



Pacific Islands FORESTS & TREES



No. 2/95

June 1995

1995 HEADS OF FORESTRY MEETING

The theme for this year's meeting, to be held from 25-29 Sept. 1995, will be "Working together for the future." As this Project will end in December 1996, this would be an appropriate time for all HoFs and our cooperating and collaborating partners to seriously review what issues, activities, mechanisms, opportunities and constraints there have been, are and may be in the region, what we have achieved, what else we could or should have done, and where (and how) we go from here.

Among the more critical issues that come to mind are,

- what happens to the Programme after 1996 (assuming that we can get the funds), including its "regionalisation".
- linkages to the FAO sub-regional office/forester's functions, and to other regional (e.g. SPC, SPREP, Forum, GTZ, EU/PRAP and global (e.g. CIFOR) programmes.
- can our various MoUs, and some of the linkages above, provide sufficient support, leverage or momentum to carry the Programme's activities beyond 1996, either formally or informally?
- should a Pacific Islands Forestry Association (or Society) be formed? If so, what should be its objectives, charter, mandate, constitution, etc.
- how can we secure continued (and increased) support, especially funding, for forests and trees related activities for the region as a whole. Inputs from the various donors would be particularly useful in this discussion.

The output of the meeting should be a strategy, or at least a framework (perhaps for a Project Document for submission to UNDP and/or other donors for 1997-2001) on how we can collectively strengthen and energise the forests and trees sector to move positively into the 21st century.

An Information Note and invitation to the meeting will be sent to all participants of the 1994 meeting shortly. If you were not there last year, but would like to attend this year's meeting, please inform us (address at back page of this newsletter) soonest possible. If you wish to present a paper on the theme, please send an outline of your paper to us before 31 July 1995 for consideration. Only approved papers will be presented at the meeting.

As in previous years, we can fund only the Head of Forestry of our 15 Project countries. All other participants will have to secure their own funding. No fees are charged for participating in the meeting. The annual Tripartite Review Meeting of the South Pacific Forestry Development Programme (SPFDP) will be held immediately after the HoF meeting, i.e. on 29 September.

The venue of the meeting will probably be in Nadi, Fiji. Confirmation and details will be included in the Information Note. We will look forward to seeing as many as possible of our collaborators, cooperants and friends at the meeting in September.

FAX US YOUR SUPPORT (OR NON-SUPPORT), INCLUDING YOUR REASONS, FOR THE FORMATION OF A PIFS.

Natural Forest Management & Logging Practices Workshop

This will be held from 05 July - 02 August 1995 for 15 participants from Fiji (2), F.S. of Micronesia (1), Palau (1), Papua New Guinea (3), Solomon Islands (3), Vanuatu (4) and W. Samoa (1). The workshop, aimed at teaching and demonstrating proper natural forest management and (reduced impact) logging practices, will include training at the Gympie Forestry

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Quote

'Hasten slowly and you will soon arrive.'
Milarepa

Training School in Queensland, Australia (10 days), and at the Luasong (7 days) and Danum Valley (5 days) Forestry Centres in Sabah, Malaysia, and a two-day visit to the Forest Research Institute of Malaysia (FRIM). This workshop has been made possible through the generous support of AusAID, the French Government, USDA Forest Service, GTZ Regional Forestry Project, CIFOR, FRIM and Innoprise Corporation of Sabah, Malaysia.

Indigenous Forest Management Study Tour to Fiji

A study tour of indigenous forest management activities in Fiji will be organised from 12-16 June 1995 for 20 participants from Niue (1), PNG (3), Solomon Islands (5), Vanuatu (4), W. Samoa (3) and Fiji (4) by the GTZ Regional

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Proposed Pacific Islands Forestry Society/Association

We received support for the formation of the above Society/Association (PIFS/A) from only a handful of persons, and one expression of reservation. Our request for modest funding support to help prepare a comprehensive proposal to be discussed at the September 1995 HoF meeting was not successful. This was partly because we did not have sufficient expressions of support from the relevant persons, i.e. all of you, to attach to our request. We intend to resubmit the request - SO PLEASE TAKE THE TIME AND EFFORT TO SEND OR

Agroforestry workshop for atoll environments

The Fourth Training Workshop on Agroforestry for Atoll Environments was conducted in Majuro, Republic of the Marshall Islands from March 20 to 30, 1995. The workshop was organized by the South Pacific Forestry Development Programme in collaboration with the USDA Forest Service, the GTZ Regional Forestry Project, the State of Israel and the Ministry of Resources and Development, Marshall Islands. It was attended by twenty-four participants from Tonga, Cook Islands, Niue, Fiji, FSM, Republic of Palau, Tuvalu, Kiribati and the host country.

Improving Atoll Environments with Trees was the theme of the workshop and the participants were able to share their own traditional agroforestry knowledge during intensive sessions on defining and solving problems on the job, establishing and operating nurseries, improving plant growth under saline or arid conditions, and organizing and conducting agroforestry training workshops and extension activities. Community farm visits were organized to further the participants' training on real life practical conditions. There is no doubt that the participants learnt some new ideas from the workshop which they can apply in their own respective countries.

As part of the workshop, an evaluation of agroforestry training was undertaken. This involved interviews with participants and trainers, as well as observations and some group work during the course itself. Participants generally expressed a need for further training in agroforestry in future, but suggested that it should be more specific and institutionalised. Rather than trying to cover a wide range of

subjects and countries during one course, they suggested that a number of national courses could yield better results. Such courses should concentrate on certain technical aspects of agroforestry only, and complement each other over a time-span of several years. It was also suggested that training courses and field work could be more tightly integrated.

There was general agreement that more trainers from the region should be qualified. Such "train the trainers" programmes should be undertaken separately from the more technical agroforestry courses for extension staff. It was noted that regional trainers are much easier to understand and follow than resource personnel from outside the region.

The success of the workshop can be attributed largely to the proficiencies of the resource persons. They were Robert Wescom from the US Forest Service, Amar Singh from the Department of Agriculture, Fiji, Wieland Kunzel from GTZ, Yechiel Zohar and Abraham Gafni from the State of Israel and Edwin Teunissen, APO, SPFD. It is envisaged that future workshops of this nature will use more local trainers from the region.

(by Frederick Muller
Chief Agricultural Officer,
Ministry of Resources & Development
Majuro, Marshall Islands
Wieland Kunzel
GTZ Agroforestry Advisor
E. Teunissen, APO, SPFD)

Since 1992, a total of 85 extension workers and other participants from the region have taken part in the annual workshops. The workshops were not designed to build on each other, so the 6% of repeaters is very low. Only seven women have taken part so far, which could be a reflection of the low number of women working in the agriculture and forestry sectors in general. The number of participants for each year and country are as follows.

Country	1992	1993	1994	1995	Total/1
Marshall Is. (1995)	1	4	1	13	16
Solomon Is.	1	-	-	-	1
W. Samoa	2	-	-	-	2
Tonga	1	-	1	1	3
FSM	1	-	-	3	4
Vanuatu	1	-	-	-	1
Cook Is.	1	2	1	1	5
A. Samoa	3	-	-	-	3
Niue	-	2	1	1	4
Tokelau	-	2	-	-	2
Kiribati (1993)	1	13	2	1	16
Tuvalu(1994)	1	2	10	11	2
Fiji (1992)	12	-	1	1	14
Palau	-	-	-	2	2
Total	25	25	17	24	85

(1/-Repeaters excluded from Totals. The "year" in parenthesis indicates the workshop venue for that year).

by Wieland Kunzel
GTZ Agroforestry Advisor
and E. Teunissen
APO, SPFD

Women & Traditional Medicine Workshop



Mere Ula of Fiji discusses a medicinal plant with Mrs. S. Naulivou, President of the Organisation of Traditional Healers, Wainimate.

Background

A follow-up to the very successful 1993 Regional Women & Traditional Medicine Workshop was organized by SPACHEE, the Fiji Forestry Department and WAINIMATE (Women's Association for Natural Medicinal Therapy), which was conceptualized at the first workshop. The follow-up workshop was held 3-7th April 1995 at Nadave, Fiji. Thanks to assistance provided by the UNDP/FAO South Pacific Forestry Development Programme, New Zealand ODA, GTZ Regional Forestry Project and the Canada Fund, thirty-one women from Cook Islands, Fiji, Kiribati, Marshall Islands, Papua New Guinea, Solomon Islands, Tonga, Tuvalu and Vanuatu took part in this workshop.

Participants prepared brief papers on the status of traditional medicine and medicinal plants in their country prior to their arrival in Fiji. These reports indicate that a number of initiatives to promote and document the use of traditional medicines, and to conserve the plants that save lives have been put in place since the 1993 workshop. These reports will be included in the workshop proceedings which are currently being prepared.

On the final day participants looked at possible follow-up activities that they would like to undertake. Participants at the 2nd workshop also indicated that they are prepared to continue follow-up work at the national level to *Save the Plants that Save Lives*. A number of participants at the follow-up workshop are health professionals and we therefore expressed a stronger emphasis to work towards the integration of safe and effective traditional medicine in national health delivery programmes. While many participants indicated that some doctors and health centers allow the use of traditional medicines alongside western or so-called modern medicine, no country in the region has policies in place to allow the integration of safe and traditional medicines.

