



# Pacific Islands



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Incorporating SPRIG, SPC/GTZ Pacific-German Regional Forestry Project  
and Pacific Forestry Updates

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## Regional Awareness Tour for Non-Forestry Government Agencies in the Pacific organised through the SPC/NFPF Partnership

Forests and trees play an important role in the local and regional development of many parts of the world including the Pacific and contribute to the human well-being. From the local to the global, the forests and trees sector faces many challenges and opportunities. The importance that forests and trees play in sustainable development and in providing a secure future of the Pacific's people is often little understood, taken for granted or not appreciated enough.

There are many good examples of what such resources can provide, especially in enhancing rural livelihoods, and if well managed these benefits are sustained. Cases of



good forest management remind us that there are good people investing much time and resources in forests and trees. Yet, many foresters in the Pacific, in particular national forest services, are short of basic resources, and the lack of resources. Inadequate resourcing has been consistently highlighted as one of the main reasons for countries not being able to achieve sustainable forest management. This is despite the fact that forests and trees are a vital resource contributing to the

economic, social and environmental development of the peoples of the Pacific.

It was with the above in mind that the Secretariat of the Pacific Community (SPC), under its partnership with the National Forest Programme Facility (NFPF), and with co-funding from GTZ, through the SPC/GTZ Pacific-German Regional Forestry Project (PGRFP), organized a regional awareness raising tour, in Nadi, Fiji from 3-6 October 2005. The important role that forests and trees play in sustainable development, poverty reduction and environmental conservation was the focus of the four day event. The theme was 'Investing in Forests and Trees for a

Secure Future for Our People'. The main objective was to enhance the awareness of government agencies responsible for planning and the allocation of government financial resources on the importance of forests and trees, and the need for the sector to be adequately supported.

The event attracted a total of 46 people from Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu, mostly from Finance, Treasury, Planning, Trade and Commerce, Forestry, Natural

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## QUOTE

*"I am the first and the last, the beginning and the end. Happy are those who wash their robes clean and so have the right to eat the fruit from the tree of life and to go through the gates into the city".*

*Revelation 22: 13-14*

## Country Updates

### **Regional Awareness Tour for Non-Forestry Government Agencies in the Pacific organised through the SPC/NFPF Partnership**

Resources Departments and the Prime Minister's office.

As the tour was the first of its kind to be organized in the Pacific, we had to come up with a programme that needed to capture the attention of the participants during the four days, and to also convince them of the need for the forests and trees sector to be better supported. The programme included testimonies, presentations, field visits and dramas that focus on the environmental, social, cultural and economic benefits of sustainable forest management, and from the comments received at the end of the event, it would seem that it adequately met the objective and the expectations of the participants.

As it is customary in the Pacific, the tour started with a devotion led by a minister with the Methodist Church of Fiji who provided some spiritual dimensions to the need for the sustainable management and use of natural resources. This was followed by some cultural items, which portrayed the vital roles that forests and trees play in the maintenance of tradition and culture in Pacific communities.

Presentations were made by the representatives of the Forestry Departments of the participating countries on developments in the sector and its contributions to Pacific island countries' economies and welfare. These provided an overview of the multiple benefits that forests provide and the challenges faced by the sector. Other presentations included cross-sectoral linkages and the significant effects that policies of sectors other than forestry could have on forest and tree resources. Also successful case studies on

sustainable forest management, and the relevant financing strategies available for sustainable forest management illustrated potential solutions to participants.

Testimonies were made by representatives of landowners who were benefiting from forestry development projects in the field of natural forest and plantation management, forestry business and ecotourism. The testimonies related to the environmental, social and economic benefits that communities received from their forests and also the need for adequate support to ensure the sustainability of these benefits in the long term.

Field visits were made to a number of locations to confirm to the participants that what they had heard can work in practice. The visit to the ABACA eco-tourism area showed how the members of a community, through their collective decision to protect their forests, were able to earn a regular income, rehabilitate degraded lands, protect their water source, and ensure food security in enhancing the availability of wild yams and feral pigs, which were important to their diets.

One visit made to Fiji Pine Limited's plantations showed how the investment made by the Fiji government in establishing the plantations was benefiting the landowners economically, socially and environmentally. Areas where pines had been established were highly degraded, and pines have helped in the rehabilitation of these sites, and in some cases, allowed natural vegetation to re-establish. The pine industry has provided direct income in terms of rent money,

direct employment, and in the establishment of landowner-owned forest-based businesses.

Other visits were made to wood processing industries where participants witnessed the benefits of value-added processing in providing increased employment, and more effective utilization of wood, which facilitates sustainable forest management and better returns to resource owners can be realised.

The tour programme ended with an impressive performance by the children of a nearby primary school on the need for the sustainable management and use of forests and trees. It was a fitting end to an amazing four days of hearing, discussing, seeing and witnessing the importance of our forests and trees and the need for the resource to be managed and used in a sustainable manner. The message was especially strong in the sense that it came from children whose future will be at risk if we do not change the way that we treat our valuable forest and tree resources.

