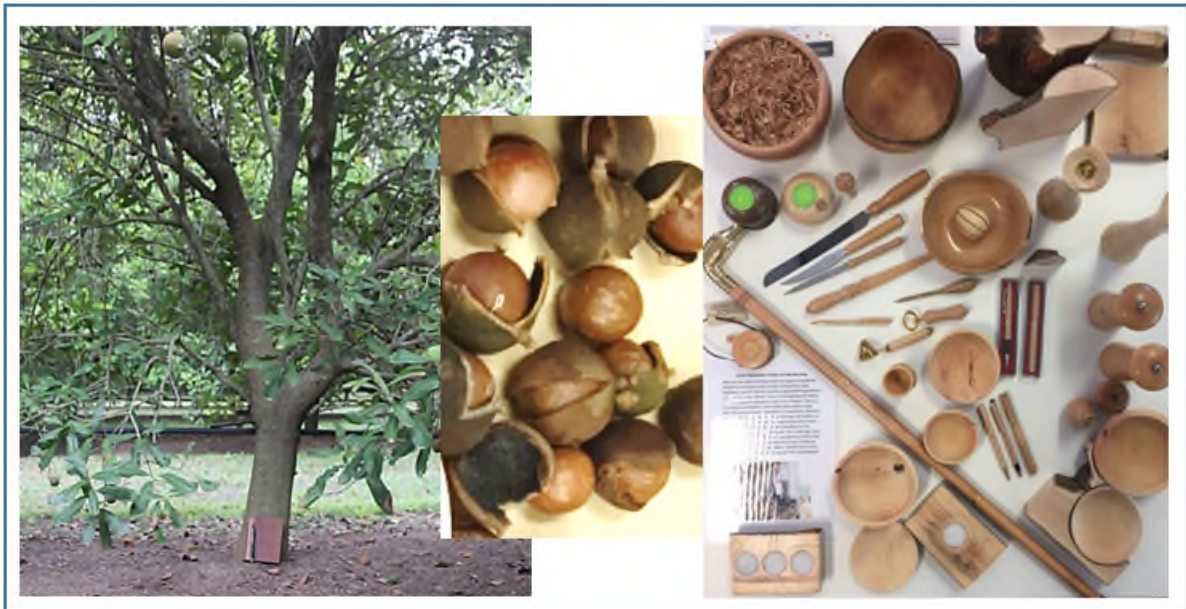


What do macadamia nuts and fine timbers have in common?



Agri-Science Queensland Innovation Opportunity

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Summary

Macadamia trees are best known for their nutritious edible nut which supports a \$291 M/annum industry in Australia. What was a source of bush tucker for the indigenous tribes of sub-tropical Queensland and New South Wales has developed into a high value commodity in domestic and export markets. Australian orchards produce 30% of the global crop and exports to over 40 countries across Asia, Europe and North America.

Although industry benchmark data has shown that macadamia orchards have a commercial life span of more than 40 years, it is likely that trees will be replaced at earlier ages due to improvements in productivity and health in new varieties developed through research and development projects. Trees are also removed from time to time to reduce inter-tree competition, make way for roads, nurseries, farm buildings and other crops. Although some orchard managers can chip these removed trees for re-use as mulch on-farm, there is interest in the wood's potential for higher value products such as craft wood.

The project reported here investigated the potential of the wood salvaged from trees cleared for a nursery on an orchard near Bundaberg, Queensland. The wood was provided to a test team comprising fourteen craftspeople based in south-east Queensland to create objects and appraise the wood's attributes.

The test team were unanimous in their praise for the appearance of the wood and concluded that it's similarities to the well-known silky oak timbers (especially *Cardwellia sublimis*, northern silky oak and *Grevillea robusta*, southern silky oak) indicate that it could do well in the craft and fine wood turning markets. As with other members of the Proteaceae family, the wood has wide medullary rays which provide this recognisable 'oak' appearance, but also form zones of weakness and during drying can provide sites for splitting. Careful drying after harvesting is required to minimise losses due to splitting. The application of end-sealer is recommended to retard the rate of drying and assist with reducing degrade during drying. The patient wood craftsman will be rewarded with an attractive wood suitable for craft items such as knife handles, salt and pepper mills, pens, walking sticks and turnery. The light colour of the wood provided was also well suited for pyrographic art.