Participants expressed the hope that work could continued at the regional level. They were anxious to find ways for the regional traditional medicine committee to function, and suggested that we attempt to hold monthly satellite meetings. This workshop, like the first one, provided participants with an opportunity to exchange knowledge and to look at joint strategies that could help to save the plants

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Forest Resources Monitoring Systems Consultation

The consultation was part of a continuous global effort by FAO Rome to standardize forest type classification systems, improve accessibility and reliability of information, reduce the period of forest resources assessment and strengthen national and regional monitoring capability.

Country papers from China, India, Bangladesh, Burma, Nepal, Bhutan, Philippines, Malaysia, Laos, Cambodia, Sri Lanka, Thailand, Vietnam and Fiji (representing the PICs) showed a multitude of results from the strategies used within the region. The forest type classification systems at the national level used different methodologies and practices and were poorly established, thus showing a diverse group of forest type classifications based on national standards and needs. To resolve this would be an enormous and difficult task.

Certainly, this would create a demand for technical cooperation with donor agencies. However, it was accepted that satellite data and GIS technological development have provided the mechanism to be used in forest type classification.

Fiji and Pacific Island Countries

Fiji's national forest resources inventory has evolved significantly in recent years with the use of digital satellite images (Landsat TM and SPOT) and adopting some recently developed technologies in remote sensing and GIS to en-

hance the country's capability for forest monitoring and change detection.

Fiji (while also representing the Pacific Island Countries - PIC) commented that the variability of classification standards being used was difficult to standardize at national level. PIC forest type classification has yet to be developed. While Fiji has stratified its forest cover to dense, medium and scattered forests based on its reflectance on digital satellite images (Landsat TM), most Pacific Islands used aerial photos for forest classification. On the other hand certain PICs have other priorities than forest classification. However, there is an awareness to utilize satellite images in the small Pacific Island Countries.

Because of the small scale and wide distribution of the islands it was important to have regional institutional support (SOPAC, SPC etc.) and consideration of a mobile receiving station for receiving regular satellite data in the Pacific.

The week long consultation was very useful, especially in realizing what is possible and what would be difficult to achieve in the short term.

The consultation endorsed the following recommendations:

- * national level classification to be maintained with a good international links.

- * non-forest and forest products should be monitored
- * sub-regional and regional levels of classification of forest types should consider the eco-floristic zones.
- * regional scale maps (1:250,000)
- * standard terminology and methodology should be developed and used for exchange of expertise under TCDC
- * national planning and funding to support the forest sector
- * FAO to promote and strengthen national biodiversity inventory and monitoring.

These qualitative outputs recommended by the consultation expert group would assist planners and decision makers in forestry and related development sectors, scientific community including universities, national and international research agencies and the public at large.

Acknowledgment

I would like to express my sincere appreciation to UNDP/FAO South Pacific Forestry Development Programme, Suva for their support that enabled my participation in the *FAO/RAPA Expert Consultation on Forest Resources Monitoring Systems for Asia/Pacific Region on 27/2/95-3/3/95* Bangkok, Thailand.

(by Osea Tuinivanua
Management Officer
Forestry Department,
Fiji)

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that save lives as well as work towards the integration of safe and effective traditional medicines into health delivery systems. They felt very strongly that they would like to continue having regional forums to learn from the experience of their sisters from throughout the region.

Highlights of the workshop (see below) were outlined by Annie Homasi, one of the Tuvalu participants, at the official closing and World Health Day Celebration on 7th April. Participants, at this workshop also endorsed the Pasifica Declaration on Traditional Medicine adopted by participants at the first workshop.

The organizers are hopeful that this work will continue to show results at the national and regional level as well. The enthusiasm of participants was very strong at the follow-up workshop, and those who were not at the first workshop have expressed their desire to catch up. We are aiming to have the workshop proceedings available by the beginning of July so that those who will be attending the regional health director's meeting in Noumea at the end of July will be able to discuss this important issue.

Highlights of Workshop

We have come from different parts of the Pacific but with a common interest,

1. to discuss progress since the August 1993 workshop on conservation, documentation and promotion of traditional medicinal plants/trees and to encourage continued work in these areas.

2. to examine the status of traditional medicine within national health programmes and to develop strategies to encourage the use of safe and effective traditional medicines.
3. to practice documentation skills by assisting USP's Chemistry Department with the compilation of information for WHO's REGIONAL TRADITIONAL MEDICINE HANDBOOK.
4. to explore income generating potential from traditional medicines as a means of encouraging the conservation of biological diversity, and
5. to identify future training and networking needs of traditional healers and promoters of traditional medicine in the South Pacific.

Traditional Medicine

*Traditional medicines reveal identity
That long stands forever
Unity, one mind, one soul, one heart
We, Pacific indigenous people
Revive, Conserve, Preserve
For tomorrow's use*

*Maintain advancement for our
ancestors*

*For we are to uphold
Herbal plants united we stand
For the saying goes
Save the Plants that Saves Life*

(From: Kerrie Strathy
Women's & Education Advisor
SPACHEE
Suva).



Temata and Ngai Tupa from Cook Islands looking at some samples of medicinal plants.

Non-Wood Forest Products Consultation

An International Expert Consultation on Non-wood Forest Products was held in Yogyakarta from 17 to 27 January 1995. The Consultation was attended by 56 experts and 42 observers from 44 countries / organisations. Participation reflected a wide range of expertise, from resource conservation to trade and marketing, economic statistics, anthropology, pharmacology, bio-chemistry, nutrition, industrial development and research management. This international consultation was the first world-level meeting exclusively to draw attention to non-wood forest products (NFWPs) and represented the culmination of a series of regional expert consultations for Africa, Asia and the Pacific,

and Latin America and the Caribbean. These regional consultations had strongly highlighted the need for; inter-regional exchange of information; a generally-accepted international definition and classification for NFWPs; national and international initiatives for resolving problems common to many countries; and abroad guidelines and directions for post-UNCED actions in forestry related to NFWPs.

One of the important recommendations of previous sessions of the committee on Forestry had been to provide higher priority for NFWPs. The consultations have thus been a part of the initiatives taken by FAO in this direction.

The experts at the International Expert Consultation felt that non-wood forest products did not still receive adequate attention and priority in most countries. In order to improve the situation, it is necessary to enhance awareness on the part of planners and decision-makers regarding the roles and potentials of non-wood forest products; and this needs to be reflected in the UNCED follow-up.

*(From: Alec Chang
Permanent Secretary
Commerce, Industry, Trade
& Public Enterprises
Fiji)*

Forest Rehabilitation Proposal for Nauru

This is the second part of the summary of the Forestry component of the rehabilitation programme for Nauru (part I was published in *Pacific Islands Forests & Trees*, March 1995). It covers the Forestry Development Plan as presented in the Report.

Forestry Development Plan

The Forestry Development Plan identifies three main areas of attention: Reforestation of Reclaimed Pinnacle Land, Establishment of Agroforestry Systems, and Landscaping and Other General Planting Activities. Although described and discussed separately, each part is related to every other part.

For the description of the areas, several principles have been followed:

- Agroforestry and landscaping developments are complementary and have significant linkages between themselves and with the other Study Components Environmental Protection, Housing, Human Resources Development, etc.).
- The main objective of the Forestry Component is the protection and planting of trees, forests and other plants as being important to the sustainable habitation of Nauru.
- Two main areas can be identified within Agroforestry and landscaping developments: those with existing trees and forest remnants and those for potential replanting, reforestation or habitat reconstruction.
- Species and vegetation types / forest stands are identified as priority status for protection, propagation and replanting, based on inventory data of Nauru flora.
- An immediate start of the propagation of priority species maximizes the sustainability and cost-effectiveness of plant propagation.
- The multi-purpose value of trees and forests should be maximised, including the protection and re-establishment of noddly bird habitats and the cultural value of certain plant species or vegetation types.
- Agroforestry and landscaping activities should be coordinated with plans for remaining pinnacle removal.

Reforestation of Reclaimed Pinnacles

Selection of land

Areas that involve the planting of trees and other plants (according to the Land Use Plan) are sections for conservation, reforestation and housing, and those left as the Balance of Rehabilitation Land not used for roadways or other hard surfaces.

The Conservation Areas have to be managed and rehabilitated in a special way, since these are selected for their existing vegetation cover. This is discussed in the Environment Component Report.

The major effort for reforestation will be in those areas that are not covered with vegetation and are undergoing residual mining and pinnacle reclamation process.

As mentioned in PART 1, a minimum topsoil layer of 150mm is needed over a subsoil layer to support a forest structure of vegetation.

Considering that:

- an area of 120 ha over the next 20 years is needed for housing and,
- the main objective of housing land is that it can support trees and an agroforestry system, meaning that
- it has to be rehabilitated to the same standard as reforestation land, in terms of soil profile, and
- another 323 ha. of land is selected as reforestation land,

a total of 443 ha has to be covered with 150mm of topsoil. Given the volume of soil currently available, the balance of land (957 ha) could receive a layer of topsoil of an average of 40mm depth, meaning that not all reclaimed land will be ready for reforestation.