We wish to sincerely express our gratitude to the NFPF and GTZ for their support in terms of funding and technical assistance. It would have been impossible to organize such an event without their support. The assistance of the various companies, groups and communities that gave testimonies, performed dramas and cultural items, facilitated field visits, is gratefully acknowledged. Last, but not the least, the active participation of the various agencies from the countries represented was an eye opener and a clear sign of the desire by the countries to better manage and use their forest and trees resource for the sustainable livelihoods of their peoples.

*Submitted by*

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## Country Updates

### Regional Sandalwood Workshop Held in Nadi, Fiji 28th November – 1st December 2005

Sandalwood (*Santalum* spp) has considerable cultural and economic importance to many communities in the Asia-Pacific Region. It is for this reason that the conservation of sandalwood is an important issue and deserves added input to ensure its sustainable management. Sandalwood's high economic value and the opportunity to cultivate it in agroforestry systems and plantations give it the potential to make a significant contribution to rural economies. Its natural regeneration or artificial establishment is dependent on suitable host plants as well as a suitable forest and agricultural environment.

As *Santalum* usually grows in drier open forest and woodland communities, its conservation and management will determine the conservation status of many of the *Santalum* species in Asia-Pacific. *Santalum* is generally vulnerable to fire and grazing animals, both of which are common in the habitats in which it is found.

Sandalwood was heavily exploited in the past in the Pacific Islands during the first half of the 19th Century. However its initial trade commenced with the introduction of Buddhism into China from India in the first century and with it came the practice of burning incense (produced from sandalwood) in temples. Later the trade expanded to the Pacific when Americans and Australians began trading with China. This trade led to the discovery of sandalwood in the Pacific, including Hawaii, and Australia. Sandalwood has also been used and traded in Indonesia for over 1000 years.

As much of the initial stands have been overexploited through the Asia-Pacific, there is concern now for its survival and the habitat in which it grows. For this reason, greater research and input into ways of improving stand management, introducing sandalwood in agroforestry systems, and policy

requirements to conserve both the species and its habitat are required.

In the last decade, CIRAD-Foret in New Caledonia, ACIAR in Australia and Indonesia, SPRIG/AusAID in the Pacific region and several other PICs have been carrying out research on and some field plantings of sandalwood. In August 1994, a regional workshop was organised by the South Pacific Forestry Development Programme (SPFDP) in association with CIRAD-Foret and ACIAR in Noumea, New Caledonia. The principle aim of the workshop was to provide "hands-on" training on sandalwood seed, nursery and planting technology.

In 2002, SPC, with the support of SPRIG/AusAID, ISSS/AusAID, CIRAD-Foret – France, CIFOR, IAC – New Caledonia and GTZ, organised a regional workshop on sandalwood which brought together participants from sandalwood-growing countries of the Pacific and Asia with the main aim of reviewing existing sandalwood research and development activities and to determine future prospects. This was presented with a lot of useful work in progress, and provided an ideal opportunity to discuss this work. The



*Working group session during the workshop*

workshop also made recommendations on areas that needed urgent attention. Over the past three years there has been considerable progress in research and development and also extension work on sandalwood. It was considered timely for the relevant PICTs and other countries and agencies to present,

share and discuss current developments with a view to determine future areas of focus. Accordingly a 'Regional Workshop on Sandalwood Research, Development and Extension in the Pacific and Asia' was organized. The workshop was held in Nadi, Fiji from 28th November to 1st December 2005. It was organised and sponsored jointly by the Secretariat of the Pacific Community (SPC) Land Resources Division, AusAID/SPRIG and ISSS, SPC/GTZ-Pacific German Regional Forestry Project (PGRFP), ACIAR and IAC-New Caledonia. The workshop created considerable interest from governments and industries in the Asia and Pacific region. A total of 45 participants attended the workshop, including Government and industry representatives and individuals from Australia, China, Cook Islands, Fiji, France, French Polynesia, India, Indonesia, Niue, New Caledonia, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu. Also included were representatives from SPC, SPRIG, IAC, ACIAR, PGRFP, Queensland DPI and CSIRO/ENSIS.

The programme for the workshop included presentations on regional and international programme initiatives, country reports, technical papers, group discussions and a field visit to Colo-i-Suva and Vunimaqo. A considerable amount of information was presented during the workshop, and this included research and development work done by universities, Forestry Departments, projects and other agencies, and also on current markets and potential future demands and challenges, which was very important to the Pacific countries represented. The workshop proved an excellent opportunity for participants to exchange information, establish networking and also to agree on areas of research, development and extension that would require further work both at the national and regional levels.

