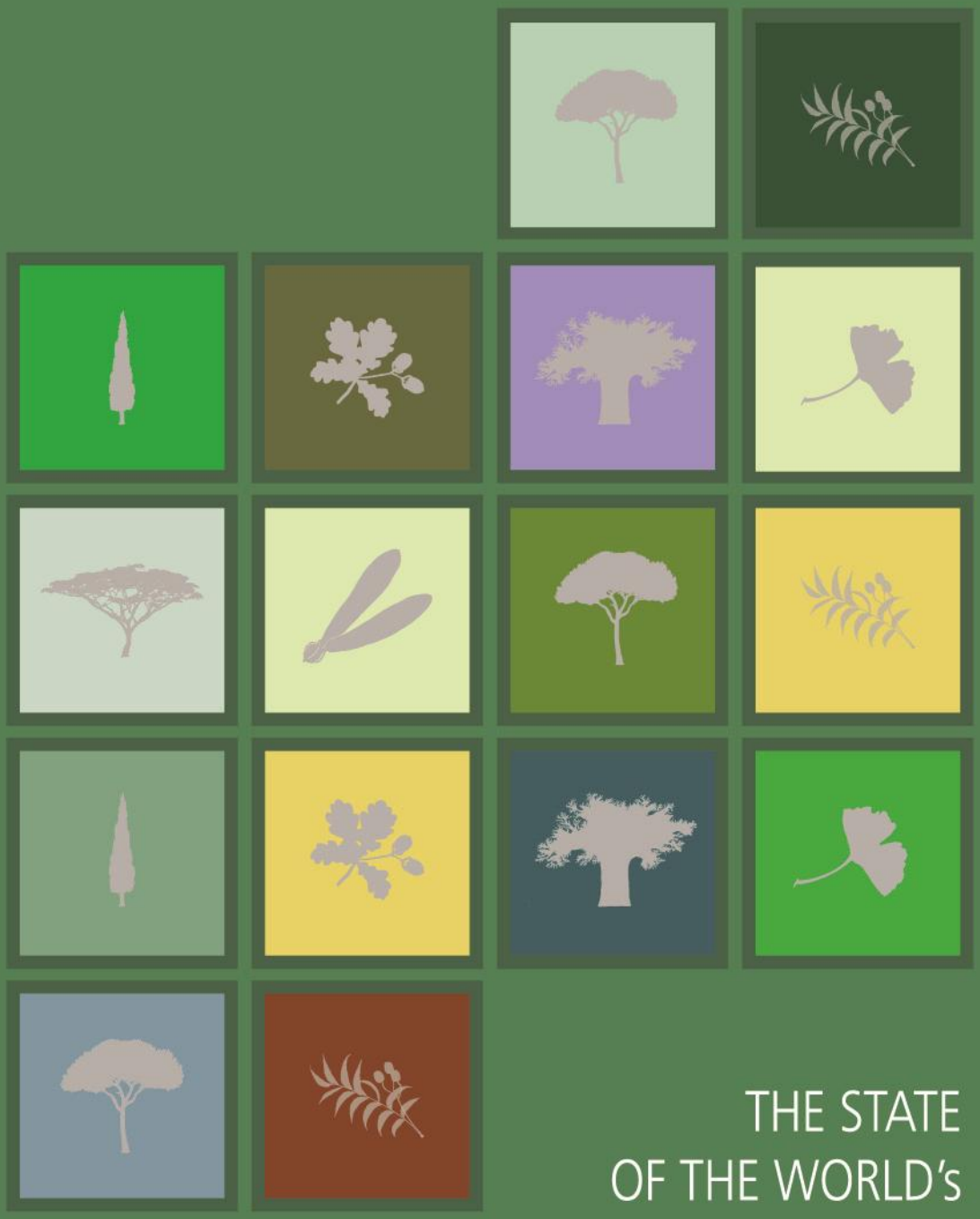

THE STATE
OF THE WORLD's

FOREST GENETIC RESOURCES

COUNTRY REPORT

VANUATU

This country report is prepared as a contribution to the FAO publication, The Report on the State of the World's Forest Genetic Resources. The content and the structure are in accordance with the recommendations and guidelines given by FAO in the document Guidelines for Preparation of Country Reports for the State of the World's Forest Genetic Resources (2010). These guidelines set out recommendations for the objective, scope and structure of the country reports. Countries were requested to consider the current state of knowledge of forest genetic diversity, including:

- Between and within species diversity
- List of priority species; their roles and values and importance
- List of threatened/endangered species
- Threats, opportunities and challenges for the conservation, use and development of forest genetic resources

These reports were submitted to FAO as official government documents. The report is presented on www. fao.org/documents as supportive and contextual information to be used in conjunction with other documentation on world forest genetic resources.

Vanuatu Country Report

for

The State of the World's Forest

Genetic Resources

Prepared by:

The Forestry Department
Ministry of Agriculture, Quarantine, Forestry and Fisheries
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September 2012

SECTION II: INTRODUCTION TO THE COUNTRY AND THE FOREST SECTOR

1. INTRODUCTION.

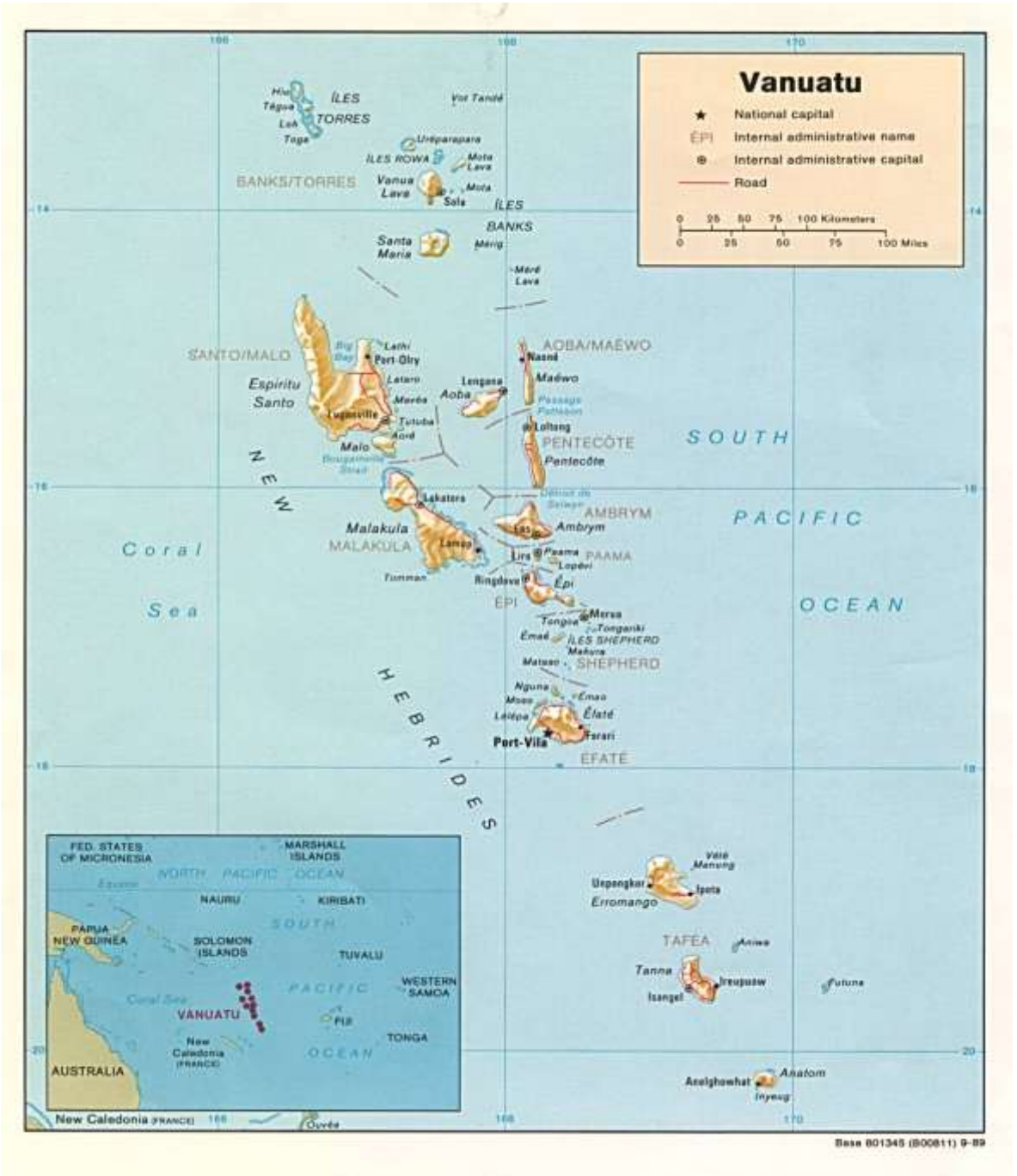
A. THE COUNTRY

Vanuatu is made up of some 80 islands with a total land area of about 1,226,905 hectares. There are 68 inhabitant islands. By mid 2011, the total population is 251,784 (SPC-SDP) and 80 percent of whom live outside the two main urban centres of Port Vila and Lugainville (Agriculture censes, 2006). The rate of population increase for the whole country is 2.4 and that of ni Vanuatu alone is 2.8. A population density of 17 people to one square kilometer.

The country has a dualistic economy, with a large smallholder subsistence agricultural sector and a small monetised sector. The monetised sector consist of plantations, ranches and associated trading, manufacturing, banking and shipping services, as well as the country's tourist industry. Copra is the most important cash economic activity in the rural sector. At present, about 69,000 hectares of land are under coconut plantation, producing 50,000 tons of copra a year. Nearly all exports are primary goods (coconut products, beef, cocoa, coffee and timber)

Vanuatu is still largely an agriculture-based economy with copra, cocoa, kava and cattle continuing to dominate the sector. Since 2003, the agriculture sector has grown at an annual rate of 3.3 percent compared to 2.8 percent growth for the economy and an average population growth rate of 2.6 percent per annum.

Fig. 1 Location Map of Vanuatu



B. THE FORESTRY SECTOR

The Government of Vanuatu is strongly committed to ensuring that its forests are managed on a sustainable basis. Forestry is important to rural communities as in many cases it is one of their main sources of cash income. Over 500 people are estimated to be formally employed in 1997 in forest operations and fixed sawmills and wood processing industries.