Table 1. Classification of Land Use and Depth of Soil Profile.

Land Use Profile	Area (ha)	Subsoil (mm)	Topsoil (mm)	Total (mm)
Housing	120	850	150	1000
Agroforestry	323	850	150	1000
Balance of Land	957	90	40	130

Housing areas have been selected in each Nauruan District and reforestation areas have been selected according to certain criteria i.e.

- those areas undergoing primary mining and becoming available for rehabilitation in the near future.
- areas selected for housing but that are not needed for the next three or more years (these will receive food tree and indigenous species).
- areas adjacent to Conservation Areas, where the reforestation will add to the integrity of these conservation zones and assist in protecting them from further impacts.
- areas along ridges to provide green linkages between other land uses.

These criteria are meant to be used as a guideline for specific situations, but detailed planning has to be undertaken on an annual basis in conjunction with residual mining programs and housing development, and each parcel of land has to be assessed individually.

Residual land and soil-building process

As the residual land areas don't have yet a subsoil layer of crushed limestone or reject phosphate material, finer material such as the to-be-applied topsoil will be lost due to washing into the voids by rainfall, resulting in severely restricted plant growth. Therefore it seems to be an efficient strategy to chemically stabilise the surface until sufficient reject phosphate is available to provide a meaningful profile.

In the meantime, to generate soil material, composting of organic waste material has to be promoted. Any organic material, from domestic green waste to the green material available from clearing land for primary mining, has to be used in this process.

Programming of work

Two aspects that affect the programming of planting after the soil profile has been reinstated, are important:

1. for the flow of work for the production nursery and installation team, rehabilit-

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- ated land should be ready to be handed over to the planting team on a regular quarterly basis,
- land with topsoil should not be left unplanted or unstabilized too long to avoid the effects of wind-erosion and the introduction of wind-blown seed of weedy species.

It is recommended that the first stage of reforestation proceed in the areas designated as Housing and Reforestation (total of 443 ha), and be planned in such a way the area is planted within the first five to seven years of the programme.

The second phase of planting proceeds to areas designated as Balance of Land. These areas are direct-seeded with ground-cover, shrub and tree species. Timing should take into account the yearly pattern of rainfall to reduce the need for additional irrigation.

Indigenous species selection

The reforestation programme has to focus on utilizing indigenous plants as these are adapted to the physical conditions of the soil and the water availability. Species recommended are listed in Table 2. Of the tree species, *Calophyllum inophyllum* will make up about 90% of the number, as it did in the pre-mined forests. The other tree species are used to provide diversity at selected locations in the forests.

Cultivated exotic trees

Two introduced species, *Casuarina equisetifolia* and *Leucaena leucocephala* seem to be able to colonize the pinnacle areas close to their original sites of introduction. They may be planted on the Balance of Land areas with reduced soil profile, to assist in the building of bio-mass and the soil-forming process.

Shrub and groundwater species

Shrubs and ground cover are planted in the lower layers of the forest to assist with the stabilisation of the newly applied soil, to produce an increase in biomass on the sites, and to establish a more complete eco-system, that includes animal life and soil organisms.

Trial site selection

The Document recommends the establishment of one or two sample forest planting exercises as a combined reforestation and agroforestry trial. The location should be easy to monitor and accessible for public visits.

Table 2. Recommended Species

SPECIES-TREES	USES
<i>Calophyllum inophyllum</i>	Main planting
<i>Guettarda species</i>	Occasional species
<i>Morinda citrifolia</i>	Occasional species
<i>Pisonia grandis</i>	Occasional species
<i>Premna obtusifolia</i>	Edge planting
<i>Terminalia catappa</i>	Main planting
SPECIES-SHRUBS	USES
<i>Colubrina asiatica</i>	Occasional species
<i>Dodonea viscosa</i>	Occasional species
<i>Scaevola sericea</i>	Main species

SPECIES-GROUNDCOVER

<i>Cynodon dactylon</i>	Ornamental grass
<i>Cyperus javanicus</i>	Wet grass
<i>Echinochloa utilis</i>	Cover grass
<i>Lepturus repens</i>	Main species
<i>Polypodia scolopendria</i>	Shady, moist areas
<i>Stylosanthes humilis</i>	Cover legume
<i>Triumfetta procumbens</i>	Occasional species

USES

The sites selected (in the Menen District) were still psychologically in touch with the bottom side, were positioned to catch the sea breezes and views and therefore attractive for housing, and were adjacent to the road system and existing housing sites.

Trial site layout

The site has been chosen for the design of a conceptual layout for Housing Development, as illustrated in Figure 1. The layout covers an area of 3.95 ha, incorporates a single road ending in a car turn around, 27 housing lots and 0.48 ha of public open space.

The housing lots are designed to illustrate a variety of sizes based around an average lot of 1000sq. meters. The street has trees on both sides to provide shade and end in a turn around to limit traffic to local-only. The public open spaces function as a basin to collect storm-water run-off and can be planted with multi-purpose tree species.

The housing plan will demonstrate the concept of housing integrated with agroforestry within an accessible budget.

Planting design

A concept planting plan for the trial is shown in Figure 2. After completion of the earthworks, the topsoil will be seeded with soil-stabilising grasses and a legume. Next, the site is divided into zones for different planting treatment for different purposes:

Zone A - Screen planting

- * quick-growing shrub and tree species to provide shelter from wind and protection from invasion by weed species
- * shrubs can be harvested and used to produce compost
- * trees continue to grow and develop a closed canopy.

Zone B - Indigenous planting

- * indigenous tree species
- * to rehabilitate natural vegetation on topside
- * initially planted at high density for fast closed canopy
- * unwanted trees can be harvested and used for recycling
- * selected trees continue to grow with final end-use as sawlogs

Zone C - Agroforestry

- * food trees and other useful plant species (discussed later)
- * to be harvested when houses are built

Zone D - Display gardens

- * fruit, vegetable and ornamental species
- * to address the functional housing and living requirements

Zone E-Biomass

- * quick-growing shrub species
- * to minimize the invasion of weeds and can be recycled as green waste on lots for housing and harvested when construction starts

Zone F-Streetscape

- * to develop a shady habitat and landscape character for each street

The set-out and planting of trees and other plants around the houses is illustrated in Figure 3. The house has been placed in such a way that sufficient space is available for a small ornamental garden in the front, leaving the maximum possible for the multi-use agroforestry type garden in the rear.

Coconuts are planted along the common side boundaries where there is not enough room for large trees and both neighbours can enjoy the fruits. Although the garden at the front is mainly ornamental, it can be mixed with food and/or useful plants as papaya, banana and citrus. At the rear boundary indigenous tree species will be planted, along with fruit such as mango and breadfruit. A chicken run can be placed, beneficial for its manure. A composting area is also included, to produce organic additives to the garden. Of course the layout as shown in the figure is only one of many possibilities.

Planting for reforestation

The planting programme for newly produced rehabilitated land will start with the initial seeding of grasses and a legume. The legume seed could be pre-inoculated with nitrogen bacteria to assist with the establishment of this function, as the soil will be deficient in nitrogen. Where possible, all seed should be watered after sowing and kept moist until 95% cover is achieved.

Trees should be planted in a hole or depression, lower than the surrounding ground level, to ensure water does not run away and compost material or mulch can be applied to reduce water evaporation and to provide nutrients.

Irrigation

The natural rainfall, supplemented by an occasional manual watering in the early stage of plant establishment, should be the strategy for the majority of rehabilitated sites. Most of the indigenous and other plants recommended and used are well adapted to the climate, and in average and wetter years this should be sufficient.

Establishment and maintenance

Mortality of the plants can be expected:

- in the time between leaving the nursery and planting in the ground
- shortly after planting when not carried out correctly,
- due to pests and diseases.

To minimize losses, plants should be handled with care, planted as soon as possible, and adequate soil moisture around the roots of newly planted trees should be maintained. Checking regularly for pests and diseases, and applying treatment when necessary, will be the establishment maintenance.

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Vanuatu Sustainable Forest Utilization Project

A new project has commenced in the Vanuatu Department of Forests with assistance from the Australian government through AusAID. The Vanuatu Sustainable Forest Utilization Project is a five year project with a budget of A\$5.4 million. The objectives of the project are to assist Vanuatu in the management planning of its forest resources, minimize the environmental impact of logging operations, maximize returns to Government, the forest industry and landowners and to optimize the participation of ni-Vanuatu in all aspects of the forest industry. The project will include training in the planning, monitoring and control of logging operations and will be targeted at Department of Forests staff, timber industry operators and landowners.

The first training activity was a ten day study tour by a group of eleven people from the Government, industry and non-government

sector, to the Forestry Training Center at Gympie in Queensland, and inspection of logging operations near Coffs Harbor in northern New South Wales. Following up to this study tour, the project is assisting in the introduction of a Code of Logging Practice for Vanuatu.