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## Country Updates

### Silviculture of Kauvula, *Endospermum macrophyllum* & *E. robbianum*, in Fiji

#### Introduction

The growth rate of kauvula has been rapid, a key factor contributing to its selection as alternative species for large scale planting by the Forestry Department in the 1980's. In primary forest the species may be a canopy emergent up to 30 meters in height with moderately spreading crown. Species commonly associated with kauvula include dakua makadre (*Agathis macrophyllum*), dakua salusalu (*Decussocarpus vitiensis*), bauvudi (*Palaquium hornei*) and sa (*Parinari insulari*). The species generally exhibits a high preference for sunlight, having good rooting ability to withstand strong wind and having a peculiar trimmed crown form in exposed sites.

Kauvula is one of the prominent secondary colonizing tree species in disturbed forest. They often regenerate well on cleared sites, especially along skid tracks. At the later succession phase, kauvula typically overgrows and shades out the primary colonizers such as mako (*Trichospermum* sp) and gadoa (*Macaranga* sp) along with other long-lived tier species. Kauvula has a sporadic emergence in Fiji's secondary forests.

In Fiji the two important timber species of the family Euphorbiaceae are *E. macrophyllum* and *E.*

*robbianum*. Of the two species, *E. macrophyllum* is widely distributed whereas *E. robbianum*, is endemic to Vanua Levu. Both species are locally known as kauvula referring to its whitish bark and wood coloration.

Since the 1960's experimental planting of the species has been undertaken by the Department for the purpose of collating growth data, observing tree form, branching habit and determine site adaptability. Recent work aims to derive useful information from the available data in these earlier trials. Trial sites has been sporadically distributed in Viti Levu from Colo-i-Suva, Naboro, Nukurua, Naboutini, Nausori Highlands and Bukuya with a lone plot at Sasa in Vanua Levu. All of these old plots have been written off since 1980 so that field and plot verification for observations was difficult or impossible.

#### Planting Trials

Analyses of kauvula planting trials showed an average girth increment of 1.09 centimeter (range: 0.69 – 1.56) for macrophyllum and 0.60 centimeter (range 0.1 – 0.8) for robbianum. Based on the current findings it can be deduced that kauvula has the potential to yield sizeable trees of 50 cm diameter within a 25 years rotation. The best performing kauvula trees under trial planting in

Nukurua yielded an impressive 55.5 cm diameter breast height at 27 years, with a mean growth of 2.0 cm per annum. The progressive growth in tree height has been encouraging also with a mean annual increment of 0.9m (range 0.71 – 1.54) recorded. The most obvious challenge for commercially growing plantations of kauvula is its poor form for timber production, including low branching habit and the high tapering of the merchantable bole. It is reasonable to believe that further genetic and silviculture improvement has to be undertaken to develop good-formed kauvula tree.

#### Natural Regeneration

Re-generation study along roadside clearing in Nakavu showed an average diameter increment of 1.91 cm after 12 years. The best performing tree from this same data set recorded a diameter breast height of 30.3 cm that literally give a calculated mean growth of 2.5 cm per annum. On average, these naturally regenerated kauvula showed good tree form and superior apical growth.

#### Conclusion

Kauvula prefers relatively open sites for maximum growth performance as evidenced along roadside regeneration in Nakavu. Therefore, silviculture techniques will have to be refined in areas such as spacing and canopy manipulation to enhance

**Table 1** Summary from old kauvula trial sites, age, survival, mean increment, basal area and spacing

PSP	SITE	AGE	%	MD (cm)	MH (m)	MDI (cm)	MHI (m)	Basal Area (m <sup>2</sup> )	Spacing
01	Coloisuva	27.8	45	29.9	15.6	1.08	0.56	1.551	12 ft x 12 ft
01	N/Highland	20.0	42	31.2	30.8	1.56	1.54	1.184	12 ft x 12 ft
02	Bukuya	9.7	37	10.1	8.41	1.0	0.87	0.144	9 m x 3 m
04	Naboro	20.0	76	25.2	18.3	1.30	0.91	0.947	9 ft x 9 ft
06	Sasa	15.5	76	17.2	13.1	1.10	0.84	0.904	9 ft x 9 ft
08	Nukurua	20.9	58	38.1	25.5	1.83	1.22	2.400	12 ft x 12 ft
20	Naboutini	16.9	75	17.4	19.2	1.03	1.14	0.646	12 ft x 12 ft
22	N/Highland	19.0	37	28.5	28.5	1.49	1.50	1.092	8 ft x 8 ft
24	Naboutini	19.1	76	16.3	13.6	0.85	0.71	0.397	9 ft x 9 ft
26	Nukurua	21.0	67	23.9	19.7	1.14	0.94	1.080	12 ft x 12 ft
41	Naboutini	17.1	67	15.3	12.8	0.89	0.75	0.609	9 ft x 9 ft
Mean						1.21	1.00	0.996	

## Country Updates



**Figure 1** The lone planting trial of *E. robbianum*, Nakavu, at 5 yrs.

faster growth and good merchantable bole. Further improvements can be achieved through genetic selection and soil fertility analysis and appropriate amendments. With new innovation and improved technology, kauvula has the potential for large-scale plantation use in Fiji somewhat similar to the development of *E. medullosum* by our neighboring Melanesian colleagues. Another advantage for kauvula is its resistance to major pests and diseases. Research

for the species indicated the resilience of kauvula to the fungi *Armillaria mellea* and *Phellinus noxious* and also the insidious riddling of the pest *Neoterme samoanus*.