The major areas of commercial forest occur on the larger islands of Santo, Malakula, Erromango and Efate, with smaller areas on the islands of Gaua, Ambae, Ambrym and Tanna. There is a

total of 205,000ha of mid height forest and 234,000ha of low forest throughout the country. The details of the various vegetation classes found in Vanuatu are given in Table 1.

Forests/Tree Resources

A National Forest Inventory to identify the forest resources of Vanuatu was completed in 1993. The major areas of commercial forest occur on the larger islands of Santo, Malakula, Erromango and Efate, with smaller areas on the islands of Gaua, Ambae, Ambrym and Tanna. There are a total of 205,000ha of mid height forest and 234,000ha of low forest throughout the country. The details of the various vegetation classes found in Vanuatu are given in Table 1.

The National Forest Inventory estimated the total forest resource at about 13 million m3. However only about 20% of the total forest resource is thought to be commercially available, owing to factors such as steep slopes, dissected landform, low sawlog volumes and cultural reasons. The average commercial sawlog yield is rather low by international standards at around 15 m3 per hectare. The sustainable level of harvest from Vanuatu's forests has been estimated to be in the range of 38,000-68,000m3 of logs per year depending on the assumptions that are used.

Table 1: Vegetation Cover of Vanuatu

Vegetation type	**Area (ha)**	**Percentage of land area**
Midheight forest (20-30m)	205,307	16.73
Low forest (10-20m)	234,089	19.08
Woodland (<10m)	386	0.03
Thickets (3-8mm)	433,941	35.37
Scrub (<3m)	45,018	3.67
Grassland	51,128	4.17
Swamp communities	2,261	0.18
Mangroves	2,519	0.21
Bare ground/human made	252,256	20.56
Total land area	1,226,905	100.00

Source: Vanuatu National Resource Inventory System (VANRIS).

Classifications and descriptions as defined in the	**Definition**

Vanuatu Resource Information System (VANRIS) **Vegetation Type**	
Forests	Land with forest having tree canopy greater than 10m in height. This includes mid height forests of 20-30m and low forests10-20 meters. The main type of forests that contain most of our commercial timber species for timber productions
Wood land (<10m)	Forest areas with separated crowns, generally <10m tall. A clearly visible ground layer of herbs and /or small grasses.
Thickets (3-8m)	Forests with dense canopy of poorly formed trees and/or or other arborescent life forms 3 to 8 m tall and no ground layer being visible.
Scrub (<3m)	Forests that are dense to open layer of shrubs and <3m tall.
Grassland or Herbaceous communities	Land covers consisting of grasses, sedges, herbs and low woody shrubs. Few scattered trees may be present
Fresh waterSwamp communities	Land having a complex comprising thicket, scrub and herbaceous vegetation. It is subjected to permanent or near permanent inundation. Other where possible it can be mapped as woody or herbaceous.
Mangrove communities	Forest areas also having a complex comprising low trees, shrubs and herbs subjected to tidal inundation
Bare ground/man made	Land areas where there is man made activities going on. It could be agricultural subsistence farming or any other activities or development made by inhabitants within the area

The area of plantations in Vanuatu is shown in Table 2. Local Supply Plantations are located throughout Vanuatu and range in age from 12 to 20 years. The National Forest Policy aim is to establish 20,000ha of plantations in Vanuatu over the next 20 years and negotiations are continuing with several companies to encourage investment in commercial timber plantations. Some discussions have been held recently on the possibility for wood-energy plantations.

Table 2: Area of Plantations within Vanuatu

Type of Plantation	Area (ha)
Local Supply Plantations	1,160
Aneityum Pine Plantation	890
Ipota Industrial Forest Plantation (IFP)	260
Shark Bay, East Santo, IFP Research Plantations	350
Melcoffee Whitewood Plantation	250
Total	**2,910**

Land tenure system in the country is simple but complex, there is a national council of Custom Chiefs of the republic called Malvatumauri. One of the important role of this council is to look after the customary landownership system and making it effective. The entire land in the country is owned by the customary landowners. A man who is a true custom landowner is one whose blood originates directly from the *nakamal* (men's house), *varea* (village), or *nasara* (dancing grounds, public square, ritual clearing or place) associated with that land. If a man's heritage traces to that place, he may resume the titles and ownership of its lands. In parts of the country the right to own the land is through women but the majority is by the men. Depending on the size of a family each individual has a right to a piece of land allocated by the head of the family.

Extent of Forests

The production forests of Vanuatu occupies around 36 percent of the total land mass (FRA 2005). This data was based on the interpretation of the 1988 aerial photography with data analysis completed in 1993.

71 percent of Vanuatu's land mass is covered by other vegetation types including forests, classified according to the following categories; Mid height forests (20-30m) which covers 205,307 hectares, Low forests (10-20m) covering 234,089 hectares, Woodland (<10m) covering 386 hectares and Thickets (3-8m) 433,941 hectares; elaborated as percentages in figure 1. These figures have not been verified or updated for the last two decades.

The production forests comprised of the Mid-height forests and low forests, which constitutes 36 percent of the total land mass (Figure 1). Up until the 90s, log harvesting activities were undertaken by the medium scale logging companies, acquiring licenses for harvesting of more than 100,000 cubic meters of logs per year. Until recently, the medium logging activities have scaled down and the main logging activities currently have been undertaken by portable or mobile sawmills.

Forest Ownership

All forests in Vanuatu are traditionally owned. This traditional ownership of forests is based on the ownership of land, which is determined by custom and enshrined in Articles 73 and 74 of the national Constitution.

The traditional ownership could have both a positive as well as a negative effect on forest management. On the positive note, the nature of forest ownership favours land and forest owners to participate in forestry activities. In Vanuatu, the majority of portable mills are owned either by landowners or community groups who own land and forests. Landowners have also participated enormously and have taken the lead in reforestation activities. The draw back with traditional ownership is that all government management plans have to be approved by land and resource owners before it can be implemented. The lengthy process involved could also have an impact on potential forestry investors.

The National Forest Policy has recognizes the need for landowner participation in forest plantation investment and thereby calls for joint venture investments between investors and landowners. The aim of this policy requirement is to ensure maximum land and resource owner participation in forestry developments, and also to provide security for the investment.

All forestry development initiatives are to be negotiated with respective landowners. A few of the successful conservation and protected areas in Vanuatu are community based, and the management has been successful due to community participation and ownership.

The Laws of Vanuatu does allow for land to be leased for development. Land leases can be up to 75 years and renewable upon expiry. The 75 years timeframe would be sufficient for two to three rotations of managed hardwood plantations. Currently around 10,000 hectares of land is under lease for forestry plantation developments.

Production Forests

Forests for timber production are concentrated in the Mid-height and Low forests. However, with the current operations of mobile sawmills, merchantable logs could also be salvaged from the Woodland and Thicket forests. For the purpose of this report, timber production areas are areas classified as forests (Table 1) and covers 36 percent of the total land mass. Timbers extracted from the Woodland and Thicket forests forms a very small percentage of all timber produced annually.

Non-timber forest products (NTFPs) and minor forest products form an important produce of the forest. Fuel-wood, building and construction materials, food (including nuts, fruits and spices, bush meat and water) fodder and medicine are all important products supplied from forested as well as non-forest areas. The non-timber forest products could also be harvested from the Mid-height forests, Low forests, Woodland and Thicket forests, and also from the Mangrove forests

and Scrub land areas. The total land area that produces non-wood forest products therefore represents 79 percent of the total land mass.

Sustainable Forest Management in Vanuatu

The sustainable management of Vanuatu's natural wealth including forest has been enshrined in Article 7 of the National Constitution. The Forestry Act and the National Forest Policy further sets in detail the SFM requirements and to certain extent detailed sustainable management requirements for all forests in Vanuatu. The Code of Logging Practice sets the criteria for forest harvesting, aiming at limiting adverse environmental impacts, and sets guidelines to achieve SFM.

The National Forest Policy defines sustainable forest management as "the management of a forest estate to produce a sustainable yield of timber and non-timber forest products over hundreds of years". It also noted the importance of the sustainable management of ecological aspects that inter-link with the well being of forests. The National Forest Policy provides as the Government's guideline toward management of all forests in Vanuatu including forest conservation, reforestation activities and forest plantation establishment.

CONTRIBUTION OF FORESTS & TREES TO ECONOMY AND ENVIRONMENT.

The Government of Vanuatu is strongly committed to ensuring that its forests are managed on a sustainable basis. Forestry is important to rural communities as in many cases it is one of their main sources of cash income. In addition to the commercial forestry operations the forests provide a wide range of products into the subsistence lifestyle of most of the ni-Vanuatu people. The main benefits of the commercial forestry operations in Vanuatu are spread between the landowners, the people who work for the timber companies, the timber companies and the government. In 1997, the landowners were paid about Vt 34 million (US$260,000) in royalties for 37,000 m^3 logs, the forestry workers were paid an estimated Vt 120 million in wages and the government collected about Vt 25 million in fees and taxes. Over 500 people are estimated to be formally employed in 1997 in forest operations and fixed sawmills and wood processing industries. Several hundred more are estimated to be involved on full or part-time basis with mobile sawmills.

The forest and trees in Vanuatu are an important component of the environment in the country. They have been part of the life of the people in the past up till now. Products from trees and forests are not the only benefit provided, they also serve as protection, control of soil erosion, providing and purifying water systems and improving and maintaining agricultural products.

Coastal areas in the islands are protected mostly by the coastal vegetation. The trees roles as protection from strong wind/cyclones which visited the country least twice a year. Protected the land from eroding away by the sea. Also other values they provide like habitat for the wild life and a source of other materials like medicine and fuel wood for the locals.

Trees and the forest in the catchments areas are important to maintain the water level and quality for the local people and wild life. It has become obvious that with the disturbance or removal of trees and the forest at the catchments areas often the water level drops or the river gradually disappears. With the increasing need to earn some cash, people go into developments ignoring the roles of trees and forests. Some villages in the country are now next to contaminated rivers. For small islands water is very essential and shortage of it is a serve problem.

Soil erosion problem is one that results from removing trees and the forests, especially at the coast and river bank and steep slopes. Removal of trees for timber resulting with grasslands and continues burning is a serious problem in Anietyum island in the southern part of the country. The department of forest has been with the assistance of the New Zealand government have been working together to fight the erosion problem.

