Australian Government
Australian Centre for International Agricultural Research
Queensland Government
Pacific Community
Communauté du Pacifique
UNIVERSITY of TASMANIA

ACIAR project

CSAW

FST/2009/062

Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific communities

Content

- Project participants and objectives.
- Project structure.
- Information resources.
- Training program.
- The characteristics of coconut

Project organisation

Commissioning organisation

Australian Government
Australian Centre for International Agricultural Research

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Australia based

UNIVERSITY of TASMANIA

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Project organisations

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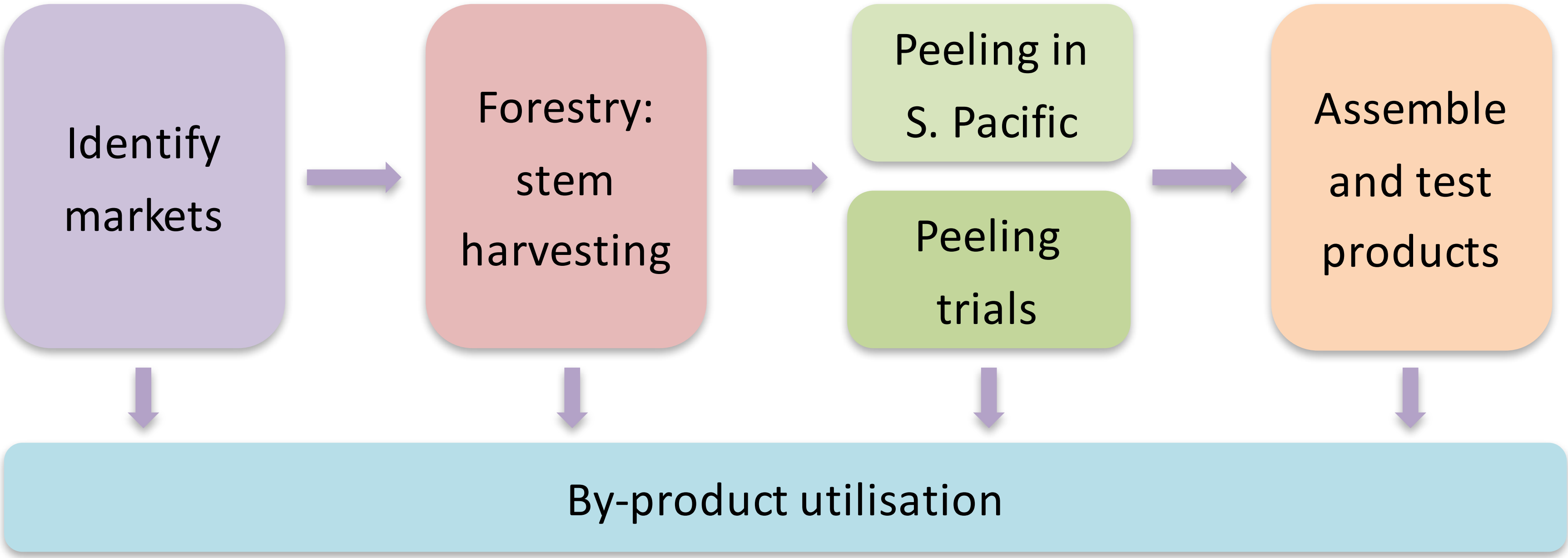
Project Objectives



Objective 1 – Identify Markets

Identify markets

Objective 1 – Identify the most promising product options for the veneer from coconut stem

Objective 2 – Forestry

Forestry: stem harvesting

Objective 2 - Develop protocols and capacity for sustainable low-impact coconut wood harvesting, plantation rehabilitation, and log grading, handling and transport

Obj. 3 – Veneer peeling in S. Pacific

Peeling in S. Pacific

Peeling trials

Objective 3 – Establish experimental veneer-peeling capacity in the South Pacific

