# Objective 3.2
# Assessing the potential of a regional trial and demonstration program

Authors: Associate Professor Gregory Nolan

Coconut Veneer project

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

Australian Government
Australian Centre for International Agricultural Research
UNIVERSITY of TASMANIA
Queensland Government
SPC Secretariat of the Pacific Community

# Contents

# Executive summary

This report presents the result of a feasibility study that assessed the potential of conducting a regional trial program to demonstrate the use of spindleless lathes to peel coconut logs. It is part of the ACIAR funded CocoVeneer project: *Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific communities.*

As part of this project, a spindleless lathe was acquired and installed at the Fiji Department of Fisheries and Forestry's Timber Utilisation Division (TUD) Nasinu facility. This feasibility study aimed to determine the technical potential and costs of relocating the lathe and its associated equipment suite to other locations in Fiji, Samoa or the Solomon Islands for a regional trial and demonstration program. A 10 stage operational plan is proposed for the program.

Four sites in three regional trial locations were investigated. These are:

- One TeiTei Taveuni (TTT) Farmer Association selected location at Taveuni, Fiji.
- Strickland Brothers Ltd facility at Apia, Samoa.
- Two locations at Honiara, the Solomon Islands: The Timol Timber facility and the Value-Added Timber Association (VATA) Timber yard.

Three equipment options were modelled. These are:

- Option 1: The existing lathe suite is adapted for travel and relocated to each of the trial locations.
- Option 2: An additional lathe suite is acquired and adapted for travel to each of the trial locations.
- Option 3: Additional lathe suites are acquired, adapted and supplied to each of the trial locations.

The estimated cost of the program for each equipment option is shown in Table 1.

The nominal lengths of the demonstration trial program are shown Table 2. These estimates assume that:

- The trials at each site are staged immediately after each other.
- The length of the demonstration period at each site is six weeks: two weeks each to unpack and install the equipment and train local staff; a regional research and equipment demonstration; and 'slack' time for additional equipment installation, packing and other activities.

In practice, parallel research activity and local factors such rainy seasons, cultural events and staff availability could influence the length of each demonstration trial and the efficiency of running them one after the other.

The exposure to risk of successfully running a regional trial and demonstration program is shown in Table 3. This shows that these risks are low to medium for a trial in Samoa and low to high for a trial in the Solomon Island. The exposure to risk of conducting the trial in Taveuni is very high. This is mainly due to the services available in each centre and the industry collaborator's experience.

The major significant risks to conducting a successful trial are:

- Securing the expertise necessary to train and support the regional trial teams, particularly project officers skilled in lathe operations.
- The level and cost of modification needed to any additional lathes.
- Finding a suitable site and power supply for the trial on Taveuni.
- Establishing a network of reliable local suppliers and subcontractor for infrastructure modification and lathe equipment installation in each centre, but particularly in Taveuni.

Costs presented are based on August 2015 figures and subject to change in prices and exchange rate. Currency exchange rates used in the calculation are $AUD 1 is equal to $FJD 1.57, $SB 5.88 and $WST 1.93.

**Table 1: Estimated trial cost**

| Project cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $100,997 | $102,636 | $105,534 |
| Supplies and services | $34,093 | $29,193 | $23,217 |
| Travel | $48,293 | $47,337 | $47,337 |
| Capital items | $59,898 | $167,398 | $420,148 |
| Contingency (22.5%) | $54,738 | $77,977 | $134,153 |
| **Total** | $298,019 | $424,541 | $730,389 |

**Table 2: Nominal program length**

| Critical path activity | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Order manufacture and deliver equipment | - | 4 months | 5 months |
| Modify equipment | | 2 months | 3 months |
| Pack and prepare equipment | 2 months | 2 months | 2 months |
| Dispatch and operate in Taveuni. | 3 months | 3 months | 3 months |
| Dispatch and operate in Samoa | 3 months | 3 months | 2 months |
| Dispatch and operate in the Solomons | 3 months | 3 months | 2 months |
| Return to TUD and reinstall | 2 months | | |
| Slack | 1 month | 1 month | 3 month |
| **Total** | 14 months | 18 months | 20 months |

**Table 3: Activity risk profiles**

| Activity | Taveuni | Samoa | Solomons |
|---|---|---|---|
| Stage 1: Initial training. | Low | | |
| Stage 2: Infrastructure upgrades. | Very high | Medium | Medium |
| Stage 3: Equipment preparation. | Low - medium | | |
| Stage 3: Equipment preparation - Dispatch | Medium | Low | Low |
| Stage 4: Regional equipment installation. | Very high | Medium | High |
| Stage 5: Regional training. | Medium | | |
| Stage 6: Regional research. | Medium | | |
| Stage 7: Regional demonstration. | Medium | | |
| Stage 8: Repack and despatch. | Very high | Medium | High |
| Stage 9: TUD Reinstall. | Medium | | |
| Stage 10: Central coordination | Low - medium | | |

# 1. Introduction

This report presents the result of a feasibility study that assessed the potential of conducting a regional trial program to demonstrate the use of spindleless lathes to peel coconut logs. It is part of the ACIAR funded CocoVeneer project: *Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific communities.*

The participating research organisations in the project are the University of Tasmania (UTAS) as program leaders supported by the Process and Product Development team from the Queensland Department of Agriculture and Fisheries (QDAF) with the Secretariat of the Pacific Communities (SPC) as principal partner country collaborator. The Fiji Department of Fisheries and Forestry, the Samoan Ministry of Natural Resources and Environment, and the Solomon Islands' Ministry of Forestry are also partner country collaborators.