Forests and trees are continued to be removed and mostly for the purpose of agriculture. Much land is cleared for the establishment of the plantation of coconut, cocoa and coffee and cattle grazing. There is also subsistence farming and to mention the grassland resulting from continues burning. There is a need for the forest and trees in the agriculture system to improve and maintain agriculture productivity.

1 Status of forest and trees sector in national context

Forestry is an important sector to the Vanuatu government and also to the rural communities, as in many cases it is one of their main sources of cash income. In addition to the commercial forestry operations, the forests provide a wide range of products into the subsistence lifestyle of most of the ni-Vanuatu people. The main benefits of the commercial forestry operations in Vanuatu are spread between the landowners, the people who work for the timber companies, the timber companies and the government. For the above reasons, the Government of Vanuatu is strongly committed to ensuring that its forests are managed on a sustainable basis. In 1999, the landowners were paid about Vt 36 million (US$280,000) in royalties for 40,000 m3 logs. It is estimated that the forestry workers were paid around Vt 120 million in wages and the government collected about Vt 35 million in fees and taxes. Over 500 people are estimated to be formally employed in forest operations and fixed sawmills and wood processing industries. Several hundred more are estimated to be involved on full or part-time basis with mobile sawmills.

The forestry sector contributes significantly to the export earnings of the country, usually ranked second or third of the commodities behind copra and kava. The value of forest products exported has been increasing dramatically and has more than doubled in the past 5 years from Vt 255 llion to Vt 536 million (US$4.1m) in 1999. This represented around 13% of the country's total export earnings in 1999. However, there is generally a low level of understanding of forestry issues and contributions of the forestry sector by politicians, policy makers, urban and business community. Rural people have an appreciation of income potential in areas where forestry operations occur ut

are not familiar with the complexity of management or legislation due to generally low levels of education. The development of the National Forest Policy in 1997 was very useful to raise awareness of the importance of the forestry sector with many stakeholders.

The National Forest Policy outlines the major stakeholders in the forest sector as National Government, Department of Forests, Provincial Governments, Customary Chiefs, Landowners and Communities, Forest Industry, and Non- Government Organisations. The policy describes the role of the national government is to establish forest policy and determine how the forests should be managed. The Government will enact forestry legislation and issue timber and sandalwood licences for forestry enterprises. It shall ensure the provision of adequate resources (ie. trained staff, funds) to implement the National Forest Policy. The Department of Forests will implement the National Forest Policy and the forestry legislation. It will promote the sustainable management of forest resources for both timber and non-timber benefits. It will approve utilisation operations agreements and ensure that the Code of Logging Practice is implemented. It will collect information about forest resources, conduct forest research and facilitate the development of commercial plantations and agroforestry systems. It will provide advice on forest conservation, protected areas and National

The main issues to be faced in the forestry sector in the short term include:

• the implementation of the Code of Logging Practice
• the training of forest operators and timber processing workers
• the securing of land and investors for plantation development
• implementing silvicultural guidelines and reduced impact logging for native forest harvesting
• the development of export markets for value added forest products
• implementing improved control and management of mobile sawmills
• the identification and protection of important conservation sites
• implementing the Biodiversity Trust fund for conservation reserves

The main issues to be faced in the forestry sector in the medium term (3-8 years) include:

• improved silvicultural knowledge for the commercial species
• development of forest management plans
• develop estimates of the sustainable yield of sandalwood
• reduced concentration of logging on main islands - diversify operations
• increased involvement of landowners in planning and managing logging operations
• encourage landowners to maintain forested areas as forest to develop a permanent forest estate
• encourage landowners to replant commercial tree species for future harvesting

• identify potential non-wood forest products and encourage landowners to plant or protect these nonwood forest products

2 Organisation and structure of Department of Forests (to be updated!)

2.2 Forest sector organizational set-up and stakeholders

A forest policy also defines the roles and responsibilities of the various actors involved. In the following, the present roles and responsibilities of the stakeholders in the sector are briefly described.

National Government

The responsibility for the regulation and administration of the forestry sector throughout Vanuatu rests with the National Government. It enacts forestry legislation It ensures the provision of adequate resources (i.e. trained staff, funds) to implement the National Forest Policy. The National Government consults with Provincial Governments on relevant forestry matters. Forestry falls into the domain of the Ministry of Agriculture, Forestry and Fisheries (MAFF). A forestry board provides advice to the Minister and the Prime Minister on forestry issues, particularly forest use negotiations and forest policy. The Forestry Board consists of the Directors of Forestry, Environment, and Lands.

Department of Forests

The Department of Forests (DoF) has the administrative responsibility to manage the forestry sector throughout Vanuatu. It leads the implementation of the National Forest Policy and implements and enforces the forestry legislation. The Department of Forests issues licenses and permits for forestry enterprises. It promotes the integral and sustainable management of all forest resources for the supply of products and services. It approves utilization operation agreements and ensures that all forest-related orders and codes are implemented. It collects information about forest resources, conducts forest research and facilitates the development of commercial plantations and agro-forestry systems. It provides advice on forest conservation, protected areas and National Parks. The DoF provides forest policy advice to the Government and ensures the sustainable management and conservation of Vanuatu's forests.

Other National Government institutions

The DoF cooperates with other national government agencies such as the Department of Lands (DoL), Department of Agriculture and Rural Development (DARD), Department of Environmental Protection and Conservation (DEPC) and the National Advisory Committee on Climate Change (NACCC) to implement and support the various strategies under this National Forest Policy. The Departments of Finance (DoFi), Customs (DoC), and Industry, Trade and Commerce cooperate with the Department of Forestry to strengthen the forest industry.

Provincial Governments

The Provincial Governments (PG) issue Business Licenses, assist with the development and implementation of provincial land use plans, and facilitate the development of forest industries and plantations as well as the necessary supporting infrastructure. They facilitate the protection of conservation areas identified by landowners and assist in the resolution of landowner disputes.

The Provincial Governments assist the DoF in providing advice to communities and in monitoring forestry operations. The DoF consults the Provincial Governments about forestry operations, including the issue of timber licenses and annual logging plans.

Customary Chiefs
The DoF recognizes the role of customary chiefs and cooperates with them in matters such as notification of logging plans, identification of tabu sites, and resolution of disputes.

Landowners and Communities
Landowners decide how their forest resources are managed. They identify land boundaries and assist the DoF in monitoring forestry operations. They are involved in harvesting, mobile sawmilling and tree planting on their land. Communities assist landowners in decisions on forest resources management and are encouraged to actively participate in forest development.

Forest Industry
The forest industry negotiates with landowners on areas for timber harvesting and tree planting. The industry prepares logging plans and implements these in accordance with the Code of Logging Practice. The industry cooperates with the government in developing rural infrastructure as well as a skilled rural workforce. It develops value-adding timber processing facilities that provide competitive forest products for domestic and export markets. It finances the implementation of afforestation and reforestation efforts and assists the DoF in research.

Non-Government Organizations
NGOs with clearly defined objectives and strategies are encouraged to closely cooperate with the DoF to promote sustainable forest management at the commercial and community levels, as well as the conservation of forest resources

Main issues and constraints

The forest sector of Vanuatu is confronted with the following issues and constraints:

• **Land disputes.** Although land-tribunals have been established, land disputes in forest areas or areas with potential for development continue to hamper forest development. Disputes about ownership of land and forest resources disrupt forestry operations, cause financial losses for forestry investors and limit the establishment of development projects. These disputes might even increase with the development of forest carbon projects.

• **Resource and land allocation.** In the absence of comprehensive and updated national and regional land use plans, there is no clear process for identifying conservation and timber production areas or for enforcing any form of land use planning.

• **Resource security.** If landowners do not protect the forest values for themselves and their descendants, the existing system of customary land ownership may well form a constraint to sustainable forest management.

Population growth. The high population growth will increase the pressure on Vanuatu's forest resources.

• **Forest management plans.** Due to the lack of land use plans and subsequent forest zoning, comprehensive forest management plans are not implemented. However, operational plans are available for some areas.

• **Reforestation/afforestation.** There is a gross imbalance between forest utilization and reforestation/afforestation. A reforestation program has been initiated, however it requires further work and subsequent implementation.

• **Business knowledge.** Knowledge of farmers, landowner, and communities regarding economic and financial opportunities and business management is limited and requires attention and training.

• **Technical knowledge.** Knowledge on the survival and growth of natural regeneration following logging is still limited and requires further research.

• **Resource knowledge.** The National Forest Resource Inventory from 1993 is outdated and urgently needs reassessment. This is of particular importance as Vanuatu begins to participate in any REDD+ initiatives.

• **Institutional weaknesses.** Shortage of funds still hampers the availability and attraction of adequate and qualified staff, the further development of skills and the implementation of forest activities.

• **Industry weakness.** There is an urgent need for comprehensive skills training for the forest industry to improve knowledge of forest utilization, downstream processing, and marketing.

• **Infrastructure**. Infrastructure limitations and high utility and transport costs hamper the domestic and international marketing of Vanuatu's forest products at competitive prices.

• **Coordination.** Coordination between public institutions and with private sector is weak, but indispensable to induce sustainable development.

• **Bureaucratic procedures.** Although progress has been made, policies, guidelines and procedures for forest businesses still require further refinement to attract and secure local and international investors to the sector.

• **Legislative framework.** The Forestry Act of 2001 was a major step forward for Vanuatu's forestry sector. Nevertheless, linkages with legislations of other sectors, and with other forestry-related acts and orders still require to be addressed, e.g. through amendments.

• **Funding and management of protected areas.** The provision of long term funding for the management and leasing of protected areas is still uncertain.

• **Climate change impacts.** Climate change will affect Vanuatu through temperature rise, changes in precipitation patterns, increase in frequency and intensity of extreme weather events, and rising sea level. Forest planning for the management of natural and planted forest may be confronted with changing site and growth conditions, and a possible increase of pests and diseases. On the other hand, Vanuatu's forestry offers opportunities for climate change mitigation through carbon conservation (SFM, protected areas, reducing of deforestation and forest degradation), carbon sequestration (afforestation and reforestation), and carbon substitution (replacement of carbon intensive products and fuels through wood products).

SECTION III: MAIN BODY OF THE COUNTRY REPORT

□ Chapter 1: The Current State of the Forest Genetic Resources

Assessment of Forest Genetic Resource Development in Vanuatu.