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Background

Currently, when branches and stems are removed from macadamia tree orchards they are often chipped for mulch and applied to aid in weed control. This is desirable in sloping orchards, typical of the Glasshouse and Gympie regions, where erosion of the A-layer from the soil profile exposes tree roots. Macadamias are shallow-rooting trees and productivity is impacted due to the lack of nutrients in the remaining sub-soil. Of the 20,000 ha estate, it is estimated that 7,000 ha would benefit from a 50% thinning, for example removal of every second row, to minimise the inter-tree competition effects and maintain ease-of-access for orchard operations. These thinning operations could potentially result in the removal of 700,000 trees which is likely to result in an oversupply of mulch. The aim of this project was to assess alternative options for some of this material.

Macadamia wood has been listed on four Queensland Government (forestry) departmental files since the 1920s. Some notes of interest from these files, attributed to district foresters working in the regions where *Macadamia* species occurred naturally, are provided below:

- “Its decorative ray flowered mauve pink appearance gives it distinction, but its bard hardness and heaviness limit it to only special applications, as for hard turnery.”
- “Used for turnery, fancy articles, etc.”
- “Has no definite uses at present but could be availed of for fancy articles such as walking sticks, collection plates, serviette rings, fancy rules, lodge work.”
- “It would make pretty small turned articles but it is too hard for general use in furniture”

The Queensland Government’s wood reference collection includes samples provided by early Brisbane sawmiller William Pettigrew to the Colonial Botanist Frederick Manson Bailey in 1899 (Brown, 2004). The original Pettigrew blocks were subsequently processed into triplicate ‘hand samples’ as displayed in Figure 1.

The potential billets that could be provided from orchards would be smaller than traditional sawlogs and veneer logs used by the timber industry, but would be suitable for craft items as targeted in this trial.

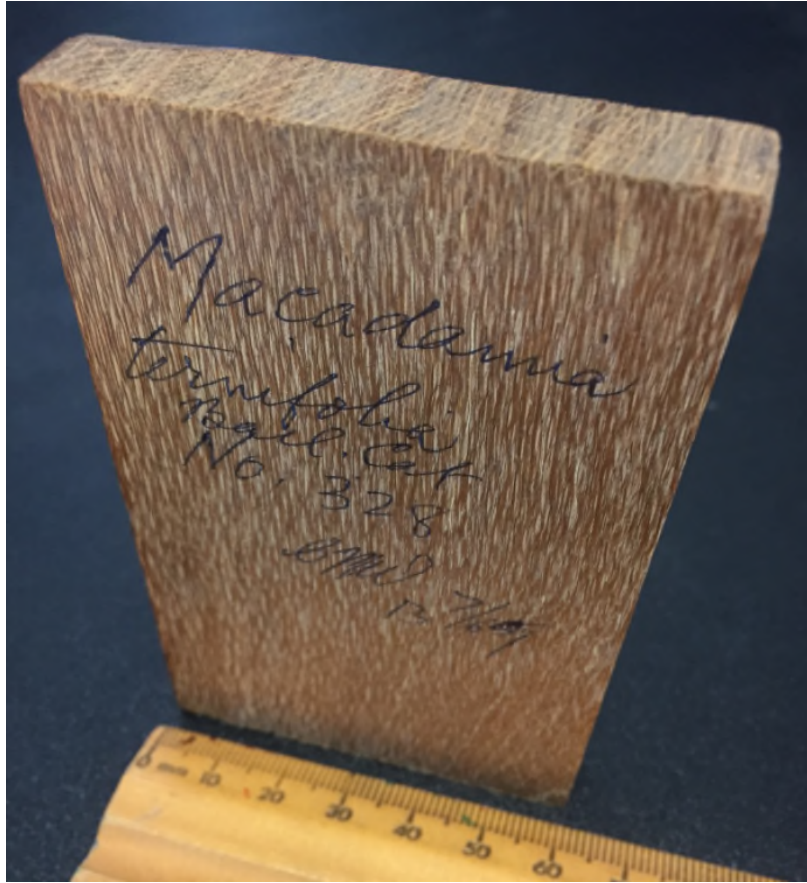


Figure 1. Macadamia ternifolia hand sample, F.M. Bailey Collection 1899 (DAF xylorium).