Other project activities include assistance in establishing quality standards through timber grading rules and timber preservation standards, and the introduction of improved health and safety standards. It will also provide the timber industry with information on the physical properties, mechanical properties, durability and seasoning of Vanuatu timber species.

The project will provide an awareness campaign for landowners and communities to help them with decisions about the use and management of their resources, taking into account

the social and environmental impacts of logging. Department of Forests staff, together with representatives from other departments and Non-Government Organizations have recently been involved in training in Participatory Rural Appraisal, to improve their skills in communication with communities and assisting with land use decision making.

There will also be technical studies of Vanuatu tree species, building on the forest regeneration studies carried out under the Vanuatu National Forest Resource Inventory Project, to enable landowners to develop appropriate silvicultural systems to maintain their land as productive forest.

In addition to training and landowner awareness, the project will also assist the Department of Forests in the development of infrastructure to control logging operations and deliver ex-

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Agroforestry

The comments stated above in the reforestation part apply as well to the development of Agroforestry which will be integrated with the process of Reforestation.

Species selection

Studies showed that planting and protecting food trees and tree-like plants have been central to the maintenance of diverse agroforestry systems throughout the Pacific. It is considered that ecosystem balance can best be achieved through niche utilisation by a highly diverse plant community.

For Nauru, a number of species have proved particularly useful in the past, and are reviewed in respect to future importance:

- *Cocos nucifera* (coconut): will form part in any Nauruan agroforestry system; varieties will be planted for eating, drinking and weaving material.
- *Pandanus tectorius* (Pandanus): propagation has to be from cuttings as plants from seed will rarely reproduce desirable characteristics.
- *Artocarpus altilis* (breadfruit): an important species in Pacific Island agroforestry systems; a number of different varieties were observed in Nauru; although having a low resistance to drought, it bears fruit for nine months (May/January).
- *Mangifera indica* (mango) once planted widely in Nauru, appearing now as large, mature trees with few to no fruit; new stock of appropriate varieties should be imported to replace existing trees.

Other cultivated fruit trees

Bananas and plantains (*Musa* cultivars) are common in Nauruan gardens and pawpaw (*Carica papaya*) is grown successfully and both are promising for future cultivation on a more widespread basis. The lime (*Citrus aurantifolia*) can be observed in gardens, although appearing to be

neglected. The species is promising for agroforestry systems.

Possible introduced food plants

Species of important food plants found in other Pacific Island agroforestry systems should be considered for introduction in Nauru, as they are likely to tolerate the natural conditions, such as hibiscus spinach (*Hibiscus manihot*) and cassava (*Manihot esculentum*).

Landscape and Other General Planting

The comments as stated for reforestation and agroforestry apply equally to landscaping. The growing and installation of plants for end-uses other than reforestation or agroforestry fall under this general category.

Species selection

The selection of species for planting for coastal protection, street tree planting, around buildings, civic projects such as parks, etc. is no different from that for reforestation. Generally, the use of as many indigenous species as possible is recommended.

Conclusions

Out of the many conclusions and recommendations given by the Report, some of the most important are as follows,

1. Urgent action be taken to protect and nurture, through a program of controlled propagation, all of Nauru's rare and endangered species.
2. Indigenous Nauruan plants form the majority of those selected for use in Reforestation, and in particular that *Calophyllum inophyllum* be used as the dominant tree species. Introduced species that are proposed to be used should be proved capable of growing in environments at least similar to that of Nauru.
3. The combined information on flora and vegetation of Nauru underscore the necessity to preserve and conserve the rema-

ining Nauruan indigenous plants in their natural habitats. These plants will be needed to supply the seeds and cuttings for the reforestation of Nauru.

4. A production nursery of approximately one hectare be established on topside as a matter of urgency. The nursery should be designed and constructed to the standard prescribed.
5. In order for even native trees to be able grow and thrive on rehabilitated areas, a substantial investment needs to be made on the reconstitution of a new soil profile, in addition, it is recommended that for future clearing operations prior to primary mining, all green matter be separated and passed through a chipper or mulcher to create the raw material for compost, and be added to the available quantity of topsoil.
6. The possible environmental risks of importation of soil or fill materials from overseas, are too great to take, and should not be seriously considered.
7. One or two trial areas be established to test the proposed soil profile and tree planting program, along with that for the residual mining. Such monitoring should prove useful in increasing the efficiency and cost effectiveness of the rehabilitation process.
8. An integrated approach be taken to reforestation, agroforestry and landscaping on Topside, and the demonstration area, be constructed in the form of a model housing development project.

Reference:

Nauru-Australia Cooperation Rehabilitation Feasibility Study, Draft Report Component 4 Forestry, David C Hassall, 1994. (With thanks to Dept. of Island Development & Industry)

(by A. Pitcher
Special Project Officer
Dept. of Island Development & Industry
Nauru, and
E. Teunissen, APO
SPFDP-Kiribati)

Indigenous forests in Western Samoa

Summary

All trees on ten 10m by 10m plots in an area of disturbed *Pometia pinnata* lowland rainforest in Western Samoa were measured and identified. A management treatment intended to speed up the recovery of forest canopy and growth rate of commercial tree species was carried out on half of the plots which were then remeasured after 10 months. Tree growth was not significantly affected by the treatment after 10 months although visual observations suggested that the treatment was successful in promoting the development of canopy cover and suppressing the woody vines. Although secondary tree species appear to dominate the canopy at this stage in the post disturbance succession, it is likely that *Pometia pinnata* will eventually come to dominate as the short lived, secondary tree species become senescent.

Introduction

Western Samoa has the most diverse flora of any Polynesian archipelago, with the exception of Hawaii. Prior to the last few decades when the impact of deforestation accelerated rapidly, Western Samoa had by far the largest area of tropical rain forest in Polynesia. One reason for Samoa's unique flora is that it has developed on a characteristic geology, that formed from geologically recent volcanic basalt.

Cyclone 'Ofa struck Western Samoa in February 1990 and was followed by Cyclone Val in December 1991. The combined effect of these cyclones on the indigenous forests was devastating. Even in forests which were in an undisturbed condition before the cyclones, canopy loss has been severe and invasion of weeds and creepers threatens the recovery of the forest. Ecologically, Western Samoa's forests are now in a critical condition.

Some areas that were healthy rain forest have been so substantially modified that it will be many decades before new tree growth emerges through the exotic vines that follow cyclone damage, and the overturned and broken trees are replaced by forest again.

The rationale for the research described in this paper is that large areas of disturbed forest within the land base intended for reforestation under the joint Western Samoa/New Zealand Forestry Development Project, contain a reasonably high density of natural regeneration



Cyclone damaged indigenous rainforest in O le Pupu Pu'e National Park at Togitogiga, Western Samoa. The palms (*Clinostigma* sp.) survived the cyclones better than *Pometia pinnata*, the species which normally dominate the upper canopy.

(seedlings and saplings) of indigenous tree species. It may be a viable option to carry out rehabilitation of these areas at a lower cost than line planting and at the same time maintain the biodiversity of the sites. This research will also provide much needed data on the recovery of degraded indigenous forests and in particular how indigenous species regenerate despite the weeds and vines which proliferate after disturbance.

The objective of this research is to investigate management options for rehabilitation of the most common lowland forest type in Western Samoa, that dominated by Tava (*Pometia pinnata*). This forest type is one of the most promising in which to carry out this research because the dominant species is capable of rapid growth under conditions of high ambient light, such as exists in these disturbed forests. In the Solomon Islands, Tava is considered to be a colonizing species which is favored by disturbance of the canopy. It also provides high quality timber which is widely known locally and which can be used for a variety of purposes.

Materials and Methods

The research was carried out in a 6 ha block of *Pometia pinnata* dominated lowland forest which was logged over in the 1980's and line planted with *Eucalyptus deglupta* in 1983, in an attempt to convert the residual native forest to an exotic timber plantation. Cyclones Ofa and Val caused the destruction of most of the exotic species in 1990 and 1991, after which no further management was carried out until this research project began in January 1994.

Location of the research plots was decided on a systematic sampling basis (points of intersections of gridlines on a map). At each of five replicate locations, two 10m by 10m plots (separated only by a 2m wide buffer), were surveyed and marked with galvanized water pipes cemented into the ground.

Every tree which was greater than 3m in height was then tagged with a numbered aluminium tag, identified, and measured for DBH with a tree diameter tape. Records were kept of plot

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tension programmes. The project will provide improved communications, transport and accommodation facilities to make Department of Forests staff more effective in their work.

The project is being managed on behalf of AusAID by Hassall and Associates Pty. Ltd, a Canberra based consulting company involved in the management of agricultural development projects throughout the world. The project manager, based in Port Vila is David Wood, who previously worked in the Department of Forests on the Vanuatu National Forest Resource Inventory Project. He is returning to

Vanuatu after two years with State Forests of New South Wales as an Operations Auditor in the Management Audit and Review Branch.

Ross Andrewartha, the Training Adviser comes to the project with extensive experience in the development of training programmes in forestry and in the planning and management of logging operations in Australia and the Solomon Islands.