Forest Genetic Resource (FRG) development in Vanuatu is very much in its early stage. Through the SPRIG project priority species were identified and conservation strategies of some of the species developed with some effort on their implementations. Department of forests liaised with regional institutes to study propagation techniques of various species to assist in tree growing. There need to continue effort on the conservation of the FGR and progeny testing based on existing trials is fundamental.

This is a very general way to give an understanding of the effort on the FGR in Vanuatu. Basically a list of sites had been identified as In-situ conservation areas to date. Another list is of the existing trials currently acting as Ex-situ conservation for some priority species through the SPRIG project. It is necessary to consider that Department of Forestry is putting effort annually on the production of seedlings of the indigenous tree species for farmer's woodlot plantings. And included are other plantings specifically mentioned to contribute to the growing stock. Finally a list of issues and recommendations hopefully representing status and way forward to the FGR development in Vanuatu. This is a brief overview, certainly if further information is needed and where necessary to be budgeted then it may be looked into.

Table 3: Important indigenous tree species for wood and fodder

NAME OF SPECIES		WOOD						FOOD & FODDER				
No.	Scientific name	Ti	Po	Ro	Wd	Pu	Fu	Fr	Nu	Ve	Ho	Fd
1.	*Agathis macrophylla*	**			*							
2.	*Canarium harveyi*	*	*	*	*		*		**			
3.	*Canarium indicum*	*	*	*	*		*		**			
4.	*Endospermum medullosum*	**					*					
5.	*Fluggea flexuosa*		**	*	*		*					
6.	*Garuga floribunda*	**	*	*	*		*					
7.	*Intsia bijuga*	**	*		*		*					*
8.	*Pterocarpus indicus*	**	**		*		*					*
9.	*Santalum austrocaledonicum*				**							
10.	*Terminalia catappa*	*	*	*	*		**		**			
11.	*Agathis silbai*	**										
12.	*Alphitonia zizyphoides*	*		**			*					
13.	*Antiaris toxicaria*	**										
14.	*Barringtonia edulis*		*	*			*		**			
15.	*Barringtonia novae-hiberniae*		*	*			*		*			
16.	*Castanospermum australe*	**					*					
17.	*Dysoxylum amooroides*	**		*			**					
18.	*Elaeocarpus angustifolius*	*	*	*			*					
19.	*Hibiscus tiliaceus*		**	*			**					**
20.	*Inocarpus fagifer*						**		**			
21.	*Pleiogynium timorense*	*	*	*			*					
22.	*Pometia pinnata*	*	*				**	**				
23.	*Syzygium buettnerianum*	*	*				*					
24.	*Syzygium clusiaefolium*	*	*				*	*				
25.	*Syzygium malaccense*		*				*	**				
26.	*Acacia spirorbis*		*		**		**					
27.	*Artocarpus altilis*				**			**		*		
28.	*Bambusa vulgaris*			*								
29.	*Barringtonia procera*		*				*		**			
30.	*Bischofia javanica*	*	*		*		*					
31.	*Burckella obovata*	*	*		**		*	*				
32.	*Calophyllum inophyllum*	*	*		*		*					
33.	*Calophyllum neo-ebudicum*	**			*							
34.	*Casuarina equisetifolia*		**	**	*		*					
35.	*Cocos nucifera*				*		**		**	*		*
36.	*Cordia subcordata*		*	*	**		*		*			
37.	*Dracontomelon vitiense*	*	*		*		**	*				
38.	Dysoxylum aneityense	*	*	*			*					
39.	*Elaeocarpus floridanus*	*	*	*	*		*		*			
40.	Glochidion namilo		**	*	*		*					

41. *Hernandia moerenhoutiana*	*			**							
42. *Kleinhovia hospita*			*	*		**					*
43. *Macaranga tanarius*		*	*	**		**					*
44. *Morinda citrifolia*		*									
45. Palaquium tannaensis	*	*									
46. *Podocarpus imbricatus*	*										
47. *Rhizophora spp.*		**	**	*		*					
48. *Thespesia populnea*		*	*	**		*					
49 Turrrilia lutea	*							*			
50. *Veitchia sp.*			**								

KEY:

Wood
Ti = sawn timber
Po = posts, poles (ground contact)
Ro = Roundwood (above ground)
Wo = other wood (e.g. carving, canoe)
Pu = pulp and paper
Fu = fuelwood, charcoal

Food and fodder
Fr = fruit
Nu = nut
Ve = green vegetable
Ho=honey
Fd = animal fodder

Coding

***** = major use***

**** = minor use***

Table 4: Important indigenous tree species for Environmental Services and NWFP

NAME OF SPECIES		NWFP				SERVICES				
No.	Scientific name	Me	Gu	Oi	Cu	Sh	Lf	Cs	Co	Sa
1.	*Agathis macrophylla*		*			*			*	
2.	*Canarium harveyi*		*	**		*		*		
3.	*Canarium indicum*			*		*		*		
4.	*Endospermum medullosum*	*				*				
5.	*Fluggea flexuosa*	*				*		*		
6.	*Garuga floribunda*	*						*		

7. *Intsia bijuga*	*						*		
8. *Pterocarpus indicus*	*				*	**		*	
9. Santalum austrocaledonicum			*						
10. *Terminalia catappa*					*		*		
11. *Agathis silbai*		*			*			*	*
12. *Alphitonia zizyphoides*									
13. *Antiaris toxicaria*	*							*	
14. *Barringtonia edulis*	*					*			
15. *Barringtonia novae-hiberniae*						*			
16. *Castanospermum australe*								*	
17. *Dysoxylum amooroides*							*		
18. *Elaeocarpus angustifolius*									
19. *Hibiscus tiliaceus*	*				*	**	*	*	
20. *Inocarpus fagifer*	*				*		*		
21. *Pleiogynium timorense*									
22. *Pometia pinnata*	*								
23. *Syzygium buettnerianum*									
24. *Syzygium clusiaefolium*									
25. *Syzygium malaccense*	**				*				
26. Acacia spirorbis									
27. *Artocarpus altilis*	*				*		*	*	
28. Bambusa vulgaris								*	
29. *Barringtonia procera*							*		

30. *Bischofia javanica*	**					*		*	
31. *Burckella obovata*	*							*	
32. *Calophyllum inophyllum*	*				**		**		
33. *Calophyllum neo-ebudicum*								*	
34. Casuarina equisetifolia					*		**		
35. *Cocos nucifera*			**				*		
36. *Cordia subcordata*	*				*		**		
37. *Dracontomelon vitiense*					**				
38. Dysoxylum aneityense					*			*	
39. *Elaeocarpus floridanus*								*	
40. Glochidion namilo									
41. *Hernandia moerenhoutiana*					*			*	
42. *Kleinhovia hospita*									
43. *Macaranga tanarius*	**				*		*		
44. *Morinda citrifolia*	*								
45. Palaquium tannaensis								*	
46. *Podocarpus imbricatus*									
47. *Rhizophora spp.*							**	*	
48. *Thespesia populnea*	*						**		
49 Turrrilia lutea								*	
50. *Veitchia sp.*									

KEY:

Non-wood forest products

Me = medicinal products

Gu = gums, resins, tannins

Services & Environmental

Sh = shade, shelter, amenity

Lf = Living fence

Oi = oils
Cu = cultural
Cs = coastal stabilization
Co = soil and water conservation
Sa =sacred

Coding

***** = major use**
***** = minor use**

Table 5: Threats to genetic resources of important tree species

	Name of species	Location	Threatened at population level	Populations and status (including description of any threats)
No.	Scientific name	Province and/or major island group or island		
.	*Agathis macrophylla*[1]	A.Erromango; Tafea Province	No	Occurs in three main areas totaling 14,000 ha. *Happy Land* (south) - Protected in Erromango Kauri Reserve (Area 3,050 ha; approximately 15% occupied by kauri stands). *Ponmoungo* (south-central) - Extensive population (approx. xxx ha) in remote, inaccessible location. May be subject to logging in future. *Ipota* (south-east) – Heavily logged in 1960 and 70's. Few mature trees remaining. Stands have regenerated well since logging. The species is regarded as common and there is little interest in additional planting. Not protected. *Port Narvin* (north-east) – Limited, scattered stands (approx. xxx ha) of mature trees; residual from logging in late 1980's.

	B. Aneityum; Tafea Province	No	*Anelghowat* (west) – Common (Area approx. xxx ha). Previous logging from 1930's up to 1979 has provided conditions conducive to good regeneration. The species now occurs as patches up to 1 ha in extent and 200-300 m distant from each other. Some interest in replanting, with natural regeneration occurring in gardens. Three folklore varieties are recognised. *Umetch* (south) – Occurs in at least two stands. More information is needed on the current status of this stand.
2. *Canarium harveyi* var. novae-hebridense[2]	A. Torba Province	No	*Banks Islands*. Present on many islands in the Banks Group. Important food source used in cooking. Trees protected and planted. Large stands on Vanua Lava, Mere Lava and Mota Lava. *Torres Islands* – rare. This variety now widely planted in northern parts of Vanuatu including Santo, Malekula, Ambae and Ambrym.
Canarium harveyi var. harveyi[2]	B. Shepherd Islands	No	Plentiful in coastal forest. Important food. Better nut-types protected while small nut-types cut for timber (Selection against smaller, hard-shelled nut types).
	C. Erromango	No	Wild types present in forest communities between Potnarvin and Tuwit
3. *Canarium indicum*[2]	A. Torba Province	No	*Banks Islands* – Rare on Gaua *Torres Islands* - Rare on Hiu

[2] See Walter and Sam 1993

[2]

[2]

	B. Sanma Province	No	*Santo and Malo* – Widespread and common. Better nut types protected; other types cut and utilized for timber. (Selection against smaller, hard-shelled nut types).
	C. Penama Province	No	*Maewo* – Widespread and common in gardens and forest. *Ambae* – Present on West side of island (Nduindui village) *Pentecost* – Common at lower altitudes in north and central parts of the island
	D. Malampa Province	No	*Malekula* – Very common in lowlands of eastern, southern and south-west parts of the island. Uncommon elsewhere. *Ambrym* – Common in S, SE and W parts. *Paama* - Common
	E. Shefa Province	No	*Epi, Tongoa and Emae* – Very common. *Efate* – Common in N and E parts.
	F. Tafea Province	No	*Erromango* – Uncommon in Potnarvin area where planted in garden areas.
4. *Endospermum medullosum*	A. Torba Province	No	*Vanua Lava* and *Gaua* – Uncommon scattered along coast and plateau. Limited use for canoe making.(not recorded from Torres Islands)

	B. Sanma Province	Yes	*Santo* – Widespread in East and South Santo. Populations have been considerably reduced due to intensive logging and change in land use. Some stands have regenerated poorly following past logging, e.g. near Malel (E. Santo) and the species has become a minor forest component. In South Santo, populations now surviving as residual trees in agricultural lands will disappear in future due to lack of regeneration. *Malo* – Many trees present in small scattered stands. Species is decreasing and may be at risk in some areas.
	C. Penama Province	Yes	*Maewo* – Occasional to common. Extensive populations occur in the rugged, central mountain range and these have not yet been subject to intensive logging. *Ambae* – Good stands in SW part of island. *Pentecost* – Extensive stands in central part of island. These are presently being heavily utilised and regeneration is uncertain.
	C. Malampa Province	Yes	*Malekula* – Present in restricted area in north west (Uri and Wiaru villages) and central east (Burbar and Lendemboi villages). Around Uri and Wiaru the species is highly endangered due to clearing for village gardens. In the Burbar area it is common in large stands but decreasing due to clearing for making gardens. *Ambrym* – Uncommon to common in SE part of island (including Toak and Ase). Utilized for traditional purposes and an interest in replanting. Paama – very rare.