Two species listed under *Macadamia* are included in the Queensland Government's Harvesting and Marketing species list- *M. ternifolia* and *M. praelta*. This indicates that these trees in their natural habitat can attain a minimum sawlog of 2.4 m in length and a small-end diameter of 30 cm. The latter was transferred to the genus *Floydia* in 1975. Neither of these species are cultivated for nut production. The DAF Forest Product Innovations wood collection includes approximately 20 samples comprised of a mix of *M. praelta*, *M. whelani*, and *M. ternifolia*.

The species to be sourced from commercial nut orchards for this project are likely to be *M. integrifolia* and *M. tetraphylla*, which are preferred for nut production. Some indicative wood properties data for the wood of *M. integrifolia* are: air-dry density 705 kg/m³ and Janka hardness value (indicating resistance to indentation) 10.2 kN. Until the development of this orchard wood project, the most recent forestry research records on macadamia wood were recorded in 1978.

Project Objectives

The aim of the project was to provide billets of typical macadamia trees from an established orchard to craftspeople for testing, and collate their feedback. An additional objective was to retain finished items to demonstrate to orchard managers of the potential of salvaged wood for craft timbers.

Methodology

An internet search of macadamia industry websites provided contact numbers for potential suppliers of macadamia wood. Orchard managers were cold-called to discuss the project and locate interested collaborators.

Wood artisans were approached via Queensland's largest club, the Woodturners Society of Queensland (WSQ), whose members include experts in turning, toy-making, pyrography (the art or technique of decorating wood by burning a design on the surface with a heated metallic point) and related crafts.

Billets were end-sealed immediately after harvesting to minimise degrade from rapid drying.

The test team offered to produce the following items and record their experience and appraisal of the results:

- turnery
 - bowls, pens, knife handles, letter openers, bottle openers, walking sticks, candle holders, salt and pepper mills, fruit sculptures, perfume flask.
- pyrographic art.

Results

Two orchards offered to provide access to trees for harvesting- at a Macadamias Australia property near Bundaberg and the Cummins property near Bauple. Sufficient material was available from the Macadamias Australia property due to proposed clearing of a 1.5 ha area of orchard to make way for a new nursery facility. DAF technicians selected a range of different sized billets and crotches, applied end-sealer (impermeable wax emulsion) and loaded into a covered truck. The material was delivered to the Woodturners Society of Queensland's (WSQ) headquarters in Greenslopes, Brisbane and a presentation was given by DAF to explain the project. A range of craftspeople volunteered to take billets, make demonstration products and provide feedback on their experience and outputs. In some cases indicative market values for the finished items were provided. Appendix 1 provides details of the items produced and comments by the artisan. None of the test team recorded any health issues such as skin irritation from handling the wood or from the dust.

Conclusions/Significance/Recommendations

Macadamia trees harvested or salvaged from nut orchards can provide an attractive wood for craft items. The desirable features are its pale brown colour, sometimes with pink tints, and the oak-like grain, produced by the prominent radial parenchyma tissue (also referred to as 'rays' or 'medullary rays'). The wood is easy to work with sharp tools, but requires careful drying to avoid splitting. Billets should be end-sealed at the time of harvesting to retard the rate of drying and minimise degrade.

Key Messages

Craft items made from macadamia wood present a high value alternative to chipping for mulch.




Where to next




A public version of this report will be provided to H&FS macadamia researchers to distribute to growers and other macadamia outlets in their networks. A story will be submitted to Australian Wood Review magazine to create awareness of this attractive craft wood and highlight its potential for fine wood work. A supplementary project to undertake a cost-benefit analysis, comparing craft wood and chipping for mulch options, would provide valuable data of interest to orchard managers.




Budget Summary




Item	Cost
Employee related expenses, stationary, book, safety equipment	\$4,996
Truck hire, diesel, padlock	\$1,798
Hardware, equip and consumables for wood crafts	\$2,055
ESP car	\$110
Travel allowances	\$693
Total	\$9,652

Appendix 1. Artisan results- item, comments, value.