As part of this project, a spindleless lathe was acquired and installed at the Fiji Department of Fisheries and Forestry's Timber Utilisation Division (TUD) Nasinu facility. Given the inability of many in government and industry in the partner countries to travel to Suva to tour a research facility, this feasibility study aimed to determine the technical potential and costs of relocating the lathe and its associated equipment suite to other locations in Fiji, Samoa or the Solomon Islands for a regional trial and demonstration program.

Four sites in three regional trial locations were investigated. These are:

- One TeiTei Taveuni (TTT) Farmer Association selected location at Taveuni, Fiji.
- Strickland Brothers Ltd facility at Apia, Samoa.
- Two locations at Honiara, the Solomon Islands: The Timol Timber facility and the Value-Added Timber Association (VATA) Timber yard.

Three equipment options were modelled. These are:

- Option 1: The existing lathe suite is adapted for travel and relocated to each of the trial locations.
- Option 2: An additional lathe suite is acquired and adapted for travel to each of the trial locations.
- Option 3: Additional lathe suites are acquired, adapted and supplied to each of the trial locations.

The assumed operational staging of the demonstration trial program was:

- Stage 1: Initial training. An experienced operational staff member from each trial location is trained as a lathe team captain at TUD Nasinu.
- Stage 2: Infrastructure upgrades. Local infrastructure is upgraded to operate the lathe equipment suite.
- Stage 3: Equipment preparation. The equipment suite or suites are collected, packed and dispatched to the regional trial location.
- Stage 4: Regional equipment installation. The equipment suite is unpacked, installed and commissioned.
- Stage 5: Regional training. The local lathe team captain and a project officer train a lathe production team at the regional trial location.
- Stage 6: Regional research. Peeling experiments are conducted with local coconut resources.
- Stage 7: Regional demonstration. Regional demonstration program is held for community, government and business groups.
- Stage 8: Repack and despatch. Lathe decommissioning, repacking and relocation to the next centre.
- Stage 9: TUD Reinstall. At the completion of the program, the equipment suite is left at the chosen location or returned to TUD for recommissioning.
- Stage 10: Central planning and coordination.

Stage 10 occurs across the whole trial program while Stages 4 to 8 are generally repeated with each trial location.

The assumed regional trial sequence investigated for Equipment options 1 and 2 was:

- A trial at Taveuni, with equipment arriving from and being returned to Suva, Fiji.
- A trial in Apia, Samoa, with the equipment arriving from Suva and being forwarded to Honiara in the Solomon Islands.
- A trial in the Solomon Islands, with the equipment arriving from Samoa. Under Equipment option 1, the equipment would be returned to Suva and reinstalled at TUD Nasinu. Under Option 2, the equipment would be retained in Honiara.

In practice, the Taveuni trial could occur at the beginning or end of the sequence.

The assumed regional trial sequence investigated for Equipment options 3 was for staggered delivery of equipment to each of the locations from TUD Nasinu, with discrete installation and trials in Taveuni, Samoa and the Solomons in turn.

***Other assumptions***

Several key assumptions were made in assessing and costing the stage and options. These include:

- The technical feasibility of producing a marketable coconut veneer products is demonstrated.
- The selected equipment suite can produce quality of veneer required. In reality, the technical demands of production will influence the equipment, training and locations of any regional trials.
- The participating companies make their sites and local managerial expertise available as in-kind contributions to the project. This includes identifying and managing staff working on the project, securing logs and assisting with sub-contractor selection and supervision.
- The project pays for site modification costs and all local staff labour costs.
- The value of the Australian dollar remains at 75c to United State's dollar.

Additional assumptions are listed in the description of each stage.

# 2. Regional trial aims

A strategic aim of the ACIAR funded CocoVeneer project is to enable Pacific island communities to use a significant and available local resource, senile coconut plantations, to take advantage of an expanding international market opportunity for veneers and composite wood products. If successful, this could generate income for these communities directly, while establishing an incentive for plantation owners to remove low-productivity senile stems and realise the potential of more productive land uses.

Impediments to achieving this aim include:

- The technical and economic impediments subject to research in the CocoVeneer project.
- A natural resistance by community, government and business groups to invest in any new project-developed technology without confidence that it can operate in their own countries.