	D. Shefa Province	Yes	*Epi* – Status unclear, presumed endangered. Some small populations in the south. *Efate* - Present in two restricted populations at Forari-Ebau (east) and Teouma (south). The population at Forari has regenerated well in a demonstration logging area using reduced impact logging practices. The Teouma population consists of remnant trees in agricultural lands and is highly endangered due to lack of regeneration.
	E. Tafea Province	Yes	*Erromango* – Only found in Unpotndi catchment near Potnarvin - Cooks Bay (in east). Limited population (< 1000 individuals) of scattered well-formed trees.
5. *Fluggea flexuosa*	A. Torba Province	No	Torres and Banks Islands - common throughout the group. Considered that the species is increasing due to abundant natural regeneration in abandoned garden areas and through replanting.
	B. Sanma Province	No	Santo and Malo – Common in many parts of lowland Santo, and thought to be increasing. Unclear whether the species is indigenous or whether naturalised from ancient introductions.
	C. Elsewhere	No	Increasingly planted on other islands, including Malekula, Epi and Erromango.
6. *Garuga floribunda*			
7. *Intsia bijuga*			
8. *Pterocarpus indicus*			

9.	*Santalum austrocaledonicum*			
10.	*Terminalia catappa*			

Table 4 : List of species identified as high priority in Vanuatu for genetic resource operations and activitie

SPECIES	EXPLORATION & GERMPLASM COLLECTION[2]			EVALUATION, IMPROVEMENT & GERMPLASM SUPPLY[3]				CONSERVATION	
Indigenous	Biological information	Gene-ecological studies	Germplasm collection and research	Propagation R& D	Field testing & evaluation	Selection and breeding	Germplasm supply	*Ex situ* conservation	*In situ* conservation
Agathis macrophylla	3	1(T)	2	2 (S)	2	3	2	2	1*
Canarium harveyi	3	1	1(S)	2(V)		1	1	1(S)	
Canarium indicum	3	1	1(S)	2(V)		1	1	1(S)	
Endospermum medullosum	1	1	1*	1*(V & S)	1*	1	1	1	1
Fluggea flexuosa	3		2		2	3	2		
Garuga floribunda	3		2		3		3		
Intsia bijuga	2	3	2	1*(V)	3	3	3		1
Pterocarpus indicus	2	2	1*	1*(V)	1	2	2	3	1
Santalum austrocaledonicum	1	1	1*	1*(V & S)	1	1	1	1	1
Terminalia catappa	3	3	1(S)	2*(V)		1	1	1(S)	
Agathis silbai	1	1(T)	1	3(S)	2			3	1
Alphitonia zizyphoides			3	1(S)					
Artocarpus altilis	3	2	3(S)	2(V)	2	2	2	2(S)	
Barringtonia edulis	3	3	3(S)	2(V)		2	2		
Barringtonia procera	3	3	3(S)	2(V)		2	2		

[1] 1= Top priority, action urgently needed; 3 Action within next 5 years; Action within next 10 years; Blank = Action not required; *Action in pr
[2] Biological information, includes natural distribution, ecology, phenology; Gene-ecological studies = morphology, isozyme, DNA; (T) = taxon
Germplasm collection and research = for evaluation and *ex situ* conservation; research on seed physiology & storage regimes; (S) selected
[3] Field testing & evaluation includes trials at provenance, progeny and clonal levels; Germplasm supply refers to development of seed produ
clonal hedges etc for production of reproductive materials for general plantings

Table 7: CONSERVATION AREAS (existing and proposed) IN VANUATU

CONSERVATION AREA	LOCATION and AREA	LEGAL STATUS	FOREST TYPES CONSERVED AND MAJOR TREES SPECIES PRESENT
1. Erromango Kauri Reserve	Happyland, south Erromango; 3050 ha	A customary owned land which was leased using an adapted Agricultural lease for 5 years by the department of Forests from 1995. The department had established a biodiveristy trust fund this year (1998) with the support from the Minister of ALFF (Agriculture, Live-stock, Forestry & Fisheries). This trust fund will be used to make payments to the custom landowners for the lease of Erromango Kauri Reserve land and the Trust Fund will because for the land after may2000.	Grassland and rainforest *Agathis macrophylla, Calophyllum neo-ebudicum, Acacia spirobis, sandalum austro-neocaledonicum, Alphitonia ziayphoides, Causarina equisetifolia, Hernandia moerenhoutiana, Endospermum medullosum, Macaranga tanarius. Elaeocarpus floridanus, Dysoxulum aneitynesis, Pterocarpus indicus, Instia bijuga*
2. Wiawi Protected area	Wiawi, Norht East Malekula	Customary own land. The protected area land is owned by a group of three brothers for which the eldest brother is the chief of their village. Land is protected using traditional custom tabu	coastal forest *Instia bijuga, Dracontelon vitiensis, Castanospermum australe, Acacia spibobis, Kleinhovia hospita, Bambusa vulgaris, Garuga floribunda, Citrus macroptra, Hibiscus tilicus, Calophyllum inophyllum, Barringtonia procera, Terminalia catappa, Thespesia popullnea, Pometia pinnata,*
3. Vathe conservation area	Bigbay, North East Santo	Customary owned by community which is under SPREP biodiversity project and is managed by Environment officer. There is no legal protection but a "paper" binds the two communities involved. Main basis for protection is customary tabu.	coastal and rainforest *Dracontomelon vitiensis, Barringtonia procera, Antiaris toxicaria, Endospermum medullosum, Garuga floribunda, Acacia spirobis, Instia bijuga, Pomietia pinnata, Syzgium malaccense, Dysoxylum gaudichaudianum, Hibiscus tilaceus, Inocarpus fagifera, Macaranga tanarius, Morinda citrifolia, Thespesia populnea, Hernandia moerenhoutiana, Calophyllum inophyllum, Burkella obovata, Artocarpus altilis, Bischovia javanica, Mangifera indica.*
4. Loru Protected area	Khole, East Santo	Family owned land which is supported by the Vanuatu Protected Area Initiative. VPAI is a small team of five members from British which aims to develop	coastal forest *Endospermum medullosum, Canarium indicum, Bisjovia Javanica, Thespesia*

		conservation interest for the community of Vanuatu. The landowner has signed a lease of sorts with the community committee to protect the land. But main basis for the protection is customary tabu.l	*populnea, Dracontomelon vitiensis, Antiaris toxicaria, Macaranga tanarius, Castonospermum australie, Instia bijuga, Colophyllum inophyllum, Causarina equisetifolia, Terminalia catappa, Burkella obovata, Hibiscus tilicisu, Garuga floribunda, Pterocarpus indicus, Bambusa vulgaris,Artocarpus altilis, Morinda citifolia, Kleinhovia hospita, Dysoxylum gaudichaudiarum*
5. Antiock Protected area (Proposed)	Antiock, South East Erromago	A customoray own land by a family of four brothers. The area has only been proposed as a protected area but is still in the question mark as it is in dispute with a distant related family.	Native forest *Agathis macrphylla, Calophyllum neo-ebudicum, Burkella obovata, Castanospermm australie, Instia bijuga, Bisjovia javanica, Pterocarpus indicus, Santalum austrocaledonicum, Alphitonia zizyphoides, Eleocarpus angustifolius, Cysoxylum aneitynsis, Hibiscus tiliaceus, Inocarpus fagifera, Syxygium malaccense, Barringtonia edulis, Pometia pinnata, Bambusa vulgaris, Barringtonia procera, Cocos nucifera, Dracontomelon vitiensis, Elaeocarpus floridanus, Glochidion namilo, Hernandia moerenhoutiana, Morinda citrifolia, Palaquium tannaensis, Turrilia lutea, Vetchia sp, Citrus macroptera, Mangifera indica,*
6. Nagingo poin Ex-Situ Protected area (Proposed)	Tangoa, South Santo 5 hectares	The land is customary own by the community and had been proposed a conservation site. The area is mostly covered with shrubs and few stands of trees, therefore it had been proposed to be an ex-situ conservation area.	A coastal forest *Calophyllum neo-ebudicum, Barrintonia procera, Acacia spirobis,, Leucaena leucocephala.* The species proposed to be planted in this ex situ protected area are *Bambusa, Terminalia, Canarium, Barringtonia, Syzygium, Inocarpus, Garuga Mangifer indica, Persea americana, Causarina equisetifolia and some palm trees.*
7. Middlebush conservation area (proposed)	Inland of North West Tanna.	The area is proposed to be protected. The area covers more than 3 land units.	The species which are present in the area are *Carpoxylum, Caryota, Vetchia spirobis* (all the endermic palm species) *Dracontomelon vitiensis, Pterocarpus indicus,*

8. Nevnal protected area	Leviamp, Malekula	The land is customary owned by the community. The idea was brought up by the community through meetings with the Department of Forests.	The area is proposed to be protected covers the coastal forest and marine areas.
9. Vendid pik protected area	Bamboo Bay, Malekula	The area is customary owned by the Bamboo community.The area was proposed through meetings with the Department of Forests based on an initiative of the Malekula local Goverment council.	The area to be conserve is coastal forest
10. Lakorombanga protecteda area	Dixon reef	Customary owned by Tavendrua community. This areas occupies a lot of marine life therefore is a habitat for Mangrove as well. The idea to conserve was brought up by the Department of Forests.	Conserve water and Mangrove ecosytem.
11. Pankumu protected area	Unua / Tisman Malekula	Customary owned by the pankumu community. The area had been proposed to be protected through meetings with the forestry department. The idea was initiated by Malekula local government council.	Protect water catchment and mid-height forest.
12. Lasenwi protected area (Proposed)	Lasenwi, Malekula	Customary owned by the community. The proposed area to be was made through meetings with the Department of Forests. Purpose to conserve is just for general forest wild life.	Protect forest coastal and swamp forest wild life. The area had not yet been properly surveyed.