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Lex Thomson/SPRIG and Fiji Forestry Department 2003. *Endospermum macrophyllum* (Muell. Arg.) Pax & Hoffman - kauvula and *Endospermum robbianum* A.C. Smith - Wainunu kauvula. Species files compiled for SPRIG Database, CSIRO Forestry and Forest Products, Canberra, Australia.



**Figure 2** Roadside regeneration, at Nakavu, 12 years after road clearing.

Submitted by

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## Guam proclaims 11 October Arbor Day

With the planting of Guam's 'state tree' – *ifit* or *Intsia bijuga* – the First



Lady of Guam, Joann G. Camacho, officially proclaimed 11 October 2005 as Arbor Day in Guam. Arbor Day, or tree planting day, was founded in 1872 when J. Sterling Morton proposed to the Nebraska Board of Agriculture that a special day be set aside for planting trees and promoting their benefits.

Guam's trees and vegetation are regularly exposed to devastating typhoons. It is therefore especially important to remind everyone of the value of the territory's trees, tree planting programmes and individual responsibility in practising positive environmental stewardship. From providing oxygen and protecting rivers, oceans and coral reefs to conserving energy and beautifying neighborhoods, trees are vitally important to the well-being of Guam's present inhabitants and future generations.

Over the next few months, more trees, flowering plants and shrubs will be planted in Guam as part of a sustainable village environmental enhancement programme. The programme will also include the care and maintenance of trees planted across Guam. An added long-term goal is to raise awareness of trees and their importance to people and the environment, both locally and internationally, through a training and awareness campaign aimed at village leaders and communities.

## Country Updates

### Below are excerpts from Island of Guam Proclamation No. 2005-096:



- Trees are vital to the well-being of our island as they reduce erosion, cut cooling costs, moderate temperature, clean the air, produce life-giving oxygen, provide habitat for wildlife and beautify our surroundings. The planting of trees is especially important at this time as we work to reduce erosion to protect our coral reefs and coastal resources and continue to replant following the devastating typhoons that impact our island home; and
- Trees wherever planted are a source of joy and spiritual renewal. They remind us that each generation of humanity must truly serve as TRUSTEES OF THE EARTH and conservationists of woodlands, forests and jungles as a matter of human necessity.

*Submitted by  
Diane Denenberg, Pacific Islands  
Forestry, US - Hawaii*



**Mr Peni Cawani demonstrating non-destructive sampling of sandalwood heartwood during training workshop at Colo-i-Suva.**

### Yasi Training Workshop in Fiji

A training workshop was held on Sandalwood (or yasi) from 3 to 5th October, 2005 at the Forestry Training Centre, Colo-I-Suva, Suva, Fiji. This workshop was jointly organized by the Silvicultural Research Division of the Fiji Department of Forestry and SPRIG, with funding being provided by AusAID.

*Santalum yasi*, known as *yasi* or *yasi dina* in Fiji and produces one of the most highly prized sandalwood timbers in the world, on par in quality with the well-known *Santalum album* from Asia. The heartwood of yasi was a major export during the early nineteenth century and the sandalwood trade was one of the first attractions drawing Europeans into the South Pacific. *Yasi* has important cultural uses in Fiji and is also used in woodcarving for the tourist industry and scenting coconut oil. The species was ranked very highly by communities in the SPRIG surveys. Sandalwood has considerable economic potential however the resource is depleted and there is a need to regenerate, sustainably manage and better conserve remaining populations. The impetus for this workshop came from the Silvicultural Research Division (SRD). SPRIG counterparts were keen to pass on the knowledge and techniques for better growing sandalwood learned during SPRIG 2, to farmers and tree growers, and Forestry Department extension staff.

The workshop was opened by the Acting CEO for the Ministry of Fisheries and Forestry, Ms Alivina Vuki. In her opening Ms Vuki indicated that it was estimated that a 20-25 year-old yasi tree, growing under good conditions, can produce 15-30 kg of heartwood valued at about \$F25 per kg. Therefore, on conservative estimates, a low stocked, well managed planting of about 150 yasi trees per ha could yield about 3 tonnes of heartwood valued at \$F75,000 after 25 years. The faster

growing hybrid between *yasi* and Indian sandalwood, which has spontaneously appeared here in Fiji, could give even much higher returns on suitable sites. The Fiji Forestry Department's strategic development plan for 2005-2007 has a goal of 150 hectares of *Santalum yasi* being planted by 2007. Through a more active replanting scheme of 200 hectares per year, the future annual returns to the Fijian growers would be at least \$15 million per year and the total value to the Fijian economy might be around \$100 million, through value adding such as oil production. This will only be achieved through our working closely with interested growers such as yourselves and providing you with the best technical know-how on how to do this.