A regional trial and demonstration program would enhance the potential adoption of the project's results. It would allow:

- Local communities, industry and government representative to see first-hand the broad economic and operational potential of using spindleless lathes to process coconut logs into usable and valuable veneer and veneer based products.
- Local business to confirm the economic and material potential of the product.

# 3. Regional trial locations

Three regional trial locations were chosen and four sites investigated after discussion with the collaborating organisations in the partner countries and agreement with a local industry collaborator. The locations are:

- One TeiTei Taveuni Farmer Association selected location at Taveuni, Fiji.
- Strickland Brothers Ltd facility at Apia, Samoa.
- Two locations at Honiara, the Solomon Islands: The Timol Timber facility and the VATA Timber yard.

Strickland Brothers Ltd and Timol Timbers are active wood production companies in their respective countries. The TeiTei Taveuni Farmer Association includes coconut plantation owners and other agricultural interests. Importantly, all three are private organisations with a commercial interest in coconuts or wood products. VATA is a government-supported cooperative of community-based timber producers. The VATA yard in Honiara receives timber from communities, merchandises it and on-sells it to customers. All four export product regularly.

Timber processing skill varies across the sites. TTT doesn't handle or process timber at all. VATA receives and merchandises green timber while Timol Timber receives, breaks down and moulds green timber. Of the four sites, only one, Strickland Bros, currently dries timber and value-adds into joinery products.

## Taveuni

Taveuni is the third largest island in Fiji with an area of 434 sq. km. It has a population of approximately 9,000 and an economy largely based on agricultural production. Significant coconut plantations exist on the island, especially in the southwest corner.

Taveuni presents particular challenges for a regional assessment trial as the island lacks:

- A port or container handling facilities. Containerised equipment needs to be delivered from Suva on a side-loading truck and returned the same way.
- Regular 'town' electricity. Generators are needed.
- Established light-medium industry support mechanisms, such as metal fabricators or heavy lifting equipment.

An alternative site in Savusavu on the Fijian island of Vanua Levu was considered for the study as it does not present the operational difficulties expected on Taveuni. However, Taveuni was retained as the investigated trial location as it is representative of similar rural communities in Samoa and the Solomon Island.

The industry collaborator in Taveuni is the Tei Tei Taveuni. As plantation owners, they have established agricultural and tourist operations. However, they do not have regular experience in equipment installation and maintenance. Also, while they can source unskilled local labour to be trained as part of a lathe crew, they do not have the equivalent of a leading hand familiar with equipment. A suitable person would have to be secured from elsewhere, probably Suva.

The site currently planned for the Taveuni trial for Equipment options 1 and 2 is a local contractor's service yard on the main road near Waiyevo, on Taveuni's east coast. Power can be supplied from a nearby 3 phase 130 KVA generator. However, supply is problematic as the generator services other users and is across the road from the yard. Cabling would be expensive and supply times limited. For Equipment options 1 & 2, it is assumed that a replacement yard can be found near Waiyevo adjacent to a suitable generator. For Equipment option 3, a suitable diesel generator has been added to the production suite. This would free up site selection as the equipment could be set up anywhere with shelter and a suitable hard standing.

## Apia, Samoa

Apia is the capital and largest city in Samoa and has a population of approximately 40,000 people. It is the country's major service centre, has a diversified economy, a reliable electricity supply, port facilities capable of handling containers, and established light-medium industry support mechanisms

The industry collaborator in Samoa is Strickland Brothers Ltd, a diversified hardware, building material, timber processing and joinery company operating over several sites in and near Apia. In addition to running a block making plant, they mill timber including coconut logs on both major Samoan islands and have established log acquisition processes with community land owners. They hold a timber export license.

Strickland Bros. air-dry their coconut and other sawn timbers in racks adjacent to their joinery. However, they do not stack timber in an air-drying yard, have a kiln, or have the processes or equipment in place for handling larger volumes of timber.

The investigated trial site is Strickland Bros.' facility at the Vaitele Industrial Zone about 7km from Apia port. The 0.8-hectare site has timber storage racks, a timber processing and assembly room and an office. See Figure 1. Other nearby land is also available.

Strickland Bros. report that they have adequate power in the work shed to operate the lathe, an established equipment maintenance and support network, and regularly dispatch and receive containers. They also regularly load trucks at the site, and have a mid-sized forklift.

**Figure 1: Aerial view of Strickland Bros facility in Vaitele, Samoa**

**Figure 2: Strickland Bros' storage racks and work shed**

**Figure 3: Strickland Bros' joinery storage area**

## Honiara, the Solomon Islands

Honiara is the capital and largest city in the Solomon Islands, with a population of approximately 65,000 people. It is the country's major service centre, has a diversified economy, a reasonably reliable electricity supply, port facilities capable of handling containers, and established light-medium industry support mechanisms.

Two locations were investigated in Honiara: the Timol Timber facility and the VATA Timber yard.