Forestry Extension program effort

The forestry extension program promotes the planting of these tree species. In the recent years much effort had been on woodlots and a few commercial growers on Efate on Sandalwood and on Santo on Whtiewood.

The annual achievements of seedlings raised altogether in the government nurseries reaches 80,000 seedlings. Some 50% of the seedlings are whitewood while the other is made up of the other species and Mahogany.

Issues

- Trees in In-situ conservation sites are being harvested by communities.
- Lease arrangement of the Forestry Research station and or trials not clear.
- Train landowners and or communities on propagation techniques of species.
- Need for more awareness to the community and or landowners.
- Need for progeny testing.
- Variance study for different species.
- Further collections of incomplete collections.
- Mother trees identified are being harvested in the natural stand.
- Involve landowners in the distribution and conservation of plant materials.
- Difficulty of storing seeds collected.
- Continuity of the FGR data base.

Recommendations

- Effective implementation of conservation strategy developed through the SPRIG project.
- Conduct an Assessment of the FGR effort in Vanuatu.
- Establish a seed storage facility for Vanuatu.
- Establish seed orchards of selected plus materials.
- Progeny trials of existing trials.
- Revisit the In-situ conservation sites and develop new plans involving landowners oriented towards rehabilitation work or enrichment planting.
- Establishment of Demonstration plots on areas, sites or islands as Ex-situ conservation effort for the communities and landowners.
- Conduct a woodlot study of the spread of the materials through the forestry extension program for Vanuatu.

Specific recommendations.

These more specific recommendations for the species already worked on and with the need to further develop to enhance the maintenance of the diversity and make available to the farmers or communities to access for their planting program in the future.

Currently the trials or demonstration plantings are only at Santo and on Efate. There are a growing number of farmers on different islands whom will gladly receive the materials and develop. The islands listed do have forestry stations and or forest officers whom will easily assist in conducting the activities in the field. Dof had played an important role in promoting these indigenous tree species and with the current growing interest it is necessary to ride this opportunity to effectively contribute to the FGR conservation effort in Vanuatu.

For Whitewood establish a progeny trial at:

- South Santo, Santo
- Lakatoro, Malekula

- Teouma, Efate
- Ipota, Erromango

For Sandalwood establish seed orchards at:

- Pentecost
- Ambrym
- Epi
- Maewo
- VanuaLava

For Canarium to establish a progeny trial at:

- South Santo, Santo
- Lakatoro, Malekula
- North Efate, Efate
- Isangel, Tanna
- West Epi, Epi

For the Kauri species to assess or inventory the stock of the two species at:

- Happy land, Erromango
- West coast Santo, Santo

For Natapoa spp is to establish a progeny trial at:

- South Santo, Santo
- Lakatoro, Malekula
- North Efate, Efate
- Isangel, Tanna
- West Epi, Epi

□ Chapter 2: The State of *in situ* Genetic Conservation

List of sites identified through the SPRIG project for *in-situ* Conservation.

List of species on islands for In Situ Conservation					
Island/Province	**S p e c i e s**				
	Whitewood	**Nangai**	**Natapoa**	**Sandalwood**	**Kauri**
Erromango	*E. medullosum*	*Canarium spp*	*T. cattapa*	*S. austrocaledonicum*	*A. magrophyllia*
Santo	*E. medullosum*	*Canarium spp*	*T. cattapa*	*S. austrocaledonicum*	*A. silbae*
Ambae	*E. medullosum*	*Canarium spp*	*T. cattapa*		
Pentecost	*E. medullosum*	*Canarium spp*	*T. cattapa*		
Maewo	*E. medullosum*	*Canarium spp*	*T. cattapa*		
Malekula	*E. medullosum*	*Canarium spp*	*T. cattapa*	*S. austrocaledonicum*	
Efate	*E. medullosum*	*Canarium spp*	*T. cattapa*	*S. austrocaledonicum*	
Torba province	*E. medullosum*	*Canarium spp*	*T. cattapa*		

□ Chapter 3: The State of *ex situ* Genetic Conservation

List of trials established through the SPRIG project.

Details on Trials.	
Trial Species	**Area**
Whitewood Family Provenance trial	10 ha
Sandalwood gene pool collection trial	0.5 ha
Nangai 1	0.5 ha
Nangai 2	2 ha
Nangai under *Cordia alliodora*	0.5 ha
Nangai under *Cordia alliodora*	0.5 ha
Mix species trial	0.5 ha

Other plantings (through the Department of Forestry)

- Sandalwood gene pool collection funded by SPC – 0.5ha – Navota farm, Santo
- Grafted orchard funded by James Cook University – 0.3ha – Tagabe, Efate
- *Canarium indicum* planting funded by SPC – approx. 50 ha (collectively by farmers) - throughout Vanuatu

□ Chapter 4: The State of Use and Sustainable Management of Forest Genetic Resources.

The genus *Santalum* contains a number of small- to medium-sized tree species, which occur in parts of India, south-east Asia, Australia and the Pacific. Sandalwood trees (*Santalum* spp.) are highly valued for their fragrant heartwood oils and are recognised as one of the most precious non-timber forest products. Sandalwood oil has been used for centuries for religious and customary purposes and is now used widely in the international perfumery industry. The oil-bearing powdered heartwood is also used for the manufacture of incense joss-sticks, which are valued in the international agarbatti market. With global supplies of sandalwood continuing to

decline, future sources will need to be drawn from planted trees. Domestication activities with *S. austrocaledonicum* in Vanuatu and *S. lanceolatum* in Cape York, Queensland have been undertaken within this project. A range of different trees with high oil qualities were identified that can potentially improve the planted resource in these areas.

With negative economic growth in Vanuatu over the 10-years to 2004 it is critical to develop industries that can contribute to export driven growth. Wild harvesting of sandalwood was the first export industry in Vanuatu commencing in the 1820's and continues to be the main source of export revenue for many islands. The current export capacity of AU$1,000,000 of oil per year from Vanuatu is supported exclusively from the depleted wild stands. In 2005, the amount paid directly to landowners in payments for sandalwood approached AU$700,000 for 105 tonnes of wood, which was nearly equivalent to that paid for royalties of all other forest species (AU$ 750,000) for 40,000m^3 of logs. Sandalwood harvesting is regarded as one of the most lucrative commercial activities for rural smallholder farmers in Vanuatu and in some remote areas its sale provides one of the few sources of cash income. The harvesting of wild sandalwood over such a long period has lead to a decline in the natural sources of this valuable product. There is however, considerable interest in establishing sandalwood plantings, which is being sustained by the perceived high values for sandalwood products in the future.

The interest in planting sandalwood in Vanuatu crosses many socio-economic classes, such as smallholder farmers, village chiefs and leaders, wage earners, professional workers, expatriate residents and recently foreign investors. Activity in smallholder and large-scale planting sandalwood has increased substantially since this collaborative ACIAR research began in 2004. Further expansion of sandalwood planting across Vanuatu could multiply current export earnings by many times and help satisfy an increasing international demand. The development of such an industry is culturally relevant where plantings can be readily incorporated into existing swidden agriculture and boundary areas in more populated areas.

The primary impediment to developing a genuine agroforestry-based sandalwood industry in Vanuatu is the scarcity of seed supplies. This has resulted in a 5-20 fold increase in the unit cost of seed over the past 3 years, which has stimulated the establishment of a lucrative nursery trade in urban areas, but put the goal of establishing sandalwood smallholdings beyond the reach of many subsistence farmers. To support the development of planted sandalwood industries in Vanuatu and Cape York this project surveyed the remaining natural stands and identified trees possessing heartwood oils of a very high quality. These trees were selected and propagated clonally in a seed orchard to provide the foundation for the first improvement programme for these species of sandalwood. The replication of this seed orchard across Vanuatu could provide significant volumes of seed for smallholders to establish plantings that potentially produce heartwood oils of a high quality.

Interest in establishing sandalwood plantings is also rising north Queensland, where parts of its tropical landscape suits the production of Indian sandalwood (*S. album*). Naturally occurring sandalwood in Queensland (*S. lanceolatum*) is a tree capable of growing in dry tropical savannah, but has often not been considered for planting owing to its perceived low oil-quality and value. The survey of *S. lanceolatum* in Cape York in this study has identified some populations with a high frequency of trees producing oil qualities equivalent to the International Standard for Indian sandalwood. These trees provide the opportunity for Indigenous communities on Cape York to contribute to the sandalwood industry through the implementation of domestication and planting activities 'on country'. The high quality sandalwood trees identified are well adapted to the Cape York environment and could potentially provide the basis for local enterprises and partnerships that could ultimately improve employment opportunities and livelihoods.

With an expected increase in demand for sandalwood products from some emerging developing economies and the likely reduction in the global supply of sandalwood in the next 15-20 years, an opportunity exists to establish plantation-based sandalwood industries to meet part of this potential shortfall. This project has established a base resource that if properly deployed in each country could increase the supply of high quality sandalwood that is recognised on the international market.

STRATEGIES FOR CONSERVING, MANAGING & BETTER UTILIZING FOREST GENETIC RESOURCES IN VANUATU

A. Santalum austrocaledonicum (sandalwood)

Santalum austrocaledonicum (known locally as sandalwud) is a shrub or a small tree 5-12 m in height with a short bole. It is found in the island archipelagos of both Vanuatu and New Caledonia. In Vanuatu the species has an extensive but discontinuous natural distribution. Its principal occurrences are the north-west, west and south-west portions of Erromango and on the west coast of Espiritu Santo; it is also found on Malakula, Efate, Tanna, Aniwa, Futuna and Aneityum.