During the workshop the classroom presentations and discussions were led by Dr Lex Thomson (SPRIG Project Team Leader). Mr Ponijesi Bulai and Mr Elik Senivasa (SRD) provided inputs and clarifications with translations into Fijian. The key resource persons from SRD were Mr Ponijesi Bulai who led the practical sessions on seed production, propagation and grafting and the field trip to Vunimaqo and Mr Peni Cawani who led practical sessions on seed collection and germination and heartwood drilling. Mr Maloni Havea gave a presentation on the Tongan method of making compost, a key ingredient in good potting media for sandalwood.

A total of 16 people representing Viti Levu (5), Vanua Levu (4), Kadavu (3), Taveuni (1), Kabara-Lau (1), Rotuma (1) and Tonga (1) participated in the training course. Participants completed pre- and post course questionnaires on yasi and its cultivation. It was evident during the progress of the workshop, and from the questionnaires, that participants learnt a considerable amount, both in theory and practice on how to best grow yasi in Fiji and that participants expectations were more than realised.

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## Country Updates

### New regulations in force in Solomon Islands

growers on Vanua Levu early next year, and a one-day workshop in Suva for women wanting to grow sandalwood in home gardens and backyard nurseries for income generation.

On September 29, 2005, new regulations came into force under the Forest Resources and Timber Utilisation Act in Solomon Islands. The following regulations have been gazetted and are now in effect:

- Forest Resources and Timber Utilisation (Protected Species) Amendment Regulations 2005 ('the Protected Species Regulations');
- Forest Resources and Timber Utilisation (Prescribed Forms) (Amendment) Regulations 2005 ('the Prescribed Forms Regulations');
- Timber (Levy and Milling Licences) (Amendment) Regulations 2005 ('the Milling Licences Regulations');
- Forest Resources and Timber Utilisation (Fees) (Amendment) Regulations 2005 ('the Fees Regulations');
- Forest Resources and Timber Utilisation (Felling Licences) Regulations 2005 ('the Felling Licence Regulations');

#### Protected Species Regulations

These regulations amend regulation 2 of the Forest Resources and Timber Utilisation (Protected Species) Regulations to add the tree species *Xanthostemon* to the list of species that are protected and may not be felled or removed for sale unless expressly authorized under a licence granted under the Forestry Act. *Xanthostemon* is locally known as tubi.

There are no exceptions to allow the felling of protected species and exporting of restricted species in unprocessed forms.

#### Prescribed Forms Regulations

The Schedule to the Forest Resources and Timber Utilisation (Prescribed

Forms) has been amended by revising Form 1. Form 1 is used by applicants to apply to the Forestry Division for approval of negotiations to acquire timber rights. The new form requires applicants to submit more information about proposed felling operations.

#### Milling Licence Regulations

These regulations amend the Timber (Levy and Milling Licences) Regulations to regulate tree felling operations carried out to supply timber to a licensed mill. The title of the licence now reads, "Where the licensee is not authorized to fell trees by a licence issued under section 5 of the Act". This is intended to remove the confusion that the holder of a milling licence is not allowed to fell trees.

#### Fees Regulations

These regulations amend the Schedule to the Forest Resources and Timber Utilisation (Fees) Regulations. The new regulations provide for an increase in the application fee for a felling licence to SBD 10,000 from SBD 2,000 and introduce an annual fee of SBD 10,000 payable each year on the anniversary of the issue of the licence. The fee for lodging a Form 1 application is increased from SBD 1,000 to SBD 3,000.

Hence, the total cost for the first year of obtaining a felling licence on customary land is SBD 23,000. This is in addition to the performance bond of SBD 250,000.

#### Felling Licence Regulations

These regulations deal with matters relating to licences granted under section 5 of the Forestry Act. They prescribe the forms in relation to licences issued under section 5; the procedures for issuing those licences; the conditions subject to which the Commissioner of Forests may grant those licences; and the provisions regulating tree felling operations under those licences.

There are three new forms: Form A for applications for felling licences; Form B for felling licences (more appropriate for customary land); and Form C for

completion certificates (which must be executed to certify that the logging operation in a particular concession area has been completed). Previously, felling licences were not prescribed in the regulations.

In summary, the new regulations have resulted in the following changes:

1. The Code of Logging Practice (Code) has now been given legal status. Although the Code has been in place since 2002, it had no legal status.
2. Large-scale milling licences are required to comply with the Code.
3. There are penalties for operators who fail to comply with the Code's key standards.
4. There is a new form for applying for a licence called Form A.
5. There is a new version of Form 1.