### Timol Timbers

Timol Timber's nominated facility is the company's timber processing yard in Ranadi Crescent in Honiara. See Figure 4. Timol Timbers is one of several timber processing and export facilities in Honiara. They operate by buying, resawing and milling sawn flitches delivered from other part of the Solomon Island. They on-sell the processed material to local or international markets.

**Figure 4: Aerial view of the Timol Timber facility.**

Timol Timber reports that they have adequate power on the site to operate the lathe but additionally cabling will be required to connect it to the intended lathe operating position. They have an established equipment maintenance and support network and regularly dispatch and receive containers at the site.

**Figure 5: Timol Timbers' storage yard**

**Figure 6: Timol Timbers' storage and processing shed.**
The equipment line is to the left hand side of the image.

## Value-Added Timber Association

VATA's nominated facility is the co-operative's timber receiving and merchandising yard in Ranadi Crescent in Honiara. See Figure 4.

**Figure 7: Aerial view of the VATA facility.**

**Figure 8: Shed and open air merchandising area.**

**Figure 9: Shed with office and training building.**

VATA is another of Honiara's timber processing and export facilities in Honiara. They operate by accepting timber from community-based mills, and merchandising it into batches suitable for export. VATA have a large open shed, an office and training building, and an adjacent open handling yard in Henderson, very close to the airport. They do not mill or dry the timber.

They report that they have adequate power to their training building, and ideally, the lathe would be placed adjacent to this. They have a basic equipment maintenance and support network and regularly dispatch and receive containers at the site.

# 4. Equipment suite

Three potential equipment configurations have been modelled. These are:

1. The existing lathe suite at TUD Nasinu optimised for travel, relocated to the each of the other three locations, returned to TUD and reinstalled.
2. A second equipment set acquired and prepared for travel, relocated to the each of the other three locations, and left installed at the last site on the circuit. The existing lathe suite would remain at Nasinu.
3. Three additional equipment sets are acquired, prepared at TUD, relocated to the other trial locations and installed. The existing lathe suite would remain at Nasinu.

Equipment option 2 and 3 have been included because:

- Option 1 will remove TUD's peeling research capability for over a year. This may be undesirable. Options 2 and 3 leave the TUD facility operational.
- Several government and industry collaborators have expressed an interest in having a peeling facility in their country. The information included for Options 2 and 3 help define potential costs for this.

In each case, the equipment suite has been modelled on the suite purchased for TUD Nasinu and limited to what can be fitted into a single 20ft. Handling and unloading 40ft containers in partner countries may be very difficult. The assumed installation sequence is detailed in Stage 4 below.

### Equipment option 1

Under Option 1, the lathe suite currently at TUD Nasinu would be optimised for travel, mounted in a container, relocated to the each of the other three locations in turn, installed, used, then packed up, returned and eventually reinstalled at TUD Nasinu.

The equipment suite would be optimised to simplify handling and limit potential damage to the lathe and its control equipment. The optimised suite would include:

- The existing lathe unit mounted lengthways in a 20ft open-sided or soft-sided container. The lathe and pumps would be cabled to a single electrical connection. The lathe is shown in Figure 10.
- A simpler and shorter conveyor belt than the current unit. See Figure 11.
- The existing clipper unit. See Figure 12.
- The steam generation unit from the log conditioning camber. See Figure 13.

- Sundry adjustment tools and spare lathe blades.

**Figure 10: Spindleless lathe**

The lathe would be fixed in an open-sided container to simplify handling and reduce the risk of damage.

**Figure 11: Conveyor**

A more compact unit would be acquired.

**Figure 12: Veneer clipper and control unit**

**Figure 13: Steam generation unit**

## Equipment option 2

Under Option 2, a second equipment suite would be acquired and prepared in Australia, installed in a container, and relocated to the each of the other three locations. At the end of the program, the additional equipment set would be retained at the last location on the circuit.

The existing lathe suite would remain operational at Nasinu during the regional demonstration program.

The Option 2 equipment suite would generally be identical to the Option 1 set, using the same models of gear from the same suppliers. Control modifications and rewiring to the second lathe would reflect the level of control shown necessary during the project's peeling trials. This is assumed to be simpler than the changes made to the first lathe.

## Equipment option 3

Under Option 3, three additional equipment suites would be acquired and prepared in Australia. Then, equipment suites would be dispatched to each of the three trial locations. The existing lathe suite would remain operational at Nasinu. In effect, three satellite joint production / research facilities would be established.

The Option 3 equipment suites would be identical to the Option 1 suite except that:

- Simplified control modification and rewiring would be made to the additional lathes.
- The lathes would not be fixed in containers. They would be packed.
- The lathes would be installed in more permanent position at the trial locations.
- The Taveuni equipment set would include a 62.5 KVA diesel generator.

## Additional minor equipment

Each equipment suite would need additional minor items to be operational. Assumed to be provided locally, these items include:

- Log infeed. It is assumed that this would be locally supplied in Option 3 and that a forklift would directly load logs in Options 1 & 2.
- Plywood deck to receive veneer from the clipper.
- Veneer racking frame and rack sticks to 'rack' the veneer for air-drying.
- Adequate log-conditioning camber built locally to receive a steam generation unit.