Spindle-less lathes

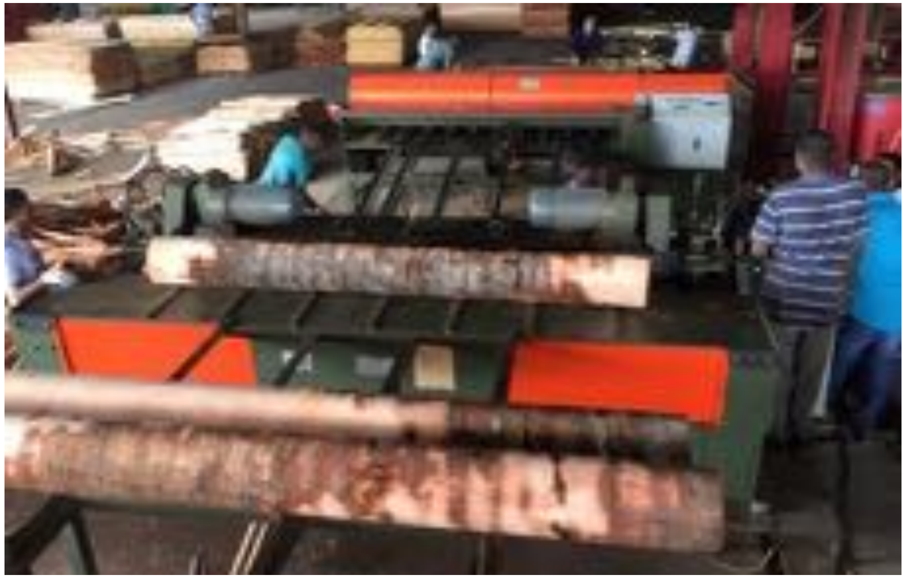
- A spindle-less lathe uses periphery drive rollers to pushes the log against the blade for peeling.
- This increases recovery over spindled lathes as small diameter logs can be peeled efficiently down to a small residual core.

Objective 4 – Peeling trials

Peeling in S. Pacific

Peeling trials

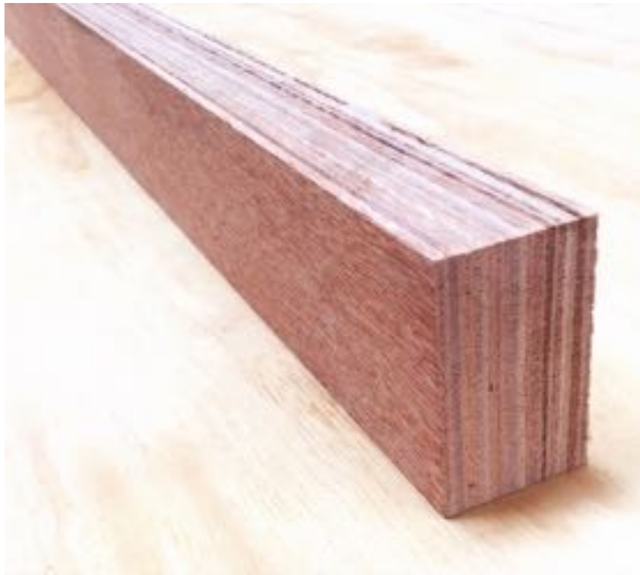
Objective 4 – Determine the optimum processing parameters & protocols for peeling coconut stems & the properties of the recovered veneer.



Objective 5 – Products

Assemble and test products

Objective 5 – Assemble the product suite and establish its characteristics and in-service performance