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#### *Yasi Training Workshop in Fiji*

All feedback from participants was highly positive. A leaflet in Fijian on how to grow sandalwood was fine-tuned during the workshop and will now be more widely distributed. Key literature on sandalwood was provided to each of the participants. Extension staff saved powerpoint presentations and photos on flash drives to use in their own education and awareness programs.

At the workshop closing Mrs Suliana Siwatibau provided an inspiring speech in Fijian and English motivating participants to take the knowledge they had gained back to their respective islands and rejuvenate yasi as an industry for Fiji.

There is considerable interest within the Forestry Department/SPRIG for holding a similar workshop for *Submitted by Ponijesi Bulai, Peni Cawani and Lex Thomson*



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## SPRIG News



### Assessment and future management of *Canarium* variety collections in Solomon Islands

*Ngali nut* (*Canarium spp.*) variety collections planted from seed between 1988 and 1990 by the



Solomon Islands Department of Agriculture (DAL) at several of its field experimental stations were assessed recently by SPRIG2 marketing specialist, Barry Evans. Information on the parent trees and fruit characteristics of the collection was published earlier (Evans, B.R. 1999. Edible nut trees in Solomon Islands: A variety collection of *Canarium*, *Terminalia* and *Barringtonia*. ACIAR Technical

Reports 44), but information on the living collections was lost when the national agricultural station at Dodo Creek was destroyed during the tensions. No data on the growth of the planted trees, their phenology and – most importantly – their heritability have been collected previously. Heritability is important because reliable vegetative propagation has yet to be developed.

The main collection at Fote in North Malaita, which contains mostly *C. indicum*, is in reasonable condition (see photo), but the collection at Lata, Santa Cruz (mostly *C. harveyi*) has fared worse due to early cyclone damage and years of neglect. The collections were tagged, re-mapped, and measured. The results will now be re-compiled with the original collection database (held by Evans) to assist with the future management of the collections by DAL and stakeholders.



Commercial interest in *Canarium* for its nuts, kernel oil and as a timber species is currently very high in the region due to the success of *Nangai* in Vanuatu and the need to reforest logged-over land. Despite their mixed condition, the collections offer a unique opportunity for foresters and agriculturalist alike to study this

valuable indigenous tree species. For example, preliminary results from the survey show a high incidence of male trees amongst *C. indicum*. This may be because male seedlings perform better in nurseries and hence are more likely to be selected for planting out, and/or because their natural occurrence is more abundant than that usually found in largely managed stands in and around villages where unproductive males are often culled. This has important consequences for planting designs in timber and horticultural plantations.

Submitted by *Barry Evans, SPRIG Marketing Specialist*

### Conservation of *Santalum macgregorii* (PNG sandalwood)

*Santalum macgregorii* F. Muell. or PNG sandalwood is under increasing threat of extinction with no active plans to conserve it in the wild. Most of the natural PNG sandalwood (Fig. 1) has been removed. For example, the last remaining natural trees known to occur south-east of Port Moresby near Gomore village were destroyed in about 2003 (Fig. 2). The landowner, Mr Minama Bodau, had attempted to conserve his three remaining natural trees as he saw sandalwood as a valuable tree with agro-forestry potential. However, these trees were illegally harvested. The only



Figure 1 Natural distribution of *Santalum macgregorii* in Papua New Guinea

remaining germplasm from the natural population in the area consists of a number of trees planted by the landowner. Currently, trees are being harvested between Central and Gulf

Provinces following the construction in 2000 of a new road through previously difficult to access stands of sandalwood in the area. This resource is also considered to be under threat as there are reports of intensive harvesting. In 2001, botanical specimens confirmed the



Figure 2 This last known remaining *S. macgregorii* tree south-east of Port Moresby has now been destroyed





presence of sandalwood in the Buzi area of Western Province. These small stands are reported to be under severe threat due to repeated burning and some harvesting.

Attempts to establish an ex situ conservation stand are discussed below. There are also plans to continue working on sandalwood under a new ACIAR project involving Ensis (part of the former CSIRO Forestry and Forest Products division) and the PNG Forest Research Institute (FRI).

*Santalum macgregorii* is a small to medium sized tree, usually 8 to 20 m tall with a dbh of up to 25 cm. Trees are typically multi-stemmed with short, crooked boles and open crowns. The species exhibits considerable morphological variation. Several traditional (folklore) varieties are recognised, mainly associated with 'male' and 'female' trees where the 'female' trees flower and fruit more prolifically than the 'males' and have larger leaves. Bosimbi and Uwamariya (2004) provide botanical information on the tree and details of flowering and seeding.

PNG sandalwood is distributed in the Central, Gulf and Western Provinces, as indicated in Figure 1. The main distribution has been between Malalaua (8° 10' S, 146° 17' E) in Gulf Province to Kwikila (9° 44' S, 147° 33' E) in Central Province (Gunn et al. 2002; Bosimbi 2005). A small separate population was confirmed recently near the villages of Buzi and Ber (Mai Kussa River) in Western Province (Doran and Lea 2005). The species grows at a range of altitudes from sea level to 160 m with reports of *S. macgregorii* occurring at elevations of up to 750 m. Most populations occur within 50 km of the coast.