# 5. Program stages

## Stage 1: Initial training

Before the lathe equipment suite can be meaningfully used in each of the regional trial locations, staff from each centre need to be trained in its use. A two stage training process is proposed:

- At least one experienced operational staff member (such as a leading hand) from each regional centre is trained as a lathe team captain at TUD.
- The local lathe team captain and the TUD trainer / project officer would train the local lathe team at each trial location. This is described in Stage 4.

Training of lathe team captains would occur at TUD, Fiji, to a program prepared jointly by TUD and Australian project staff. At least one staff member from each of collaborator companies would attend a 3-week training program: one week of wood, equipment and processing theory, a one week master class on peeling and another week of increasingly hands-on processing experience. The team captain for Taveuni would be a second TUD staff member.

Costing includes participant salaries, their return airfares, and accommodation and meals at Nasinu.

**Table 4: Estimated cost for Stage 1**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $7,060 | $7,060 | $7,060 |
| Supplies and services | $700 | $700 | $700 |
| Travel | $8,020 | $8,020 | $8,020 |
| Capital items | $0 | $0 | $0 |
| Total | $15,780 | $15,780 | $15,780 |

## Stage 2: Infrastructure upgrades

Key infrastructure needs to be available at each trial site prior to equipment dispatch from TUD. This includes:

- A 100 amp, 3 phase (42 KVA) electrical supply for the lathe and clippers.
- LPG in large bottles and a water supply for the conditioner.

A project officer would visit each site, and work with the TUD-trained lathe team captain and local site managers to verify the condition of local infrastructure, and organising its improvement using local staff and service contractors.

The electrical supply is the most important infrastructure required for the trial and most expensive to establish. The assumed conditions at the trial sites are:

1. Taveuni: Adequate but shared power is available from a generator adjacent to the trial site. Lathe operating times would be constrained.
2. Apia, Samoa: Adequate power is available immediately adjacent to the trial site.
3. Honiara, the Solomon Islands: Adequate power is available at the trial site but an extension is likely to be needed to the existing supply lines to connect the equipment at both the Timol Timber and VATA sites.

Regular access to a forklift is required but the machine does not have to be dedicated to the project. Stricklands in Samoa have a forklift and similar equipment is available at both Solomon Island facilities and operate near the Taveuni site.

A hard standing and enclosure in a building or open shed is desirable for Equipment options 1 and 2. More significant building up-grades likely under Option 3 are regarded as being outside the scope of the trial.

Costing includes local management and supervision of the changes, establishment of hard standing for the lathe, and necessary electrical connections. The cost of central co-ordination of infrastructure upgrade is included in Stage 10.

**Table 5: Estimated cost for Stage 2**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $7,354 | $7,354 | $7,354 |
| Supplies and services | $0 | $0 | $0 |
| Travel | $5,096 | $4,140 | $4,140 |
| Capital items | $25,398 | $25,398 | $19,398 |
| Total | $37,848 | $36,892 | $30,892 |

## Stage 3: Equipment preparation

The equipment suite for each of the equipment options is described above. This equipment has to be acquired and/or modified, fitted or packed into containers, and dispatched to the trial sites.

The project research team would organise equipment purchase and define its required safety and operational modifications. Under Option 1, the existing equipment would be fitting into a suitable container at TUD Nasinu. Under Options 2 & 3, the equipment would be assembled and for Option 2, installed in Australia, and then shipped directly to test sites.

Costing includes the equipment purchases themselves, TUD and contractor adjustment of the equipment, and dispatch of the equipment set (or sets) to the trial locations. The central co-ordination of equipment purchases and specification of the modifications is included in Stage 10.

**Table 6: Estimated cost for Stage 3**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $2,915 | $3,125 | $3,520 |
| Supplies and services | $5,576 | $5,726 | $13,876 |
| Travel | $0 | $0 | $0 |
| Capital items | $34,500 | $142,000 | $400,750 |
| Total | $42,992 | $150,851 | $418,146 |

## Stage 4: Regional equipment installation

Once the infrastructure upgrades are complete and the equipment container is delivered, a project and a TUD technical officer would arrive at the regional centre and, working with the local lathe captain, unpack, install and commission the lathe set using local labour and trade support.

Under Equipment options 1 and 2, the lathe set is fixed into the container and the planned installation sequence would be:

- Positioning, levelling and opening up the container on hardstanding near a power supply at the trial location.
- Removing other equipment from the container and installing them around the lathe.
    - The lathe is fixed in the container and protected from the weather. Additional shelter may be needed for the clipper and out-feed.
- Connecting power to the container and equipment set.
- Mounting the steam generation unit in a locally produced steam box and connecting it to water and locally supplied bottle gas.