Item	Comments	Value
<p data-bbox="454 309 593 331">coffee scoop</p> 	<p data-bbox="869 309 1155 416">successfully microwave dried, easy to work, comparable to silky oak to work and in appearance</p>	<p data-bbox="1201 309 1305 331">retail \$30</p>
<p data-bbox="454 952 593 974">candle holder</p> 	<p data-bbox="869 952 1155 1003">cracked during microwave drying</p>	<p data-bbox="1201 952 1294 974">\$30-50</p>
<p data-bbox="295 1489 756 1512">small letter opener, finished with Danish oil</p> 	<p data-bbox="869 1489 1166 1653">successfully microwave dried, good to work, medullary rays give interesting figure; useful for pens and knife handles if dried appropriately</p>	<p data-bbox="1201 1489 1310 1541">wholesale \$10</p>

<p>egg with ebony feature, finished with 2 coats Danish oil</p> 	<p>branchwood approx. 60 mm diameter split during drying; splits re-cut with bandsaw and filled with ebony veneer feature</p>	<p>wholesale \$10</p>
<p>egg cup finished with 2 coats of Danish oil</p> 	<p>split formed during drying was filled with ebony chips to enhance appearance; medullary rays provide attractive feature</p>	<p>wholesale \$10</p>
<p>oval bowl finished with 1 coat of Danish oil</p> 	<p>distorted during microwave drying, but minimal splitting; turned green in the rough, then microwave dried; pleasing medullary rays figure, irrigation hardware is retained in the bowl to add interest and a story; useful wood for spindle bowls either rough turned before drying or after thorough seasoning</p>	<p>wholesale \$10</p>



<p>set of three nested bowls finished with 1 coat of Danish oil</p> 	<p>bowls were turned 4 weeks post-harvest; slight distortion after drying; colour is paler than usual for macadamia with attractive figure from the medullary rays, particularly from crotch sections</p>	<p>wholesale \$20</p>
<p>letter opener</p> 	<p>good, dense turning timber; radial cracking during microwave drying spoils timber; air drying provides better results; appealing grain on radial lines; recommended for small items, handles, etc.</p>	<p>wholesale \$14, retail \$25</p>
<p>perfume flask</p>  <p>Perfume Flask Handcrafted from Macadamia this vial maybe filled with essential oils and used as an air freshener in a cupboard or car.</p>		<p>wholesale \$14, retail \$25</p>



<p>wine stopper</p> 		<p>wholesale \$8, retail \$14</p>
<p>apple and pear</p> 		<p>wholesale \$10, retail \$16</p>
<p>bread knife (handle)</p> 	<p>dried successfully in microwave; good, dense wood turning timber,; works well on lathe; sands and finishes well with lacquer; good in small pieces for example pens and handles, but difficult to get large pieces suitable for bowls due to cracking along radial lines</p>	<p>not provided</p>



<p>walking stick</p> 	<p>small radial cracking occurred from centre of tree; easy to turn, very dense, good grain pattern and attractive light colour</p>	<p>wholesale \$50, retail \$110</p>
<p>natural edge bowl</p> 		<p>not provided</p>



letter opener (handle)	cut cleanly; oak-like grain	
		
Bowl	very good to work; dried	
	rough-turned bowl in microwave, then placed in 20l container of sawdust and shavings as natural dessicant	

<p style="text-align: center;">salt and pepper mills</p> 	<p>solid wood, easy to turn; a bit bland but can have a nice pattern</p>	<p>wholesale \$40, retail \$60</p>
<p style="text-align: center;">tealights polished with EEE cream and Ubeaut Glow</p> 	<p>turns nicely, suits pens, handles and small bowls</p>	<p>not provided</p>

<p>pencil and assorted pens</p> 		<p>wholesale \$20, retail \$35</p>
<p>letter opener (handle)</p> 	<p>easy to work, good appearance</p>	<p>wholesale \$8, retail \$12</p>

<p>bottle opener (handle)</p> 	<p>easy to work, ok appearance</p>	
<p>key ring</p> 	<p>good to work, no problems; suitable for wood turning and pyrography</p>	<p>not provided</p>

<p>pyrography featuring a flower</p> 	<p>great for wood pyrography due to pale colour</p>	<p>not provided</p>
<p>shaving razor handle</p> 	<p>good to work and good appearance; microwave dried but some splitting occurred, superglue used to limit splits</p>	<p>wholesale \$15, retail \$25</p>

<p>small cheese knife (handle)</p> 		<p>not provided</p>
<p>steak knife handle</p> 		<p>not provided</p>