The typical habitat is seasonally dry, evergreen savannah woodland and grassland, although it is occasionally found in riparian semi-deciduous thickets and very occasionally in rainforest habitats (Gunn et al. 2002).



Figure 3 *Santalum macgregorii* grafts in the PNG FRI nursery showing signs of new leaf shoot development

As with other sandalwood species, *S. macgregorii* produces a high-value aromatic heartwood that has been harvested and exported as unprocessed wood for more than a century. Traditional uses for the tree in PNG are very limited. Little is known about the chemical composition of *S. macgregorii* oil, although there are indications that there is likely to be considerable variation in oils between trees growing in different locations (Doran et al. 2005). This variation offers an opportunity to use tree breeding techniques to select the best germplasm for establishing sandalwood plantings aimed at meeting market needs. However, given the rapid decline in natural populations, this opportunity to take advantage of genetic variation in the species may be lost if the genetic variation is not conserved using ex situ measures.

There are a number of reasons for the demise of the natural populations. Unregulated harvesting of mature trees to include removal of stumps has taken a major toll on the population. Fires have also had a serious negative impact on populations, particularly on young regeneration, which is very vulnerable to fire. However, shifting cultivation and grazing have had

relatively minor effects on sandalwood. In spite of attempts by communities to conserve natural stands, the above factors have prevented successful conservation.

Under the ACIAR project, 'Domestication of Papua New Guinea's indigenous forest species', CSIRO Forestry and Forest Products (now Ensis), in collaboration with the PNG FRI, have been attempting to implement ex situ conservation measures for *S. macgregorii*. These measures include preparing a document on conservation and management of *S. macgregorii* and attempting to establish an ex situ conservation stand.

The ACIAR Project published a conservation and management strategy for *S. macgregorii* (Gunn et al. 2002). Development of the strategy included using rapid rural appraisal (RRA) techniques to gather information on species distribution, community views and the status of the industry in PNG. A set of recommended conservation and management actions were then identified. They included supporting an in situ and ex situ conservation strategy and scientific work on utilising genetic variation in the species to develop improved germplasm for growers.

The aim of the ex situ conservation population was to establish 40 to 50 unrelated families across the species' natural distribution. Three attempts were made to collect germplasm for this purpose. Two collections were made in Central and Gulf Provinces (Agiwa 2001; Gunn and Bewang 2002), while one unsuccessful attempt was made to collect seed from Buzi in Western Province. Seed was collected from a total of 38 unrelated trees. These field collection expeditions all noted a scarcity of seed. It appears from field observations and monitoring of planted trees in the FRI nursery that sandalwood flowers throughout the year. It has also been found that



between flowering and seed set, most if not all the fruit crops under natural field conditions abort or are taken by birds or other predators. Substantial synchronous mature seed crops are therefore unlikely to occur under natural conditions. Because seeding is apparently not seasonal, large seed crops appear to be rare, increasing the difficulty of collecting seed.

The seed was raised at the FRI nursery. From these initial collections, seedlings from only six trees and one bulk seed collection (seed mixed from several trees) were available to establish an ex situ conservation stand in the grounds of Lae Botanical Gardens in March 2003 (Gunn 2005). Seedlings per family (tree) ranged from 5 to 28. The low number of plants raised was a result of the very small quantities of seed, poor germination, inadequate nursery techniques and theft of plants.

Since the stand was established, there have been further plant losses. As a result of this combination of problems, this conservation stand has effectively been written off.

In the most recent field collection expedition to Central and Gulf Provinces in October 2004 (Gunn 2005), a different approach was taken. While once again aiming to sample between 30 and 40 unrelated trees across the remaining natural distribution, the germplasm collection focused on sampling leafy shoots and root sections as no seed was available. The samples were taken back to FRI Lae and 20 grafted plants were struck using the leafy (scion) material (Fig. 3). Of these grafts, six have successfully established as grafted plants after nine months. It is considered that this success rate could be increased by using better seedling rootstocks and improved care in the nursery. Of the 45 root

sections (Fig. 4) that were established in large nursery pots, 21 are still alive after nine months. However, many of these plants showed stunted growth with atypically small leaves despite fertiliser applications. A more suitable growing medium and alternative host plant (*Alternanthera*) are being tried. Some of the above plants are now growing sufficiently vigorously for them to be used as sources of scion material for further bulking up of families.