Under Equipment option 3, the lathe and equipment set would be simply packed in a standard 20ft container. The equipment would be unpacked, and installed on dedicated hardstanding and support slabs and connected to a power supply.

Costing includes participants' salaries, the project officers' return airfare and accommodation, trade costs to connect water and gas, and hire of a heavy capacity forklift at each of the three locations to position the container or lathe.

It is assumed that the cost of the final electrical connection is included in the Stage 3 estimates.

At the end of this stage, the lathe suite would be operational, ready for final staff training and demonstration trials.

**Table 7: Estimated cost for Stage 4**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $8,149 | $8,149 | $8,149 |
| Supplies and services | $950 | $950 | $950 |
| Travel | $10,692 | $10,692 | $10,692 |
| Capital items | $0 | $0 | $0 |
| Total | $19,791 | $19,791 | $19,791 |

## Stage 5: Regional training

With the equipment operational, the TUD-trained lathe team captain and the TUD trainer/project technical officer would train the local lathe team in the use of the lathe and associated equipment. This would take between 7-10 working days and is relevant to the three equipment suite options.

At the end of the training, the local lathe team should be able to conduct day-to-day activities on the lathe competently.

Costing includes participants' salaries, the project officer's and accommodation and a minor log supply.

**Table 8: Estimated cost for Stage 5**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $4,320 | $4,320 | $4,320 |
| Supplies and services | $700 | $700 | $700 |
| Travel | $5,532 | $5,532 | $5,532 |
| Capital items | $0 | $0 | $0 |
| Total | $10,552 | $10,552 | $10,552 |

## Stage 6: Regional research

This stage allows researchers to validate results generated elsewhere in the project or conduct the peeling stage of other targeted research trials framed as part of the broader regional demonstration program to be completed. Generally, local coconut billets would be processed but other species may be included. These and the coconut peeling trials would be conducted between the demonstration sessions included in Stage 7.

The staffing estimates for this stage include one external researcher, a TUD project officer and the local lathe team working for two weeks. Costing includes participants' salaries during the trials only, the researcher's and project officer's airfares and accommodation, and the cost of trial logs supply.

Other research costs are not included.

**Table 9: Estimated cost for Stage 6**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $26,266 | $26,266 | $26,266 |
| Supplies and services | $3,391 | $3,391 | $3,391 |
| Travel | $12,280 | $12,280 | $12,280 |
| Capital items | $0 | $0 | $0 |
| Total | $41,937 | $41,937 | $41,937 |

## Stage 7: Regional demonstration

This stage includes a program of local presentations, field days and operational demonstrations for local community members, industry and government, organised by local industry and government collaborators and the project team. It is relevant to all three equipment suite options.

It is assumed that this stage would run concurrently with Stage 6.

The staffing estimates for this stage include one additional external researcher to present the demonstrations and liaise with industry and government for one week and a local SPC co-ordinator working for the equivalent of two weeks full time at each venue.

Costing includes the SPC co-ordinators salary, the researcher's salary, airfares and accommodation, and a venue and catering allowance for three events across the period at each venue. It is assumed that other collaborators will contribute their time.

Under Equipment option 3 at each location and for the last venue under Option 2, the end of Stages 6 and 7 would see the lathe remain in commercial operation under the control of a local production team.

**Table 10: Estimated cost for Stage 7**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $14,767 | $14,767 | $14,767 |
| Supplies and services | $3,600 | $3,600 | $3,600 |
| Travel | $6,673 | $6,673 | $6,673 |
| Capital items | $0 | $0 | $0 |
| Total | $25,040 | $25,040 | $25,040 |

## Stage 8: Repack and despatch.

Under Equipment options 1 and 2, with Stages 6 and 7 complete, the TUD technical officer, local lathe captain and work team would clean, decommission, and repack the equipment for relocation to the next trial centre. Under Equipment options 1, it would be returned to TUD after the last location.

Costing includes staff salaries, subcontractor costs and container transport charges.

**Table 11: Estimated cost for Stage 8**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $1,231 | $1,154 | $0 |
| Supplies and services | $18,726 | $14,126 | $0 |
| Travel | $0 | $0 | $0 |
| Capital items | $0 | $0 | $0 |
| Total | $19,957 | $15,280 | $0 |

## Stage 9: Reinstall

Under Equipment option 1, the equipment suite would be returned to TUD and recommissioned.

Costing includes staff salaries and subcontractor costs.

**Table 12: Estimated cost for Stage 9**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $475.2 | $0.0 | $0.0 |
| Supplies and services | $450.0 | $0.0 | $0.0 |
| Travel | $0.0 | $0.0 | $0.0 |
| Capital items | $0.0 | $0.0 | $0.0 |
| Total | $925.2 | $0.0 | $0.0 |

## Stage 10: Central planning and coordination

A successful regional demonstration program requires considerable central planning and coordination to plan the Stage 1 training, access and contract infrastructure modification in Stage 2, purchase and coordinate modification and packing under Stage 3 and to coordinate and support project and TUD staff involved with Stages 4 to 9. The costing for this stage includes the staff salaries, travel, accommodation and infrastructure costs of these activities.