The Director of Forests, Mr. Aru Mathias on being interviewed about the project, commented that "My personal view and the strong

view of the Vanuatu Government is that Vanuatu is fortunate to be able to have such a project with very specific goals. The timing is just right when the forest sector development is at a crossroads. Simply, its the right project at the right time".

Mr. Mathias continued that the project will assist and prepare the Department of Forests and people in Vanuatu in facing the challenges of sustainable development of its forest resources, for the benefit of everyone.

(From: Department of Forests
Port Vila
Vanuatu).

Fiji Arbor Week 1995

An hectare of *Calliandra calothyrsus* was planted by a group of primary school children, villagers of Nanukuloa village, members of the Rakiraki based Arbor Week organizing committee, invited guests and staff of the Department's Environment Division, half a kilometer from Nanukuloa village, on the western dry side of Viti Levu on March 2, to mark the second day of Arbor Week.

The fuelwood plot is in response to the request to plant trees for firewood by the late Tui Natawia, the chief of Nanukuloa village who passed away a week earlier and missed seeing part of his plan take shape.

Three hundred seedlings of native trees mainly *Dakua makadre* (*Agathis vitiensis*) was planted by villagers and staff of the Department

on part of the hilly grassland area above the village to also mark Arbor Week. The planting of the remaining two ha of hilly grassland will be completed jointly by the Nanukuloa villagers and the staff of the Department's Environment Division during March and May this year.

In Rakiraki on March 1st, the first day of national tree planting week, attractive ornamentals like *Baka* (*Ficus spp.*), flamboyants, palms and others were planted around the newly built District Office building and along the turn-off into Rakiraki town road.

Ratu Ovini Bokini, Minister for Agriculture, Fisheries & Forests and chief guest at the Rakiraki planting also launched the Department's awareness poster titled *MAI NA*

LEKUTU loosely translated as *IN THE JUNGLE* which is a painting of a Fiji forest scene showing representative local plants, animals and birds.

Arbor Week 1995 launching was moved to the Western side of the country to include villagers and members of communities outside Suva. Apart from generating environmental awareness, Arbor Week 1995 has meant that a firewood plot will begin to produce firewood in four years time for some families in Nanukuloa village and the expected improvement in water retention of the water catchment hills.

(by Kesaia Tabunakawai
Arbor Week '95 Coordinator
Forestry Department, Fiji)

Cont'd from page 7

numbers and DBH for every measured tree.

The northern most plot of each pair was kept undisturbed as a control while the other was considered as a treated plot which received the same management as the entire remainder of the 6 ha compartment. The treatment which was carried out at three monthly intervals for the first year (known as releasing) involved the removal of weeds and climbers from every sapling or tree which was greater than 3m tall. No attempt was made to avoid treating the saplings/trees of non-commercial species (such as secondary species) because developing rapid canopy cover is important in suppressing the light demanding weeds and creepers.

Measurements were made in March 1994 and January 1995, when tree tags were checked and

renewed as necessary. Basal area (BABH) was calculated from tree diameter, measured at 1.3m above ground level. Although the enumerations included all trees found in the plots, basal area increments were calculated from tree diameter, measured at 1.3m above ground level. Although the enumerations included all trees found in the plots, basal area increments were calculated only on trees of less than 10cm DBH because trees larger than this limit would be unlikely to respond to removal of weeds and the plots were not intended to sample larger trees which have a very scattered distribution.

Results and Discussion

A total of 17 indigenous tree species were recorded in the plots in March 1994, while six trees could not readily be identified. The most common species was *Pometia pinnata* with a total of 58 trees, or 580 stems per hectare. A total of 43 trees of the common secondary tree species (*Macaranga sp.*, *Cananga odorata*, *Pipterus sp.* and *Hibiscus sp.*) were encountered.

The mean diameter of trees on all plots in March 1994 was 7.2cm, (all species combined), 6.2cm for *Pometia pinnata* and 8.1cm for secondary tree species. In terms of tree basal area (BABH), *Pometia pinnata* contributed 31% of the total basal area of all trees on all plots. After 10 months had elapsed, the mean diameters had increased to 8.3cm (all species), 7.2cm (*Pometia pinnata*) and 9.6cm (secondary tree species).

The total basal area (all species, all plots) increased from 9.3 m²/ha in March 1994 to 11.8 m²/ha in January 1995. Of the total basal area on 10 plots, *Pometia pinnata* and secondary tree species, made up 26.5% and 32.2%, respectively, while this changed to 26.8% and 33.8% in January 1995.

This data suggests that the main timber producing species, *Pometia pinnata* is well represented in this disturbed forest and appears to be maintaining its growth rate in com-

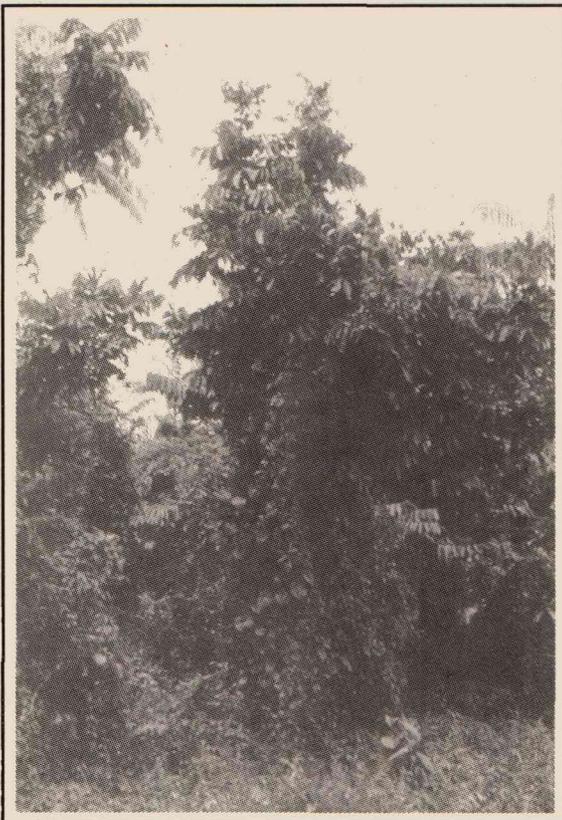
petition with the vigorous but short lived secondary tree species.

Considering only trees less than 10cm diameter and analyzing treated and control plots separately, it was found that in March 1994, before the treatment began, the mean of the total basal area per plot (basal areas summed for each plot, then meaned) for the 5 plots which were assigned to be treated (mean = 369 cm² per plot, SD = 192) was not significantly different (t test, P < 0.05) from that for the plots assigned as controls (mean = 353 cm², SD = 270). After 10 months the corresponding values were 487 cm² (SD = 188) and 469 cm² (SD = 354).

The basal area increment over the 10-month period was therefore 118 cm² per plot for treated plots and 116 cm² for the controls. Longer periods of time may be required to show any beneficial effect of the treatment on tree growth.

Although the treatment has not yet had a significant effect on tree growth, the structure of the treated forest contrasts markedly with the untreated forest. Prior to releasing, the forest was heavily infested with *Merremia peltata* which is a vigorous woody vine with large heart shaped leaves. The other common weed is the *Mikania micrantha* which can smother other herbaceous or shrubby vegetation and may inhibit timely regeneration of forest after disturbance. The most obvious difference in treated and untreated forest is that saplings or resprouting stems of *Pometia pinnata* which previously appeared as climber towers with only the uppermost foliage being visible under the shroud of vines, are now developing a more complete canopy. The woody vine *Merremia peltata* appears to be unable to recover sufficiently in the three months between releasing operations being carried out in the forest and the frequency of forest management will therefore be reduced in the second year.

(by Paul Woods
Forestry Development Project
Groome Poyry
Apia, W. Samoa
and
Tolusina Pouli
Division of Forestry, MAFF
Apia, W. Samoa)



Pometia pinnata tree smothered in creepers mostly *Merremia peltata* and *Mikania Micrantha*. Rampant weed growth in the bare area in the foreground.

Visit of NFTA Associate to Kiribati

After initial talks at the Heads of Forestry meeting in Nadi, Fiji, in July 1995, arrangements were made at the beginning of this year for a visit by a Program Associate of the Nitrogen Fixing Tree Association (NFTA) to Kiribati.

The visit by Mr. Mark Powell took place in the last two weeks of April 1995. The purpose of the visit was to give recommendations for future trials with species that are useful to the local people (firewood, fodder, shade, food, etc.), and could grow and survive in atoll environments, and to identify topics for AIS Fact Sheets.

While in South Tarawa, Mr. Powell visited the nurseries of the Agricultural Division and the

PRAP Project and the NFT trial site of the PRAP Project in Bangantebure, South Tarawa. A trip to the Agriculture demonstration plot in North Tarawa had to be cancelled because of bad weather.

Visits to the reclaimed area at Temakui Bight were also organized, as well as a trip to the first outer island to the north, Abaiang. Here the two boarding schools were visited and a meeting was arranged with the Agricultural Assistant. The field work and visits were concluded with a walk around Abatao, the first island on North Tarawa.