Santalum austrocaledonicum produces a highly scented heartwood, much prized for carving and for its valuable aromatic oil. The oil is highly regarded because of its uniform composition and its sweet, warm/spicy and long lasting fragrance. It is used in soaps and perfumes, and it also has medicinal uses. It was the high prices available in the East Asia at the beginning of the 19th century that sent adventurers into the Pacific in search of the wood and started the "Sandalwood Trade". Today the export demand for sandalwood remains high and it continues to be a valuable commodity for Vanuatu. In 1998 the royalty paid to villagers totalled 31.6 million Vatu

(approximately $US 250,000), a major source of rural income in the areas where it is still found.

The species has been widely depleted especially on Efate and Aneityum and is threatened at population level in much of its natural range in Vanuatu. In Vanuatu the major threat to sandalwood comes from unsustainable and uncontrolled harvesting. Other threats include damage to regeneration by feral cattle and clearing for agricultural development.

Management and control of the sandalwood trade and export in Vanuatu is addressed in the national Forestry Act, Order No 3 (The Sandalwood Order). This act outlines licence requirements, conditions, fees etc. related to the trade of sandalwood and it gives the Minister the power to declare a sandalwood trading season upon advice from the Director of Forests, by specifying the period sandalwood can be traded and cut.

There is a clear need to both conserve and better utilise the genetic resources of sandalwood in Vanuatu. Accordingly the first SPRIG meeting in Nadi, 1996 recommended development of a species conservation strategy for *Santalum austrocaledonicum*. The present strategy has been prepared under the SPRIG Project by the Vanuatu Department of Forests with support and guidance from SPRIG project personnel.

Recommendations:

Eight recommendations were made in this strategy for conserving, managing and better utilizing sandalwood in Vanuatu. Recommendations 1, 2 and 5 are priority action for early implementation by the Department of Forests using existing personnel and financial resources. The other recommendations will require additional resources. The recommendations are as follows:

Recommendation 1:

Expand Departmental programmes for replanting of sandalwood, including appointment of a Sandalwood Extension Officer. The programmes should include public education and awareness as well as production and distribution of relevant technical information and of high quality seedlings. Replanting activities will be concentrated in areas where sandalwood occurs naturally, and only local germplasm will be used.

Recommendation 2:

Continue to promote and enforce the Department's Sandalwood Order and annual restrictions on size-cutting limits and cutting bans for selected islands.

Recommendation 3:

Engage and support local participation in the establishment of gene conservation and seed stands of sandalwood.

Recommendation 4:

Undertake research on sandalwood necessary for the development of a scientifically sound conservation and management strategy including:

- improve knowledge of ecology and especially regeneration of sandalwood following harvesting and at other times. Identify factors involved in successful regeneration;
- determine genetic structure of the species;
- seed technology: e.g. trials on seed processing, storage, germination methods;
- volume data: an up-to-date assessment of sandalwood volumes in all major populations – and extrapolating from this the annual sustainable harvest by population;
- identify simple features or methods that can indicate when a sandalwood tree is ready for harvesting, i.e. when substantial heartwood development has taken place; and
- investigate sandalwood coppicing versus extraction of the whole tree including root systems, and determine if there are any conservation benefits of one or the other method.

Recommendation 5:

Develop closer collaboration and a joint strategy with New Caledonia to conserve the entire genetic resources of *S. austrocaledonicum*. Collaborative work should include exchange of information and germplasm of S. *austrocaledonicum* between the Department of Forests, Vanuatu, and relevant New Caledonian authorities and institutes, especially the three Provincial Forestry Departments and Cirad-Forêt, to mutually benefit each country's conservation, evaluation and improvement programs for the species.

Recommendation 6:

Undertake an inventory of sandalwood throughout Vanuatu, including planted trees.

This inventory is needed to assist in setting appropriate harvesting limits for each island on which sandalwood occurs and to place sandalwood utilization on a planned, sustainable basis in Vanuatu. The approach would involve landholders stratifying their land into areas of high, medium and low sandalwood occurrence. A further category might be inaccessible and remote areas from which sandalwood is unlikely

to be extracted. Field assessment using a rapidly conducted narrow strip sample on representative areas could then be used to quantify the resource.

Recommendation 7:

The Department of Forests should work with the communities and custom landowners to establish Managed Conservation Areas for each major sandalwood population/island. The first such target areas ought to be Ponivé and Tamsal on Erromango and Dixon's Reef, Malakula.

Recommendation 8:

Work with landholders to encourage the conservation of smaller sandalwood populations/stands on each island that are potentially good seed sources.

B. *Agathis macrophylla* (Pacific Kauri)

Agathis macrophylla (syn. A. obtusa) is a forest tree species of major ecological and economic importance in the south-west Pacific, occurring in southern Vanuatu (Erromango and Aneityum), the Santa Cruz Islands (Solomon Islands) and Fiji. Its canopy is emergent and constitutes a unique structural element in the forests in which it occurs. Its timber is of major commercial importance; a finely grained, pale, easily worked and uniform timber with high value end uses. Within the 15 species comprising the genus *Agathis* the best species and provenance for plantation silviculture is considered to be the southern Vanuatu provenances of *A. macrophylla*. These provenances combines moderately fast growth in either open or semi-shaded sites with good form and self-pruning.

In Vanuatu, *A. macrophylla* has a rather restricted distribution on the southern islands of Erromango and Anietyum. The species is at high risk of genetic erosion and loss of diversity within stands due to heavy logging and conversion of forest land to agriculture. In the longer term the maintenance of population viability and genetic variation may depend on the presence of representative sequences of vegetation types from pioneer to mature forest. The first SPRIG meeting in Nadi, 1996 recommended development of a species conservation strategy for *Agathis macrophylla*. This strategy has been prepared under the SPRIG Project by the Vanuatu Department of Forests with support and guidance from SPRIG project personnel.

This strategy has made eight recommendations to help conserve, manage and better utilise the genetic resources of *A. macrophylla* as follows:

1: The Department of Forests continue to closely monitor any new proposed logging of kauri, and work to ensure that all logging operations follow the COLP with the use of RIL guidelines and Silvicultural Prescriptions for the harvesting of kauri and its associated species including a minimum diameter cutting limit of 85 cm and retention of seed trees.

2: Department of Forests work with Tafea Provincial Council, management and custom owners of the existing Erromango Kauri Reserve to strengthen the conservation efforts and further develop appropriate management and income-generating strategies

3. The Department of Forests ascertain the current distribution of the kauri seed parasite (*Agathiphaga vitiensis*) in Vanuatu and take appropriate quarantine measures to ensure that it is not inadvertently spread to other islands.

4. The Department of Forests expand its planting programmes for encouraging the replanting of kauri in Aneityum and Erromango using only local seed sources. This includes actively encouraging the participation of other concerned Government Departments and NGOs.

5. Develop and implement an appropriate and integrated management plan for the Erromango kauri reserve.

6. Encourage the conservation of representative accessible kauri populations / stands on each island for use as seed sources.

7. Undertake and encourage research to obtain essential information for the development of a scientifically sound conservation and management strategy for kauri.

8. Establish ex situ gene conservation/seed stands for Aneityum and Erromango sources, based on more than 30 unrelated trees from each island, in a location which is free of the kauri seed *parasite (Agathiphaga vitiensis*).

C. *Endospermum medullosum (*Whitewood*)*

In Vanuatu there are many tree species which are threatened with extinction either at the species or more commonly at the population level. A priority for the Department of Forests is to conserve the genetic diversity in useful native tree species. Such diversity is needed to help trees adapt to changing environmental conditions and for selection and improvement, both by farmers and industry. As a first step in conserving forest genetic resources, the Forest Conservation Unit of the Department has developed conservation strategies for four top priority Vanuatu tree species, whitewood (*Endospermum medullosum*), sandalwood (*Santalum austrocaledonicum*), Pacific kauri (*Agathis macrophylla*) and Santo kauri (*Agathis silbae*).

Development of these strategies has involved input from the entire Department, with assistance from SPRIG. A vital step in the process has been and will continue to be consultation with key stakeholders, including village communities, industry and NGOs. Each conservation strategy details all relevant known information on the species, including biology, distribution, utilization,

threats and recommended conservation measures. The aim of this strategy is to conserve, better manage and utilise the genetic resources of whitewood.

The first SPRIG meeting in Nadi, 1996 recommended development of a species conservation strategy for *Endospermum medullosum* (whitewood). Whitewood is an important tropical tree, which combines timber of high quality and value with fast growth on good quality soils. Its wood is highly valued throughout its natural range in the south-west Pacific (Irian Jaya, Papua New Guinea, Solomon Islands and Vanuatu) and the species has very good plantation potential in the South Pacific region. The timber is used locally, especially in preservative-treated form, and has an established export market in South-East Asia, especially in Japan and Taiwan.

Whitewood is the most important native timber tree in Vanuatu accounting for between 40 and 60% of timber harvest, and the species preferred by major sawmillers and providing major revenue to landowners and Government. Major threats to whitewood in Vanuatu come from unsustainable and poorly planned and executed logging practices, conversion to agriculture and commercial development and population pressure. The species is able to regenerate well following good logging practice, as evidenced at Forari, and is in fact favoured by periodic disturbance. However, the species is threatened at population level in much of its natural range in Vanuatu.

We have made ten recommendations to help conserve, better manage and use whitewood. The first two recommendations are priority action for early implementation by the Department of Forests using existing personnel and financial resources. The other recommendations will require additional resources.

Following are our recommendations, in summarized form:

1. All future logging operations follow the Code of Logging Practice (COLP) with the use of Reduced Impact Logging (RIL) guidelines and Silvicultural Prescriptions for the harvesting of whitewood and its associated species.

2. The Department of Forests works with management, custom owners, other Government Departments, NGOs (where appropriate) and project partners of existing Conservation Areas on strengthening whitewood conservation efforts within them through development of appropriate management strategies and plans.

3***.*** *The Department of Forests establish* ex situ *gene conservation stands of all threatened whitewood populations at its Shark Bay Field Research Station, Santo.*

4. The Department of Forests programmes for encouraging the replanting of whitewood be expanded, especially in areas where it was once common, and using only local germplasm. Also encourage participation by other Government Departments and NGOs.

