08 year to reorganise the workshop format to make them even more useful. Trial runs of the new format will be held in the Waikato /Auckland / Northland areas over the next 18 months. We are hoping to work with the Forest Industries training organization (F.I.T.E.C.) on this and make the course part of a national training scheme.

The database of early indigenous forest research work is scheduled to be placed on our web-site later this year.

The Continuous Cover forestry manual is now being edited and the layout finalized. It is expected that it will be published about November.

We were successful in getting funding to produce a bulletin on the beech species. Work will begin later this year and the first activity is scheduled to be a meeting with interested people in the South Island.

We were not successful in obtaining funding to set up the database to record details of indigenous planting and growth rates. However limited work will be done on this through the next year and we will be seeking other sources of funding.

Membership:

Membership continues to increase and has now reached 323, of which 29 are corporate members. Existing members are encouraged to tell others about the Trust and encourage them to join. The Trust brochure has been reprinted and copies are available on request to anyone who would like them to distribute.

Trustees:

At the annual meeting in July Andrew McEwen, Deputy Chair if the Institute of Forestry and Andrew Caddie, a solicitor, as well as a qualified Forester were appointed as Trustees. Other Trustee details are contained in the Chairman's report which is inserted.

Renewal of Subscriptions:

Subscription notices for the 2007/08 year were sent with the last newsletter in July. If you have not yet paid there will be a reminder subscription form with this newsletter. If you do not wish to continue with membership it would be appreciated if you could let Ian Barton know. Those members who joined after 1 January 2007 have paid for the 2007/08 year and you will not receive an account.

Website:

The website continues to run well and attracts a small but steady flow of queries and the occasional new member. Don't forget that all past newsletters are on the web site and this year we will be adding a link to the data collected in our Archives project. Our publications list is also on the website and is updated regularly. ***Send requests to:-***

Ian Barton P O Box 1169, PUKEKOHE
Telephone 09 239 2049 ibtrees@wc.net.nz
Keep checking the site www.tanestrees.org.nz
See panel on page 3 for information about workshops

Where are the big totara?

Forest Research's new booklet about totara and its cultivation will almost certainly spark renewed interest in this iconic New Zealand tree, and the massive old specimens, some of them perhaps dating from pre-human times, to be found in various parts of the country.

By general consensus the biggest totara is the Pouakani tree in a small reserve near Whakamaru dam west of Lake Taupo. The tree, discovered in 1947 by Forest Service Rangers cruising a timber stand, is listed as number 34 among New Zealand's notable trees by S W Burstall and E V Sale in their book "Great Trees of New Zealand". Another massive totara listed by these authors (No. 57) is the tree in A'Deans Bush on the eastern flank of the Ruahines in central Hawkes Bay.

In Canterbury the most massive, although not the tallest, totara is the venerable specimen in Montgomery Reserve, near the hilltop on the Banks Peninsula Summit Road. Local botanists have estimated its age to be about 1000 years, so it may well have been a big tree when the first human stepped ashore from a Polynesian Canoe. In South Canterbury the well-known Peel Forest Reserve contains several old-man totara while another is in the nearby Talbot Bush Reserve in Geraldine. A notable aspect about several of the totara recorded by Burstall and Sale is that the trees were planted, often to commemorate some event. The tree at Waimate North Mission Station was reputedly planted by the missionaries; the tree at Maketu by the Rev Chapman in 1855 while that at Taumaranui was planted by the Maori people in 1890, who had just signed an agreement with the Government Surveyor to allow the main trunk railway line to go through the King Country.

The largest Hall's totara is in Dean Forest, Southland.

Most of New Zealand's largest totara

Species	Location	Diameter (m. b.h.)	Height (m)	Remarks
Totara	Waimate North			Possibly planted 1833
Totara	Maketu	1.12	15.5	Planted c. 1855
Totara	Pouakani	3.63	39	10.4 m. to first limb
Totara	Pureora	3.33	27	
Totara	Taumarunui			Planted 1890
Totara	Waipukurau	2.65	34	A'Deanes Bush, Takapau
Totara	Bulls			Burleigh
Totara	Featherston	1.92	26.4	Tauherenikau Racecourse
Totara	Pelorus Bridge			Age reputedly 500 years
Totara	Banks Peninsula			Larger d.b.h than Akaroa tree
Totara	Akaroa	2.43	22	Montgomery Park
Totara	Geraldine	2.67	29.1	Peel Forest Reserve
Totara	Geraldine	ca. 3.0	25	Peel Forest Reserve
Hills Totara	Clifden Southland	2.65		Dean Forest. 10.4 m. to first limb

This article based on one by Derrick Rooney in Indigena, Sept 2003

Plantation kauri, heartwood content and wood quality

Perceived disincentives about growing kauri (*Agathis australis*) for timber relate mainly to the length of time required to grow millable trees, the potential returns, and the quality of plantation grown timber. Two recent publications on heartwood content and wood quality are helping our understanding of growing kauri in plantations and to make it a viable commercial species.