Based on the impressions and information gathered, Mr. Powell recommended, among

others, that in future the species *Sesbania grandifolia*, *S. sesban*, *Erythrina variegata* and *Azadirachta indica* could be tested. These species are likely to survive and grow in atoll environments and can provide fuelwood, biomass and fodder. Furthermore, an AIS Fact Sheet will be compiled on agroforestry species for atoll environments, based on the results of the species trials of the PRAP Project and the Tree Crops Section. This fact sheet will include a matrix of tree species and their uses.

(by Edwin Teunissen
APO, SPFDP
Tarawa
Kiribati)

Species Screening Trial, Kiribati

In August 1993, the PRAP Project on Sustainable Systems of Food Crop Production for the Atolls, in Tarawa, Kiribati, established a species trial in Bangantebure on South Tarawa.

Under the supervision of Dr. Mohammed Iqbal, Agronomist of the PRAP Project, the survival and growth rate in the trial were observed.

The seeds of the different species, all Nitrogen Fixing and Multi-Purpose trees, were obtained from CSIRO, NFTA and Papua New Guinea.

Table 1: Seed Resource of Species

Source	No.	Species	Seedlot
CSIRO	1	<i>Eucalyptus camaldulensis</i>	12344
CSIRO	2	<i>Eucalyptus camaldulensis</i>	14466
CSIRO	3	<i>Acacia ampliceps</i>	15741
CSIRO	4	<i>Acacia auriculiformis</i>	17966
CSIRO	5	<i>Acacia aulacocarpa</i>	16950
CSIRO	6	<i>Acacia crassicaarpa</i>	16597
CSIRO	7	<i>Casuarina glauca</i>	15941
CSIRO	8	<i>Casuarina equisetifolia</i>	15958
TARAWA	9	<i>Leucaena leucocephala</i>	
W. SAMOA	10	<i>Sesbania grandifolia</i>	
TARAWA	11	<i>Casuarina equisetifolia</i>	
NFTA	12	<i>Albizia saman</i>	825
NFTA	13	<i>Pithecellobium dulce</i>	820
NFTA	14	<i>Calliandra calothyrsus</i>	495

NFTA	15	<i>Acacia auriculiformis</i>	831
NFTA	16	<i>Acacia procera</i>	865
NFTA	17	<i>Acacia saligna</i>	755
NFTA	18	<i>Acacia auriculiformis</i>	894
?	19	<i>Albizia lebbek</i>	
PNG	20	<i>Leucaena leucocephala</i>	PNG 1
PNG	21	<i>Leucaena leucocephala</i>	PNG 2
PNG	22	<i>Leucaena leucocephala</i>	PNG 3
TARAWA	23	<i>Casuarina equisetifolia</i>	
?	24	<i>Gliricidia sepium</i>	
?	25	<i>Serianthes hooglandii</i>	
?	26	<i>Sophora tomentosa</i>	

The 26 species were planted within a fenced area, in plots of 10m x 2m with a spacing of 2m x 1m, resulting in ten plants per plot. At the time of planting, some soil from the base of *Casuarina equisetifolia* and *Leucaena leucocephala* trees plus 5 gm complete fertilizer mix was applied to all planting holes.

In September 1994, Dr. Iqbal made the following observations (as mentioned in his letter to CSIRO and NFTA of 6 September 1994): "Four species have been selected for evaluation in the development of agroforestry-based food production system. The selection was based on survival, growth and regeneration after coppicing. The species selected are: *Casuarina equisetifolia* (Tarawa), *Leucaena leucocephala* (Tarawa), *Albizia lebbek* and *Sophora*

tomentosa. *Eucalyptus* and *Acacias* did not perform well, growing very slowly and having chlorotic leaves. However, *Casuarina equisetifolia* (15958) and *Casuarina glauca* (15941) are starting to show good growth now. *Pithecellobium dulce* established well and grew reasonably well. *Gliricidia sepium* grew well only in the plots with better soil. In contrast, *E. equisetifolia* (Tarawa) and *L. leucocephala* (Tarawa) both had the best establishment of all the species, grew most vigorously, and produced several shoots after coppicing."

In October 1994 the PRAP Project's Phase I came to an end, and the trial site was left on its own. In April 1995, the author and an Associate from NFTA visited the site.

As nobody had watched the plot for half a year, the fence had gone and the trial plots (as well as the Agroforestry Plot) were open to the public. Many plants could not be located but some had survived and grown vigorously.

The following observations were made:

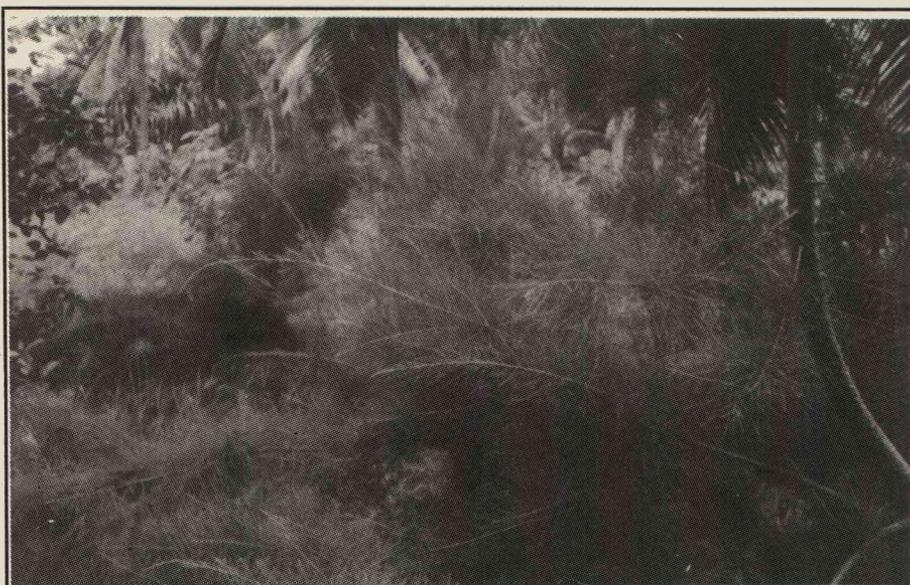
- * *Albizia lebbek* (no. 19) grew vigorously, probably due to the fact it was growing in partial shade.
- * *Leucaena leucocephala* (no. 9) grew vigorously, also due to partial shade; it was observed that this species must be the giant type, K636.
- * *Pithecellobium dulce* (no. 13) grew vigorously, but was bushy in habit.
- * *Sophora tomentosa* (no. 26) was surviving with one or two plants.
- * *Gliricidia sepium* (no. 24) was surviving
- * *Casuarina equisetifolia* lots was growing well (Tarawa and CSIRO sources).

All surviving species are highly recommendable to be used in any Agroforestry system on the atolls, except for *Pithecellobium dulce* because of its bushy and thorny appearance.

(From: E. Teunissen
APO, SPFDP, Kiribati, and
M. Powell,
NFTA Associate, USA)

Reference:

(PRAP Project - Phase 1: Sustainable Systems of Food Crop Production for the Atolls, Tarawa, Kiribati; letter to CSIRO and NFTA, 6 September 1994, and other material, with thanks to PRAP Project).



Casuarina equisetifolia, plot No. 23.

Tropical Acacias for Cyclone-Prone countries

Background

Certain tropical *Acacia* species, especially *A. aulacocarpa*, *A. auriculiformis*, *A. cincinnata*, *A. crassiparva* and *A. mangium* have outstanding potential for forestry and agroforestry in the South Pacific region. Selected provenances of these species grow rapidly, fix substantial quantities of atmospheric nitrogen and produce multi-purpose wood (utility sawn timber, poles and posts, fuelwood, high-value furniture timber and paper). *A. aulacocarpa* and *A. auriculiformis* are being planted on an increasingly large scale in south-east Asia, mainly for pulpwood.

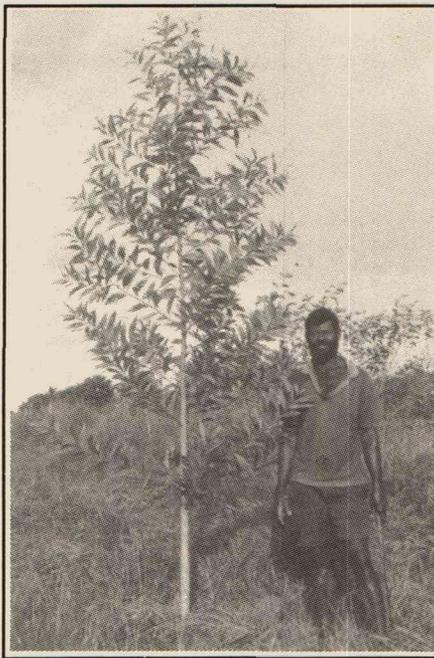
A. cincinnata has good stem form and its wood is reported to be resistant to *Teredo* marine borers, and may have a role in marine uses. *A. cincinnata* is an excellent agroforestry species with a narrow crown, ideal for growing with shade-bearing crops such as coffee, cocoa, cardamom, rattan and yams. This species appears to display the best overall resistance to tropical cyclones.