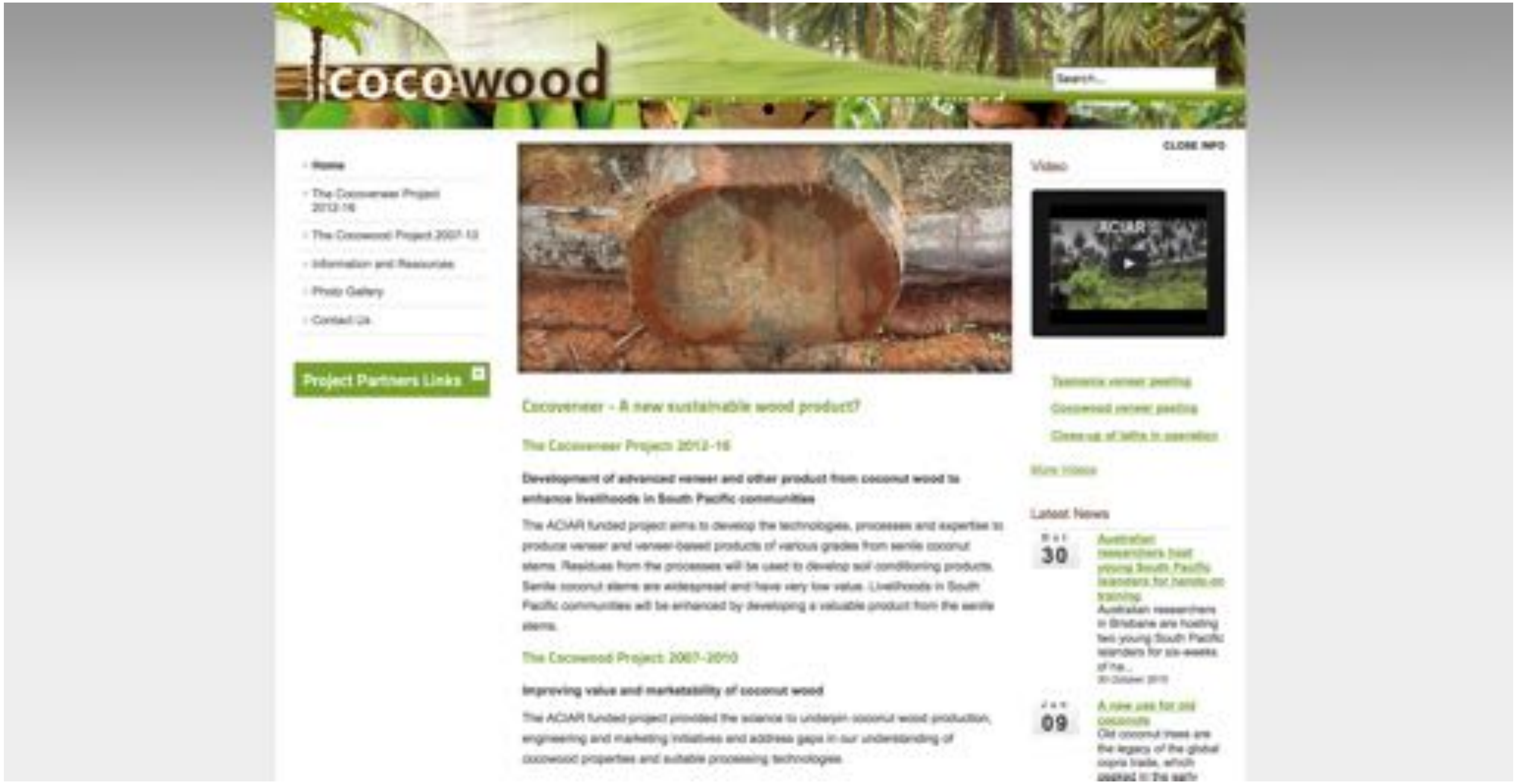


Objective 6 – By-product utilisation

By-
product
utilisation

Objective 6 - Determine the costs and benefits of using the residual cortex and soft, central cores for bio-char and other agricultural products