**Table 13: Estimated cost for Stage 10**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Personnel | $28,458 | $30,439 | $34,097 |
| Supplies and services | $0 | $0 | $0 |
| Travel | $0 | $0 | $0 |
| Capital items | $0 | $0 | $0 |
| Total | $28,458 | $30,439 | $34,097 |

# 6. Program timing

The demonstration program length would vary with the equipment option. Critical path activities and a broad estimate of their length are set out in Table 14. The assumed length of demonstration trial period at each site is six weeks:

- Two weeks to unpack and install the equipment and train local staff.
- Two weeks for regional research and equipment demonstrations.
- Two-week 'slack' time for additional equipment installation, packing and other activities.

A 4-6 week transhipment period is assumed but this is dependant on shipping schedules between locations.

**Table 14: Nominal program length.**

| Critical path activity | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Order manufacture and deliver equipment | - | 4 months | 5 months |
| Modify equipment | | 2 months | 3 months |
| Pack and prepare equipment | 2 months | 2 months | 2 months |
| Dispatch and operate in Taveuni. | 3 months | 3 months | 3 months |
| Dispatch and operate in Samoa | 3 months | 3 months | 2 months |
| Dispatch and operate in the Solomons | 3 months | 3 months | 2 months |
| Return to TUD and reinstall | 2 months | | |
| Slack | 1 month | 1 month | 3 month |
| Total | 14 months | 18 months | 20 months |

While the trials are assumed to run in a particular order and immediately after each other, in practice, local factors such rainy seasons, cultural events and staff availability would influence the installation and trial sequence.

# 7. Program risk

Activity in the CocoVeneer project has clarified many of the risks of equipment purchase and modification, the required capacity of site infrastructure, and the difficulty of equipment installation. TUD have clarified staff training risk using their observations of the lathe and their experience in training others in using portable sawmill and other equipment. However, other risks remain. For example, none of the sites regularly dry timber in significant volumes and so may lack the processes and equipment necessary to handle and dry veneer sheet without avoidable degrade.

Given this experience and visits to each of the sites, the likely technical and operational risk profiles for a regional demonstration program are set out in Table 15. In this table, the definitions of risk are:

- A low risk is where an event is likely to proceed successfully.
- A medium risk is where an event is likely to proceed successfully with close, experienced supervision.

- A high risk is where an event may proceed successfully with close, experienced supervision but unexpected delays and increased costs may occur.
- A very high risk is where unexpected delays and increased cost are likely to occur before an event proceeds successfully, even with close and experienced supervision.

**Table 15: Activity risk profiles**

| Activity | Taveuni | Samoa | Solomons |
|---|---|---|---|
| Stage 1: Initial training. | Low - medium | | |
| Stage 2: Infrastructure upgrades. | Very high | Medium | Medium |
| Stage 3: Equipment preparation. | Low - medium | | |
| Stage 3: Equipment preparation - Dispatch | Medium | Low | Low |
| Stage 4: Regional equipment installation. | Very high | Medium | High |
| Stage 5: Regional training. | Medium | | |
| Stage 6: Regional research. | Medium | | |
| Stage 7: Regional demonstration. | Medium | | |
| Stage 8: Repack and despatch. | Very high | Medium | High |
| Stage 9: TUD Reinstall. | Medium | | |
| Stage 10: Central coordination | Low - medium | | |

The major significants risks are:

- Securing the expertise necessary to train and support the regional trial teams, particularly project officers skilled in lathe operations.
- The level and cost of modification needed to any additional lathes.
- Finding a suitable site and power supply for the trial on Taveuni.
- Establishing a network of reliable local suppliers and subcontractor for infrastructure modification and lathe equipment installation.

# 8. Parallel activity

A funded regional trial and demonstration program opens up the potential for parallel research activity, including the peeling stages of other wood products development projects. While Equipment options 1 & 2 (as planned) provide a limited time for the additional peeling, Option 3 establishes facilities in each partner country that could be used on an ongoing basis.

# 9. Summary and conclusions

This report is part of the ACIAR funded CocoVeneer project and presents the result of a feasibility study that assessed the potential of conducting a regional trial program to demonstrate the use of spindleless lathes to peel coconut logs.

A regional trial and demonstration program would significantly enhance the potential adoption of the project's results. It would allow:

- Local communities, industry and government representative to see first-hand the broad operational potential of using spindleless lathes to process coconut logs into usable and valuable veneer and veneer based products.
- Local business to confirm the economic and material potential of the product.
- Researchers to validate research result using local resources and conditions.

Four sites in three regional trial locations were investigated. These are:

- One TeiTei Taveuni (TTT) Farmer Association selected location at Taveuni, Fiji.
- Strickland Brothers Ltd facility at Apia, Samoa.
- Two locations at Honiara, the Solomon Islands: The Timol Timber facility and the Value-Added Timber Association (VATA) Timber yard.