Heartwood Content

Observations from young (less than 80 years old) planted kauri and from naturally regenerated second growth stands (120-150 years old) showed that they contained little or no heartwood. Therefore, was there a way to identify the amount of heartwood within kauri, and a method to predict it for a range of diameters?

To answer these questions seven planted and four natural second-growth stands were surveyed by taking a single increment core from each of 432 stems. Planted stands were from 43-70 years old, and 10-90 cm diameter. The analysis identified stem diameter as the principal factor for predicting heartwood presence and quantity. In general, planted and natural kauri produced similar amounts of heartwood for any given diameter. Age was a secondary factor with older smaller stems from natural stands having disproportionately more heartwood than would be predicted from their stem diameter. Nearly 95% of the stems sampled in the study had sapwood width less than 15 cm. Heartwood was present in all kauri above 35 cm diameter at breast height (DBH).

While heartwood was found in kauri with diameters as small as 10.3 cm in natural trees and 15.8 cm in planted trees, it represented less than 4% of total stem volume. Usable quantities of heartwood did not appear until breast height diameters reached 60 cm when mean heartwood volumes exceeded 0.5 m^3 in the bottom 6 m log. Kauri with DBH in excess of 90 cm are predicted to contain a minimum of 1.9 m^3 of heartwood per tree in the bottom 6 m log.

The simplest method to estimate heartwood content in any kauri stem of any DBH is the following:

1. measure the diameter at breast height (1.4 m above ground).
2. subtract 30 cm from the DBH (30 cm = 2 x maximum sapwood width)
3. the remainder of the DBH is heartwood. (note: for younger trees (<60-70 years) there is a greater potential for the "heartwood" to be a combination of true heartwood and transition wood).

Wood Quality

Having identified the level of heartwood content in planted kauri, the logical follow on study was whether growing for heartwood is actually necessary. Would timber properties of native species, like exotics, be dependent on age and, would it be compromised by a push for (excessively) short rotations? Was (sap)wood quality from young stands an issue, or not?

In a recent study, twenty stems were sampled from a 68 year-old planted stand in New Plymouth. It identified homogenous wood property traits in logs that were comprised mainly of sapwood. Sampled stems represented the largest diameters and therefore faster growing stems (mean diameter 39.4 cm). Sapwood comprised 80% of the stem at ground level, increasing to 99% at 10 m above ground. Basic wood density decreased with increasing stem height from ground level to 10 m. Outer-wood density (451kg/m^3) was uniform across the width of the stem at the butt, and was consistent across the sapwood zones at higher points on the stem. Tangential and radial shrinkage across the width of the stem averaged 4.1% and 2.9% respectively and were values almost identical to old growth heartwood. Modulus of elasticity (stiffness) averaged 13.6 GPa and was as high as 15.0 GPa and was also uniform across the width of the logs.

Workshops

The Trust will be running a workshop in November, probably in Whanmgarei, to trial the new Indigeous Forestry Workshop programme. To do this we require about 10 people (guinea pigs!) to give critical feedback on the programme. Would anyone interested in taking part please register their interest with Ian Barton (ibtrees@wc.net.nz) before 26th October. Full details will be sent to those who register, when they are determined. Feel free to contact Ian at any time if you need more details.

Cross-section from 68 year old New Plymouth tree. Note slightly darker heartwood centre

The study showed that sapwood properties were at least similar to that of logs from natural second growth stands and in some cases superior to old growth heartwood. It also suggested that kauri sapwood logs from plantations have the potential to be a legitimate and valuable resource. The findings support historical (early 1900's) comments that "kauri sapwood was as good as heartwood indoors" and that "there is no great difference in the actual market value of sound heart and sound sapwood of kauri, provided it is free from borer". The majority of characteristics reported on in this study show uniform radial wood properties, which is characteristic of this species even at this "relatively" young age. Another (unpublished) study of a second stand, also in the Taranaki region, produced similar results.

When compared for two basic wood properties with old-growth kauri and three common exotic conifers (Table 1) the performance of sapwood kauri is promising.

Conclusions

The results of these studies should be viewed in context of the lack of regular or ongoing maintenance of the plantings and that the planting stock was unimproved. Timely stand silviculture, tree selection and breeding are likely, as with other forestry species, to improve rotation lengths and wood quality. While sapwood kauri is a legitimate end product in its own right there is no preclusion to growing kauri in plantations for heartwood recovery. However, the thinnings comprised mainly of sapwood would also be commercially valuable and viable.

Small table from New Plymouth kauri.

Planks from New Plymouth kauri – heartwood slightly darker

Species	Density (kg/m3)	MoE (G Pa)
Kauri (sapwood – 68 years outer wood density)	441 - 451	10.4 - 13.6
Kauri (old growth heartwood)	511 - 560	9.0 - 13.0
P. radiata	380 - 591	4.5 - 12.8
Douglas fir – 40 years breast height outerwood	392 - 466	6.4 - 11.7
Cupressus lusitanica – 40 years breast height outerwood	300 - 400	4.5 - 8.8

Table 1. Comparison of sapwood kauri wood density and stiffness with other species