Information: Cocowood.net

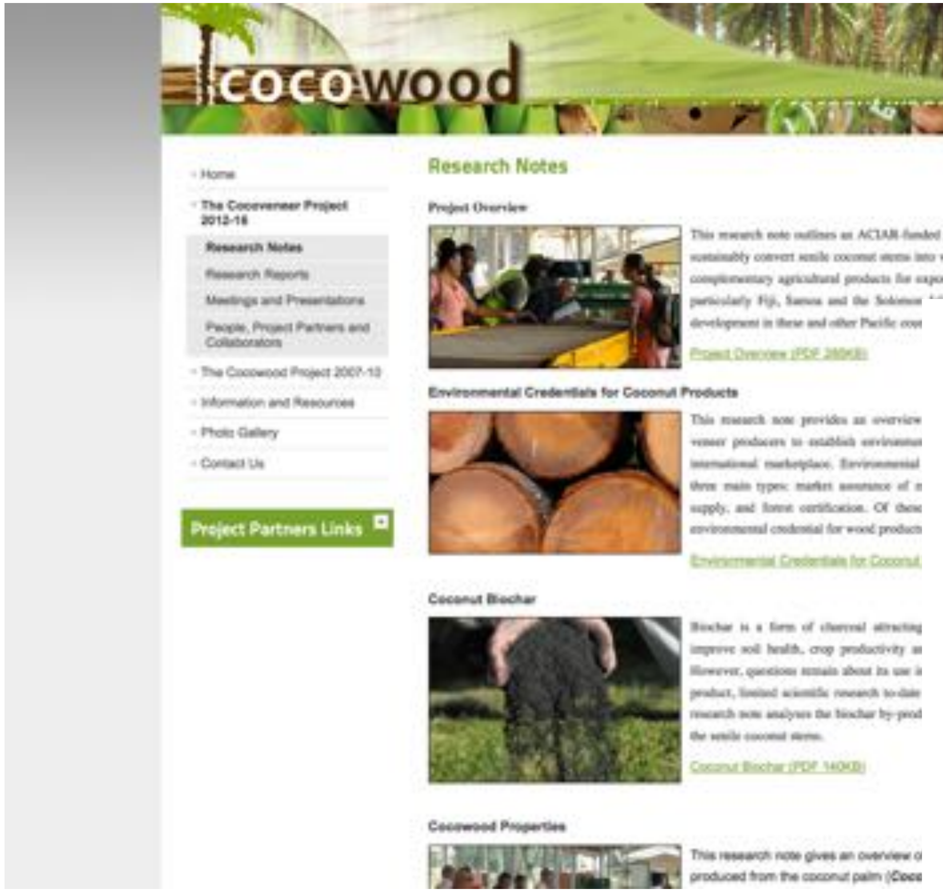


Information: Cocowood.net

Cocowood.net contains:

- Videos
- Project notes
- Research reports

and more …



CocoVeneer

Research Note: Cocowood Properties

This research note provides an overview of the physical, mechanical and chemical properties of wood and veneer recovered from the harvested stem of the coconut palm (*Coco nucifera*). It is a development of the Cocowood project note: 'Properties and processing facts for coconut wood' available at cocowood.net. The stem fibre of the coconut palm is not a true wood. As a monocot (grass), the stem's vascular structure is largely different to that found in traditional timber. The stem has a high density zone towards the periphery while the inner zone is much lower in density. Material from the outer, higher density section has properties similar to many hardwood timbers and boards sawn from it can be suitable for various traditional products including high-value flooring. The stem can also be peeled with the density of the recovered veneer reducing towards the centre of the log. The innermost core and the outlying bark of the coconut stem have low density and may be used for by-products such as composting, wood chips and insulation.

Introduction

This research note gives an overview of the properties of wood and veneer produced from the coconut palm (*Cocos nucifera*). The properties of coconut wood are shown in Table 1. Important aspects include:

Hardness - Coconut palm fibre or 'wood' density decreases towards the centre of the stem and with height. The highest density fibre occurs around the outer periphery of the stem and is suitable for many end-uses requiring a hard 'wood'. The inner core can be very low density.

Appearance - The colour of seasoned coconut wood ranges from medium to dark brown with prominent, darker, quill-like streaks for high-density outer material to light and pale brown for lower density inner material.

Durability - Tested, untreated cocowood has limited natural durability, suggesting it cannot be used in weather-exposed conditions.[f] However, above-ground durability greater than 10 years has been observed for higher density cocowood sawn boards.

High density, dry cocowood is not susceptible to the *Lyctus* beetle and is suitable for use in fully protected applications. Untreated cocowood is not resistant to termite attack.

Figure 1: Production line for CocoVeneer

Figure 2: Coconut log disk and veneer illustrating the concentration of vascular bundles on the log's perimeter

Using Coconut Stems

Coconut stems can be used in the round-form, sawn into board, or peeled into veneer. The outer high-density coconut wood can be used for flooring, furniture, joinery, panelling, pallets, plywood and decorative veneers, utility poles (preservative treated) and feature posts. The lower density material can be used in handicrafts, turnery, insulation, charcoal and firewood, or chipped as a base for compost or a potting substrate for plants.