All five species are excellent fuelwoods, the principal energy source for cooking in village communities in the South Pacific. *A. auriculiformis* is amongst the best-known long term hosts for sandalwood (*Santalum* species) for which there is strong interest in several South Pacific countries, including Fiji, Vanuatu and Papua New Guinea.

The five tropical *Acacia* species have been trialed throughout the South Pacific including Fiji, Cook Islands, Solomon Islands, Tonga, Vanuatu and Western Samoa. Growth rates and adaptability have typically been very good or outstanding. The only factor limiting their wider planting is susceptibility to tropical cyclones, which occur at frequent intervals over much of the region, for example, the islands, of Fiji have experienced 177 cyclones in the past 133 years. The crown of trees may either break off or saplings may be blown over during cyclonic winds.

During 1991, the Pacific Australia Reforestation Company (PARC)/Pacific Reforestation (Fiji) Ltd (PRF) established 10 hectares of *Acacia* species/progeny trials at Laulau, south east Viti Levu, Fiji. These trials included an extensive array of selected germplasm of *A. aulacocarpa* (PNG origins), *A. auriculiformis* (PNG and North Queensland origins), *A. crassiparva* (PNG origins), and *A. mangium* (PNG and Claudie river, north Queensland origins), and a limited trial of *A. cincinnata* (from two provenances in north Queensland).

In early January 1993, cyclonic winds and flooding from the adjacent Rewa River, associated with the slow-moving Cyclone Kina, caused extensive damage to *Acacia* trees in the Laulau trials. *A. auriculiformis* (north Queensland provenances) and *A. cincinnata* showed better wind resistance than other species/provenances. However in each species, a number of individual trees were observed to have suffered minimal damage. The severity of Cyclone Kina, variations in cyclone damage over short distances and aspects of the trial design make it difficult to determine the rela-



Acacia auriculiformis - 14 months old Laulau, Fiji. (ex north Queensland Q67). Cyclone - resistant ideotype: straight tapering bole and fine horizontal branching

tive importance of the genetic component in cyclone resistance in the five *Acacia* species. However, there is evidence of a genetic component to wind resistance in other tropical tree species such as *Pinus caribaea*, and there would appear to be good scope for selecting and breeding for improved wind/cyclone resistance in tropical *Acacia* species. Multi-purpose tropical *Acacia* tree species have an excellent potential to contribute to sustainable development in the South Pacific but planting is limited due to the risk of cyclone damage.

Outline of Research Program

In Year 1 (1995), the most promising individual trees of each of the five species in the Laulau trials will be selected for aerial layering (marcots). Preliminary marcotting trials in 1993/94 indicated that marcots can be successfully taken from each of the five species, although with some difficulty for *A. cincinnata*. The marcotted plants will then be grown in large pots at an established nursery site. A series of experiments will be conducted to optimise rooting and vegetative cuttings propagation in each *Acacia* species. These experiments will determine suitable cutting size (number of nodes/cutting length), phyllode area to be retained, hormone pre-treatments (including auxin type(s), concentration/amount and method of application), and suitable media (trials of mixtures of ground coconut husk, washed river sand, peat moss and water holding polymers).

In Year 2 (1996), it is proposed that *Acacia* clones be multiplied to provide sufficient planting stock for replicated field trials in different locations in Fiji. These trials are to be established in collaboration with groups interested and involved in undertaking reforestation activities including the Forestry Department, and a village community. The objective is to evaluate

the performance of the species/clones, especially their wind firmness and resistance to cyclone damage. The trials will be designed to assess the genetic component of wind/cyclone damage. Secondary objectives would include assessment of different species/clones as permanent hosts for Sandalwood (Fiji Forestry Department), efficiency at suppressing weed growth and green firebreak potential, and evaluation of selected agroforestry/intercropping systems.

The trials will continue to be monitored for a period of at least five years, including annual growth/form assessment and assessment of damage after the passage of each cyclone. The results will be widely disseminated in the region through various newsletters including the South Pacific Forestry Development Programme's newsletter, ACIAR Forestry Newsletter and Nitrogen Fixing Tree Research Reports, and species/clones will be made available to non-government and government organisations in other South Pacific Island developing countries.

(by Lex Thomson
Reforestation Scientist
Pacific Australia Reforestation Company, (PARC)
Australia.)

New timber mills to create jobs in Fiji

About 150 jobs will be created by a major new timber processing and export business at Deuba and Lautoka.

Fenning Pacific Limited, part of a well-known Australian Group, has purchased a partly completed sawmill at Waivunu, near Galoa, and a timber processing yard at Navutu, Lautoka.

Leonard Fenning, chief executive of the Fenning Group, said an initial export consignment of kiln dried, dressed and moulded timber, would be shipped to Belgium at the end of July.

Following construction of buildings and installation of state-of-the-art sawmilling equipment, the Waivunu mill is now ready for commissioning. It will supply timber to the Lautoka complex for further processing and drying.

He said the venture was receiving excellent support and encouragement from Government, landowners from the *vanua* of Burenitu, the Native Land Trust Board, the Fiji business community and local contractors.

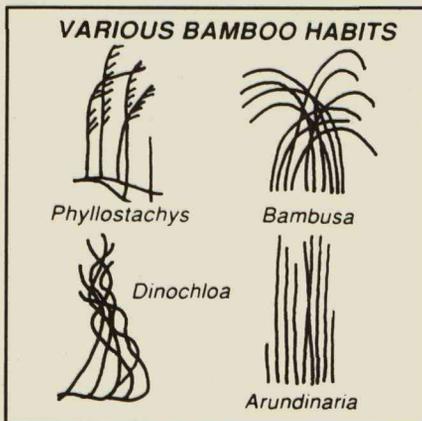
Mr. Fenning describes Fiji's forests and having excellent potential for responsible commercial development.

The country has prime species which could be harvested at a sustainable level. Fenning Pacific expects to harvest and process about 50,000 cubic metres of timber annually, mostly for overseas markets.

Mr. Fenning estimates that the company will employ about 100 people at Waivunu and 50 at Lautoka. The Fenning family has been involved in the Australian sawmilling industry for nearly 50 years.

(Extracted from:
Fiji Times
Tuesday May 1995)

Bamboo - An Introduction



Compared to timber, bamboo has generally been classified as a minor forest produce. This, however, belies the fact that an estimated 2.5 billion people depend on or use bamboo. It is the most universally useful plant known to man and its myriad uses have given rise to many epithets - "poor man's timber", "green gold," "the cradle-to-coffin timber," etc. Bamboo has been used for handicrafts in China and India since 5000 B.C.

Bamboos are used as material for paper pulp, parquet, plywood and particle board. More traditional uses are for making furniture, fishing rods, arrows, quivers, chopsticks, containers, matting, fans, light bridges, handicrafts, buildings, scaffolding, basketry, sun blinds,

water conduits, ladders, etc. Bamboo is also becoming popular as a houseplant and as an ideal plant to check soil erosion and conserve soil.

Bamboos are a unique group of giant grasses that belong to the sub-family *Bambusoideae*. It is reported that over 1250 bamboo species in 75 genera occur in the world, and most of it is available in Asia. Five genera occur naturally in Africa, 11 in South America and two in USA. Bamboos are distributed largely in the tropics, although they are found naturally in all subtropical and temperate zones except in Europe.

Most bamboo is gathered from the wild or village groves. Approximately 20 million tonnes of bamboo are harvested every year.

The mature culm (stem) and young shoots are the commercially important parts of bamboo. The woody culm of many bamboo species is very strong, yet flexible and light. Bamboo fibre is one of the strongest organic materials known. The culm of almost all bamboo species is fast-growing. In fact, it grows faster than any known fast growing wood species (sometimes four feet in a day!). Depending on the species, it varies in height from 2-4 to 30-35m and in diameter from 2-5 to 30-35cm. The culms grow singly or in a clump.

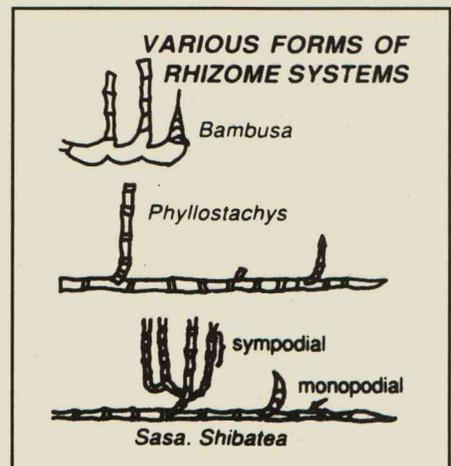
Bamboo shoot is high in protein, mineral and vitamin content and low in fat. It has had a respectable place in oriental cuisine since ancient times, and is fast establishing its name as an ideal food among the health-conscious people of the modern world.

References

Research Needs for Bamboo and Rattan to the Year 2000, IDRC, 1991. *Proceedings of a Workshop on Design and Manufacture of Bamboo and Rattan Furniture*, FAO and IDRC, 1990.