#### The next steps

Under the new ACIAR Project, 'Facilitating the availability and use of improved germplasm for forestry and agroforestry in Papua New Guinea', Ensis in collaboration with PNG FRI will continue to try and establish a conservation stand



**Figure 4** Example of *S. macgregorii* root sections containing leaf shoot suckers harvested for propagation in the PNG FRI nursery (young, small leafy shoots are more desirable than those shown in the figure).

that will also serve as a source of germplasm for growers of the species. Between 2005 and 2007, there are plans to conduct a field expedition to collect additional germplasm from new sources (trees);

- continue propagation work by grafting field material and bulking up plants in the nursery;
- establish a conservation stand/seed source in the grounds of the Lae Botanical Gardens;
- provide 5 to 10 unrelated plants to selected rural communities/individual growers who demonstrate a commitment to

establishing sandalwood. These plants will serve as seed stands and act as an ex situ conservation measure.

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## Further developments at the Drawa Model Area

After years of consultation and careful planning, harvesting in the Model Area for Community-based Natural Resources Management in Drawa, Vanua Levu, Fiji commenced on 2nd June 2005. The Drawa Landowners Forest Management Co-operative Ltd (DraFCo), a community-based forest enterprise, established with the assistance from the Pacific-German Regional Forestry Project (PGRFP) and the high-level multi-sectoral SFM Working Committee started work on Mataqali Koroni (landowning unit) Coupe 3 (management unit) under the Harvesting Right License number 81193 approved by Fiji's Conservator of Forest and issued by the Divisional Forest Officer, Northern.

Guided with the principle of "starting small", DraFCo is currently contracting the roading, loading and cartage activities to Northern Transport Limited, an established logger, but it employs an enthusiastic crew of five for felling, log making, cross cutting, recording, and the general supervision of the operation. The ultimate aim though is for DraFCo to operate and manage its own harvesting machines. The PGRFP in its commitment to help DraFCo realize its dream is currently assisting them in developing their entrepreneurship and forest management skills, and this first coupe provides the opportunity for on-the-job training and real life experiences in the world of business.

A total of 538 m<sup>3</sup> of timber have been harvested from the road line and Koroni Coupe 3 that was sold with a gross income of FJD\$57,000.

In order to separate the business line of operation from the traditional community settings and to overcome the "Pacific Way" (mixing tradition, culture and business) of

running an enterprise, the Landowners Association of Drawa (LOAD) was founded with different development objectives and by-laws. It is anticipated that LOAD will carry out community development works from its share of the profit distributed by DraFCo who will mainly concentrate on operating and maintaining a profitable business.

The month of October came with many happenings in store. The Commissioner of Northern Division (CND) officially opened the new Drawa access road and the Lutukina - Drawa crossing. The function was attended by more than 100 people from government departments, the private sector, neighbouring villages and landowners. The CND reaffirmed the government's commitment in seeing the successful implementation of the activities prescribed in the Forest Management Plan and the Land Use Plan for the Drawa Block, and assured the gathering that his office will see to the upgrading of the Keka - Vatuvonu road next year, which is Phase 2 of the Drawa Block roading programme.

Then came the visit of the Honourable Minister of Fisheries and Forests, Mr. Konisi Yabaki. Dr. Blank, GTZ Adviser for Land Management, informed the gathering of the acceptance of LOADs' request for financial assistance from the German Embassy in Wellington to fund a piped water system and flush toilets for Drawa village. The Hon. Minister in his address broke the news of their ministerial decision to issue a provisional license for DraFCo to set up a portable mill in the Drawa Block. Both news were received in jubilation, with cheers and tears, and, to top it off, with big bowls of kava. The Minister's visit,



Commissioner Northern, Mr Misieli Naivalu officially opened the new Drawa access road and the Lutukina-Drawa crossing

though short, was very fruitful for the landowners and the project as a whole.

Our training programme is starting to bear fruits now with nine landowners receiving their Advanced Level competency certificates in chainsaw operations. Drawa and the Project can be proud of the fact that 10 trainees, who received their competency certificate in Harvesting Planning, are the first for Fiji. Mr. Mateboto while officiating at the graduation ceremony told the gathering that the Project is delighted with this achievement as it signifies commitment from the trainees and support from the communities.

A First Aid course was organized for 10 landowners in early November. The group was selected from the recently graduated Chainsaw Operators and Harvesting Planners and the yet to be trained but mobilised sawmilling crew. Sawmilling training for 6 landowners will be held in Suva in December for two weeks.

The Mill will then be transported and set up for operation in the Drawa Block in January 2006.

Until then, it is Mr. Mateboto wishing you a Merry Christmas and a fruitful New Year from the Drawa Block.

Danke.

by: *Jalesi Mateboto, Forester Specialist, SPC/GTZ - PGRFP*  
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**Conservation of *Santalum macgregorii* (PNG sandalwood)**

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**New regulations in force in Solomon Islands**

6. There is a new felling licence called Form B.

7. The fees for acquiring a felling licence have increased.

8. The performance bond has increased from SBD 50,000 to SBD 250,000.

9. *Xanthostemon*, locally known as tubi, is included in the protected tree species.

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