Processing Coconut Wood and Veneer

Sawing - Cocowood has a high mineral content and large variation in grain angle (caused by the vascular bundle structure) so sharp, specialised tools are needed. High speed steel blades or Stellite-tipped blades and regular sharpening are recommended for breaking down the logs.

Peeling - Heated coconut logs can be rotary peeled … produces a continuous thin ribbon of CocoVeneer that ranges between 2.5-6.0 mm in thickness.

Stain-prevention - Freshly sawn boards or veneer are prone to mould and staining and should be processed rapidly after harvest. An appropriate anti-stain dip may be used if required.

Drying - Green boards and veneer have high moisture content and must be processed quickly to avoid deterioration caused by pests and staining.

Cocowood boards can be kiln-dried at 60-65° (dry bulb) over 10-14 days, depending on the equipment. The required moisture content for Australian and European markets is 9-14% and 7-11% respectively.

Grading - Key grading parameters of sawn boards for flooring are density (hardness) and straightness (limited spring, twist or bow). The recommended minimum density for flooring is 700kg/m^3 (Janka …

Training program

Training is being provided through:

- Participation in university courses.
- Experience in Australian institutions
- Onsite training in equipment in Suva, Fiji.

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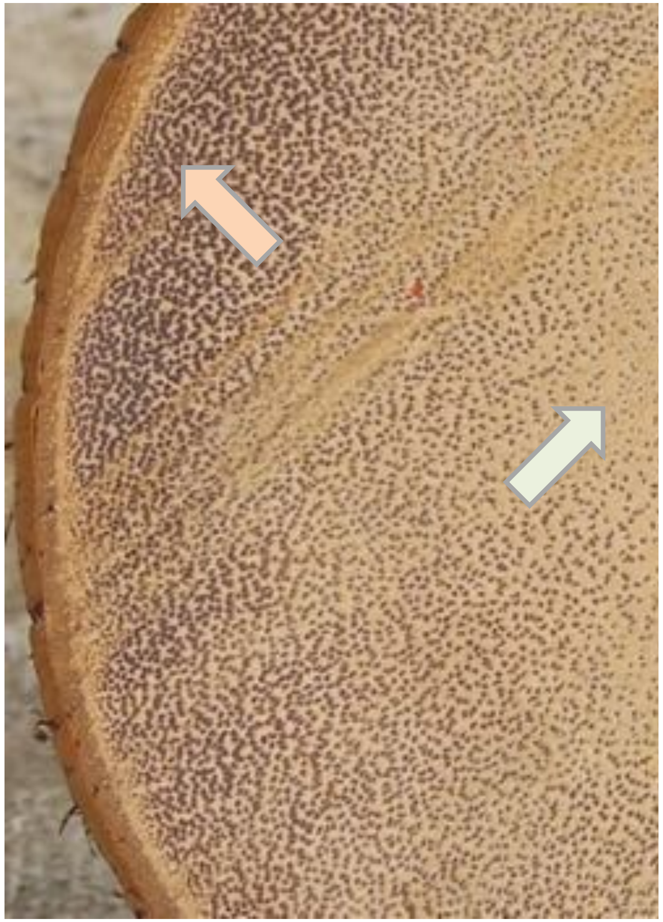
The characteristics of coconut

Character of coconut wood

- The coconut palm is a monocot (grass).
  - It is not a true wood.
- The stem's vascular structure is different to traditional timber.
- Logs are small at ~ < 350 mm diameter with:
  - A high density zone towards the periphery and the base.
  - A low density inner zone.