Bamboos Current Research - *Proceedings of the International Bamboo Workshop*, KFRI-IDRC, 1988. (Readers are referred to *A Guide to the Collection of Bamboo* published by the IDRC Bamboo/Rattan Network)

(Extracted from INBAR Newsletter No. 5 December 1994)



Alley Cropping Questioned

In an article, *Alley Cropping, Ecological Pie in the Sky?*, *Agroforestry Today* 6:(3):8-10, 1994, Chin Ong has this to say:

Formal research on alley cropping began in the late 1970's at the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria. Researchers' positive results on crop yield in alleys stimulated enthusiasm throughout the tropics for further research, and for extension of the technology to farmers. Alley-cropping research continues today in many institutes in the tropics but the results obtained thus far have been mixed. IITA researchers have also had difficulty reproducing the positive results on working farms under farmer management.

ICRAF recently synthesized alley-cropping results from its own research network and found serious experimental and interpretational problems in much of the research. Furthermore, over half the results on alley-cropped maize yields were negative. The evidence from the long-term trials indicates that because of experimental and interpretational problems, researchers have probably overestimated the capacity of the technology to increase crop yield. Such problems are not unique to alley-cropping experimentation and are probably common to all agroforestry technologies, whether they do or do not involve simultaneous or rotational tree-crop systems.

Small plot size is probably the single most important

reason that positive results in on-station trials are difficult to reproduce on farmers' fields. Researchers should be more realistic about the rate mulch is applied in alley-cropping experiments. In sites with highly acidic soils and low moisture, alley-cropping is not suitable; the technology should not be recommended in any area with low soil fertility.

After a decade of efforts to promote its potential benefits, research on alley-cropping research is sound and rigorous, as any scientific endeavour must be.

(From *International Society of Tropical Foresters ISTF News Vol. 16 No. 1 March 1995*)

Plantation timbers 'should be promoted'

Consulting engineers across Australia are urging their clients to use plantation timbers in a bid to help preserve the nation's old-growth forests. The Association of Consulting Engineers Australia has told its members to promote the use of plantation timbers above native hardwoods wherever possible and practical.

The association's chief executive officer, Mr. Geoff Crittenden, referred to the woodchip debate and the destruction of the old-growth forests and said, 'we decided perhaps we ought to do our bit.' 'What we are suggesting is that where it may be traditional or common practice to specify Australian hardwoods, under certain circumstances our members should look for alternatives.'

Mr. Crittenden said plantation softwoods and hardwoods would satisfy various building codes in many cases. Composite beams, steel

and concrete were other alternatives. The move would call on greater skills in engineers but it was a viable and achievable goal.

Australia was importing 23 per cent of its plantation timber requirements and steps needed to be taken so that it became self-sufficient in softwood and hardwood plantations. 'I don't want to get into the political arena but there needs to be encouragement for landowners and pulp and paper people to look at encouraging plantation growth,' Mr Crittenden said. 'We recognise that we cannot go on using Australian native hardwoods in construction if there's terrible waste.' Australia should follow Europe's lead and start using softwoods as much as possible in construction. Engineers were already extremely environmentally conscious.

The association represented about 90 per cent of consulting engineers and Mr Crittenden believed its stance on hardwoods was unique.

'We specify the timbers and we know what stresses and strains go into construction. It's up to us to take a lead,' he said. There would be no overnight results but it was a start. It's only a small thing but it could be an important thing,' Mr Crittenden said. 'It's as much our way of trying to ask our clients to take this approach - if the client wants things to be built in native hardwood it's up to us to persuade them otherwise.'

Mr Crittenden conceded the use of materials other than Australian hardwoods would mean greater expense to the client due to the necessity for clever engineering.

However, he agreed that if Australia grew more softwood and hardwood plantations the cost differences would drop.

(From: *The Weekend Australian April 29-30, 1995*)

Cont'd from page 1

Forestry Project and Fiji Forestry Department. The objectives of the study tour are to enable foresters and other interested persons to share their experiences and knowledge on the use and management of their forest resources, and to promote a better understanding of indigenous forest management. The tour will include visits to the Fiji-AusAID Forest Resource Tactical Planning Project, Fiji-GTZ Natural Forest Management Pilot Project, Rewa mangrove forests, and other related activities. The study tour will be funded by GTZ Regional Forestry Project and Fiji Forestry Dept. The participants from PNG will be funded by their Government and SPFDP.

Updating Directory of Oceania Forest Sector

Our request for updated information for the above Directory has resulted in some responses trickling in. *We would like to make a last appeal for those who have not responded, especially with their list of forests and trees activities (please see March 1995 issue of this newsletter), to do so before 15 July 1995.*

Watershed Management Roving Workshops

Owing to the strong, positive responses from the participating national agencies to the roving workshops organised in 1993, a follow-up series of workshops will be conducted in August/September 1995. The same resource per-

sons, Mr. Pradip Baisyet of the UNDP/FAO Watershed Management Project in W. Samoa and Dr. James McKean of USDA Forest Service, have kindly agreed to be available again. The workshops will be supported by the USDA Forest Service, SPFDP and the Governments of the participating countries (likely to be Cook Islands, F.S. Micronesia (Kosrae), Palau and Tonga).

Study of Mangroves of Kiribati

Mr. William Metz of the USDA Forest Service has been proposed for the above study, which has been provisionally scheduled from 20 August - 30 September 1995. This study will be jointly supported by the USDA Forest Service, SPFDP and the Government of Kiribati.

Announcements

Environmental Management - a Gender Balanced Approach Australian National University, Canberra, 6 Nov - 8 Dec 1995

This innovative course recognises that effective and sustainable environmental management requires the contributions of all members of the community, both women and men.

The course, therefore, will provide skills in recognising, supporting and developing the capabilities of women and men in natural resource management. It will consider methods of gender-balanced environmental impact and social management and negotiation, amongst others.

The course is designed as a professional development short course to provide new and important skills to all persons involved in natural resource management.

Both women and men are encouraged to apply. The comprehensive course fee covering all tuition and subsistence costs (including accommodation and meals) is A\$9,700.

Any further information can be obtained from:

Course Coordinator
ANUTECH Pty Ltd
Australian National University
Canberra, ACT 0200
Australia
(Tel. 616 249 5671; Fax 616 249 5875)

International Short Course on Sustainable Tropical Forest Management

The Faculty of Forestry, with the cooperation of the Forest Research Institute of Malaysia (FRIM) and the Forestry Department, Peninsular Malaysia, are organising a course on Sustainable Tropical Forest Management at the University of Agriculture, Malaysia campus from 20th November to 2nd December, 1995.

Objectives

The course is targeted at middle level and mid-career forest managers, natural resource managers and researchers in the field of tropical forestry and natural resources. The aims of the course are:

1. Present the state of the art and methodologies applied in tropical forest management.
2. Inform participants of new information on the planning, management and silviculture of tropical forests as practised in Malaysia.
3. Present development of the state of the art technologies in information sciences such as GIS and forest modelling, and
4. Inform participants of global issues of forestry and environment and how these issues affect sustainable tropical forest management, such as biodiversity, climate change and sustainability.

The course will cost US\$1,200 per participant, which will cover all course materials, food and lodging as well as cost of field trips.

The course will be conducted in the English language. The deadline for applications will be 30th July, 1995 and all applications must be submitted to:

Dr. M.N. Salleh,
Course Director, Course FHSC 1/95,
c/o Dean of Forestry,
University Pertanian Malaysia,
43400 Serdang,
Selangor Darul Ehsan, Malaysia

For participants from lesser developing countries, there may be scholarships available to sponsor their participation.

Conference on Tree Improvement for Sustainable Tropical Forestry Caloundra, Queensland, 27 Oct - 02 Nov 1996

Background

The growing world-wide emphasis on sustainability of natural resource management has profound implications for plantation forestry. The land base available for plantations is finite and demands for forest products continue to increase. Producers of plantation-grown timber will have to demonstrate that their management practices are sustainable in the long term. Small-scale farm forestry must strive to achieve sustainability, to prevent run-down of the resource base of tropical farmers. This QFRI-IUFRO conference, to be held in Caloundra, Queensland, Australia in November 1996, will focus on practical ways in which tree improvement workers are taking into account considerations of sustainability, and interacting with other forest disciplines to achieve truly sustainable management of tropical plantations.

Post-conference tour in North Queensland 03-07 Nov. 1996

Participants at the conference will be able to unwind on this five day post-conference tour, which will combine an interesting and diverse technical program with the breathtaking scenery and famous attractions that tropical North Queensland is renowned for. Technical inspections will include tropical pine and acacia tree improvement programs and the domestication of species for use in community rainforest planting programs. Other attractions include a visit to the tropical aquarium at Townsville, a marine studies tour of the Great Barrier Reef and a skyrail ride from Cairns to Kuranda through the spectacular World Heritage listed tropical rainforest.

Further information contact:
1996 QFRI-IUFRO Conference
Queensland Forest Research Institute
M.S. 483, Gympie, Qld., 4570
AUSTRALIA

TO:

Pacific Islands FORESTS & TREES

The views expressed in the articles in this newsletter are those of the respective authors, and do not necessarily reflect the views and policies of the Project, FAO or UNDP.

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