Three equipment options were modelled. These are:

- Option 1: The existing lathe suite is adapted for travel and relocated to each of the trial locations.
- Option 2: An additional lathe suite is acquired and adapted for travel to each of the trial locations.
- Option 3: Additional lathe suites are acquired for each of the trial locations and adapted.

Equipment option 2 and 3 have been included because:

- Option 1 will remove TUD's peeling research capability for over a year. Options 2 and 3 leave the TUD facility operational.
- Several government and industry collaborators have expressed an interest in having a peeling facility in their country. The information included for Options 2 and 3 help define potential costs for this.

The length of the demonstration trial program would vary with the selected equipment option. Under Equipment Option 1, the program would run for an estimated 12 month. For Option 2, the program would be 16 months and for Option 3, 18 months. These estimates assume:

- The trials at each sites are staged immediately after each other.
- The length of the demonstration period at each site is six weeks:
    - Two weeks to unpack and install the equipment and train local staff.
    - Two weeks for regional research and equipment demonstrations.
    - Two week 'slack' time for additional equipment installation, packing and other activities.

In practice, parallel research activity and local factors such rainy seasons, cultural events and staff availability could influence the length of each demonstration trial and the efficiency of running them one after the other.

The exposure to risk in running a regional trial and demonstration program is low to medium in Samoa and is low to high in the Solomon Island. The exposure to risk of conducting the trial in Taveuni is very high. This is mainly due to the services available in each centre and the industry collaborator's experience.

Both Strickland Brothers Ltd in Samoa and Timol Timbers in the Solomon Islands are operating in regional service centres, regularly mill and handle timber, have experience in operating and maintaining equipment internally, have established equipment maintenance and support networks externally, often dispatch and receive containers, and have an adequate and regular power supply. VATA has experience in handling timber but has less experience operating or maintaining equipment.

In contrast, Taveuni lacks a port or container handling facilities; regular 'town' electricity and established light-medium industry support mechanisms. Also, while the TeiTei Taveuni Farmer Association's members are experienced and skilled business people and used to handling schedules and agricultural equipment, they are unexperienced with the more focused requirements of log supply and equipment maintenance.

Notwithstanding these risk, Taveuni remains an important test site as:

- It is representative of similar coconut-stem, rich rural communities in other parts of Fiji, Samoa and the Solomon Islands.
- Shipping logs from Taveuni to the nearest suitable service town may make the exercise uneconomic.

**Table 16: Estimated trial cost**

| Stage cost summary ($) | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| **Personnel** | | | |
| Salary | $100,997 | $102,636 | $105,534 |
| Salary-related On-Costs | $0 | $0 | $0 |
| **Total personnel** | **$100,997** | **$102,636** | **$105,534** |
| **Supplies and services** | | | |
| General operating | $9,191 | $9,341 | $9,491 |
| Contracted operating | $1,200 | $750 | $450 |
| Freight & handling | $23,702 | $19,102 | $13,276 |
| **Total supplies and services** | **$34,093** | **$29,193** | **$23,217** |
| **Travel** | | | |
| Fares | $32,280 | $32,280 | $32,280 |
| Subsistence | $16,013 | $15,057 | $15,057 |
| **Total travel** | **$48,293** | **$47,337** | **$47,337** |
| **Capital items** | | | |
| Facility upgrades | $25,398 | $25,398 | $19,398 |
| Equipment purchases | $34,500 | $142,000 | $400,750 |
| **Total capital items** | **$59,898** | **$167,398** | **$420,148** |
| **Contingency (22.5%)** | $54,738 | $77,977 | $134,153 |
| **Grand Total** | **$298,019** | **$424,541** | **$730,389** |

Costs presented are based on August 2015 figures and subject to change in prices and exchange rate. Currency exchange rates used in the calculation are $AUD 1 is equal to $FJD 1.57, $SB 5.88 and $WST 1.93.

# 10. Acknowledgements

This document was developed as a project objective in a larger program supported by the Australian Centre for International Research (ACIAR). The program was undertaken in collaboration with ACIAR, the University of Tasmania, the Queensland Government Department of Agriculture and Fisheries, the Pacific Community, the Fiji Department of Fisheries and Forestry, the Samoan Ministry of Natural Resources and Environment, and the Solomon Islands' Ministry of Forestry and Research.

The detail in the report could not have been assembled and assessed without the assistance of other project participants, particularly:

- Dr Jon Shanks of UTAS and Robbie McGavin of QDAF for their insights and helpful critique.
- Mr Peter Kjear of the TeiTei Taveuni Farmer Association, Fiji.
- Ms Nanette Tutua of Timol Timber, Ms Stephanie Rikoi of the Solomon Islands' Ministry of Forestry and Research, and SPC's Mr Gideon Bouro in the Solomon Islands.
- Mr Joe Strickland and the staff from Strickland Bros in Apia, Samoa.