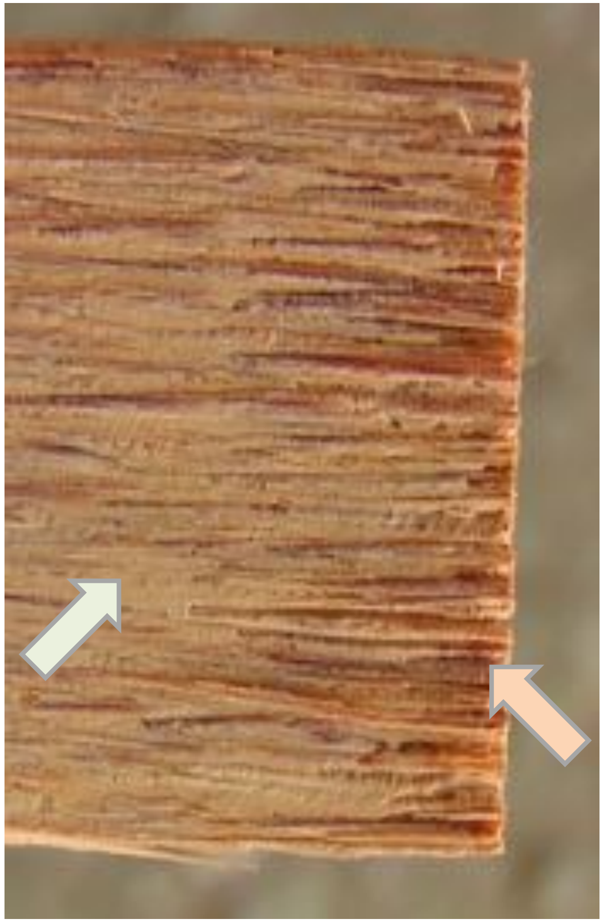
Coconut wood cell structure



The wood consists of high density vascular bundles in a matrix of spongy, low-density, parenchyma tissue.

There is low radial and tangential connection between bundles.

Bundles are clustered at the outside of the stem.



Coconut wood cell structure

Image from QDAF CocoWood project

Density variation in coconut wood

Density decreases with bundle frequency

- From the outside of the stem to the middle.
- Up the stem from the base.

Density range:

- > 800 kg m^3
- < 300 kg m^3

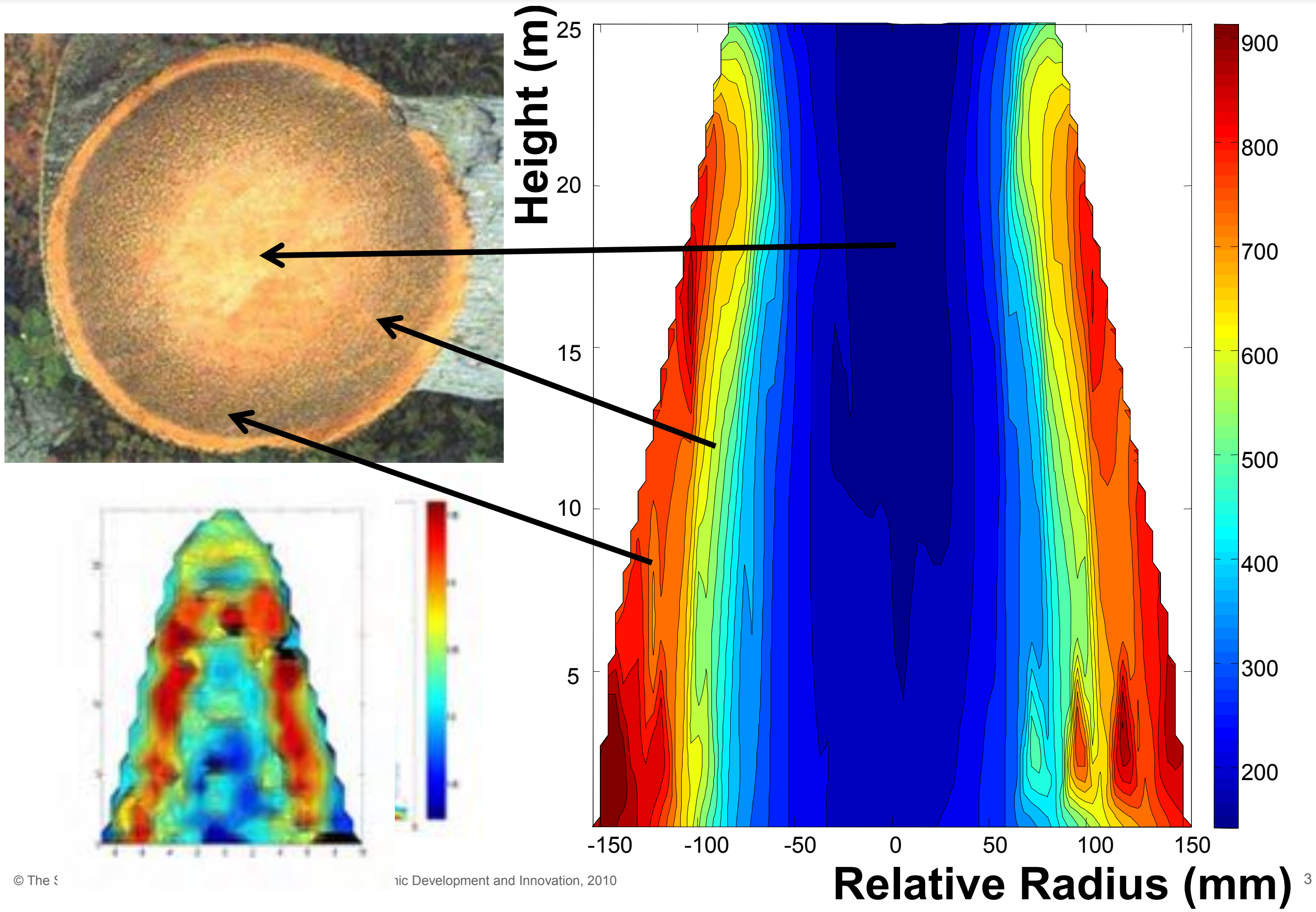
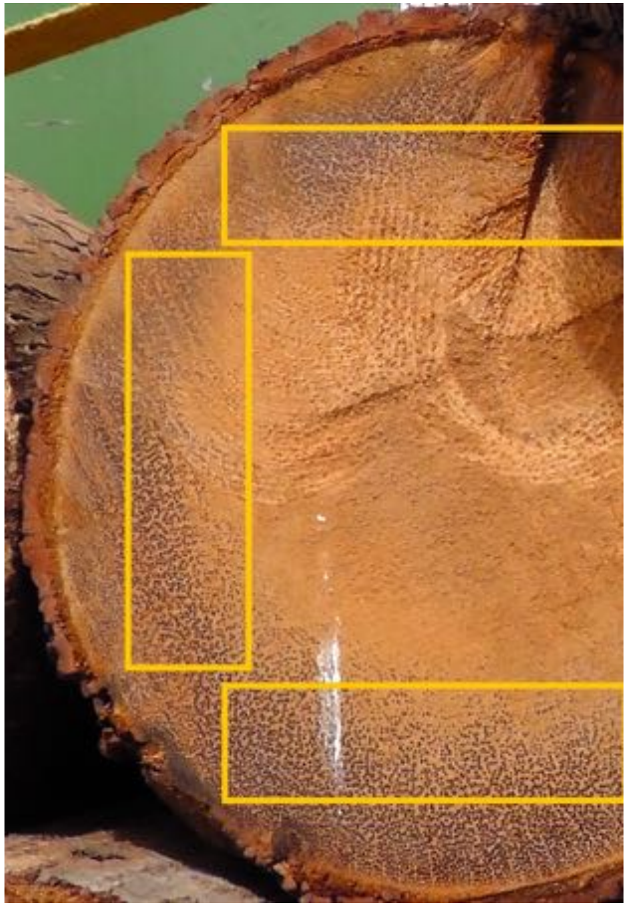


Image from QDAF CocoWood project

Coconut applications



- Coconut stems can be used in the round, sawn into board, or peeled into veneer.
- The stem's vascular structure and small log diameters complicate conversion.
  - Board recovery of dense material is limited to the outside zone.
  - High density vascular material can be difficult to cut cleanly in veneering.
  - Other characteristics are also different to true wood.

Project summary

This is conclusion of a four-year, collaborative project with six objectives:

1. Identify the most promising product options.
2. Sustainable low-impact coconut wood harvesting.
3. Establish experimental veneer-peeling capacity in the South Pacific.
4. Determine the optimum processing parameters.
5. Assemble the product suite and establish its characteristics.
6. Determine the costs and benefits of using coconut residues.

Questions

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