5. The Department of Forests work with custom owners, industry, other Government Offices, NGOs (where appropriate) to ensure that the area of whitewood west of Butmas on Santo, the plain between Tanakar and the Jordan River tributary – Ronga - is harvested following COLP, RIL and Silvicultural Prescriptions after submission of harvesting plan.

6. A Reduced Impact Logging Demonstration Area be developed on Santo in a forested area containing whitewood following the model used at Forari.

7. The Department of Forests work with communities and custom landowners to establish whitewood conservation areas at Wiaru / Uri (Malakula), Epule (Efate) and the southern portion of the IFP site, Shark Bay, East Santo.

8. Encourage the conservation of potentially good seed sources of whitewood populations / stands on each island.

9. The Department of Forests promotes the establishment of plantations of local fast growing commercial timber species, especially whitewood.

10. Research be undertaken by the Department of Forests and others to fill gaps in knowledge required for implementation of a scientifically-sound conservation and management strategy for whitewood.

D. *Agathis silbae* (Santo kauri)

Agathis silbae (Santo kauri) is a relatively recently described species found only on the west coast of Santo. Its natural distribution is incompletely known but appears to occur only in four reasonably discrete populations from Pic Santo to near the tip of the Cumberland Peninsula. It grows into a majestic tree (to 60 m tall) in tall forest pockets on the western side of ridges at about elevations of 600 m. Its height and form alone make it a keystone ecological species, meaning that it has a unique and irreplaceable ecological function in the forest communities in which it occurs. Santo kauri also has several traditional uses including as a source of resin and medicine and is considered sacred in some places. Its produces a valuable timber and has been commercially exploited in recent years.

Investigations have shown that the species in not at immediate risk, and most stands are reasonably protected by their location in inaccessible and dissected terrain. It occurs in an area of relatively low population pressure and most sites are unsuitable for development of agriculture or other purposes. The main threat comes from logging and associated possibility of poor natural regeneration if insufficient seed trees are left or if sites are degraded through poorly planned and executed logging operations. Some trees have been killed by children setting fire to accumulated resin deposits at the base of trees.

Very little is known about the biology of the species or ecology of the forests it in which it comprises a dominant element. The growth and plantation potential of this impressive tree species has yet to be investigated. This strategy to investigate, conserve and better manage the genetic resources has been developed by the Department of Forests using information from SPRIG RRA surveys of three communities and other data sources. Our strategy makes four recommendations elements as follows:

1. All harvesting of Santo kauri and its associated species to follow the COLP with the use of RIL guidelines and appropriate silvicultural prescriptions (including 85 cm dbhob minimum felling diameter).

2.Undertake high priority research on Santo kauri, to aid in its conservation, management and development, including establishment of an *ex situ* conservation/seed stand at Shark Bay

3. The Department of Forests works with communities and custom landowners to establish a managed conservation area for Santo kauri in the forested hills on the west coast of Santo

4. Initiate a Department of Forests programmes for encouraging the replanting of Santo kauri, in the forested areas inland from Petawat on the west coast of Santo using local germplasm.

LOCAL INDUSTRIES ENGAGE ON THE CONSERVATION, MANAGEMENT AND UTILIZATION OF FOREST GENETIC RESOURCES: (Please provide business profile and plans)

A. TROPICAL RAINFOREST AROMATIC LTD

B. SUMMIT ESTATE

C. MELCOFFEE

□ Chapter 5: The State of National Programmes, Research, Education, Training and Legislation

National Programs

Vanuatu needs to develop a national program for developing and deploying forest genetic resources to the greater community; as well as a mechanism to monitor deployment and performance of the genetic resources. With the absence of such a program, it would be difficult to effectively develop the national forest genetic resources in a manner that contributes effectively to the development of the sector, as well as limiting the effective engagement of forest genetic resources only to one or two national institutions. The National Forest Policy however has been in support for continuous work on reforestation, giving the basis for tree improvement activities in Vanuatu.

The main institution actively engaged in field work related to forest genetics development is the Department of Forests, which is the government agency responsible for the management of Vanuatu's forests. While some of the forest genetic works were undertaken through the Department's own initiative, the majority of genetic improvement works were undertaken through external funding through research projects.

While Vanuatu still does not have a National Programme on forest genetic resources, or established legal framework for forest genetic resources, Vanuatu's eagerness to develop its forests resources to support its people has been pivotal to the need to improve its forest genetic resources. Therefore through project assistance, the Department of Forests in collaboration research institutions has research into tree improvement programs of some of the priority species for reforestation programs. Such research activities have strengthened the forestry sector in terms of the quality of genetic resources that will soon be available for deployment to communities. The research activities have continued from the work initiated a few years back.

Funding for research activities into forest genetic resources continue to come from the Australian Centre for International Agriculture Research (ACIAR), being the main contributor to forest research in Vanuatu. Based on the current plan with Australian implementing agencies for ACIAR's funded projects, work on tree improvement programs will continue. While this program of support will continue, the challenge now for the Department of Forests is to develop a National Tree Improvement or Research Program to guide the spending of donor's money. The country also needs to look at the possibility in legislating the development and distribution of improved genetic materials. The Depart also need to build its human resource capacity and produce tree improvement experts.

Networks

The development and particularly the improvement program of the national forest genetic resources is at infantry stage, with tree improvement works on *Endospermum medullosom, Santalum austrocaledonicum* and *Canarium indicum*. At the moment, the Department has been working specifically with individual farmers to inform them on information available of improved genetic material, but no formal network has been established to disseminate this information on the national level. However, there is a need to establish a forest genetic resources improvement program that will ensure that the whole community is aware benefits from available material, the Department of Forests needs to establish a network for users of the material for the next 10 years.

To disseminate information on forest genetic resources needs establishment of an effective network. At the moment, the Department of Forests has been working with selected communities around the country promoting forestry work, without any specific networks being established. There is however, a need for a national network in forest genetic resources to ensure that all interested stakeholders are aware of the available genetic resources for use in their planting programs.

Education, Research and Training

Education, Research and Training in Forest Genetic Resources are basically undertaken and coordinated by the Department of Forests in collaboration with regional and international research institutions. The industry has also undertaken research, but more specifically on product research, especially in sandalwood processing and timber processing. Other researches were undertaken by the Vanuatu Agriculture Research and Training Centre (VARTC) which is a government institution. Specifically, the lists of institutions undertaking research on FGR and timber products in Vanuatu are;

Government – Department of Forests, Vanuatu Agriculture Research and Training Centre;

Private – Tropical Rainforest Aromatics, Melcoffee Sawmills, Summit Estate;

Others – ACIAR (James Cook University, Southern Cross University and Sunshine Cost University), CSIRO and some assistance from SPC.

While forest research and education is important for development of forest genetic resources, this has not been reflected in the government support through budget allocation, either to the Department of Forests or the Vanuatu Agriculture Research and Training Centre. The budget allocated is very small, however almost the entire budget for research activities in Vanuatu into forest genetic resources were from project funding.

Research projects play a significant role in training and education of forestry personnel, both through formal education as well as through field and laboratory training. The formal training as part of the projects involved three Masters training, two in whitewood (what areas?) and one in vegetative propagation and reproductive biology of sandalwood. Field and lab training also involved forest officers and other forestry participants in different aspects of forest research. These training are important to capacity building of national stakeholders in the area of forest research as well as promotion of forest genetic materials.

Capacity building in forest research remains an important priority for the government and the forestry sector. Vanuatu needs to gear itself in the direction that the capacity to determine its forest research priorities and the skills to implement these priorities are available in Vanuatu. However, to reach this stage, there are several things that Vanuatu needs to have in place, and among other things, two most important of these are a "Clear National Research Plan, and A Human Resource Development Strategic Plan". These plans will be significant for identifying the most appropriate germplasm improvement for Vanuatu and well as the skills required to implement the activities in the plan. Having these skills would be significant also for effectively developing and implementing conservation strategies for forest genetic resources; some of which have been developed but are yet to be implemented.

National Legislation

Vanuatu does not have any specific legislation relevant to forest genetic resources. The Forestry Act which covers the management of forests mainly covers the different issues relating to sustainable forest management, and other conducts to ensure limited disruption to the forest ecology. The other piece of legislation, the Environment Protection and Conservation Act and the Plant Protection Act were basically dealing with conservation and protection of the environment and border control on germplasm transfer (Import and Export). The National Forest Policy, again includes research activities but not very specific regarding forest genetic resources, although gene conservation is covered under the conservation section of the policy.

Vanuatu currently does not have in place a legislation on patenting forest genetic resources. One of the issues that that might have contributed to the lack of such legislation relates specifically to the ownership over these genetic resources. According to the national constitution, land and resources belong to customary owners, meaning that access, development and probably patenting have to involve the resource owners. The difficulty and obstacle to `developing a legislation for forest genetic resources directly relates to this, and Vanuatu has to find a way to deal with this if developing a forest genetic legislation is a priority.

Vanuatu has signed and ratified a few protocols and conventions related to forests and forest genetic resources. The following ratified and signed protocols and conventions are related to forest and forest genetic resources; ??????????????????????????????????

Information

The research data and information on forests genetics over the past 10 years have not been managed by the Department of Forests or kept in a database by the Department. The inability of the Department of Forests to store and manage the important information already acquired through research is of concern, because this means that that information are not readily available for use, for future planning. Following this, the need to collect and document findings and results from these reports is very important.

Vanuatu therefore needs to develop a database where all forest research information can be documented and kept, and made available for interested stakeholders wanting to use the information. The main challenge at the moment is to find the research reports, collect and entered into a database. Information in the database can be dated back to 50 years, using the list of abstracts of work done in Vanuatu in the last 50 years currently available on the web.

Public Awareness

Public awareness in forest genetic resources can now be rated as satisfactory. This is basically because the Department of Forests started its awareness through prioritizing its list of species that has been promoted for farmers planting. The species are being prioritized due to their economic potential to local farmers. These species are Sandalwood, Whitewood, Canarium, Terminalia catapa and Mahogany.

A national awareness program on forest genetic resources in Vanuatu is still absent. A national awareness program has to be standardized, and prepared in a manner that any institution or organization interested in implementing awareness can use the standard awareness program. In this manner, the information delivered is standard and the same to all communities. Therefore, the main issue now is to develop the national awareness program. This program should greatly facilitate the use of forest genetic resources, including improved FGRs in community reforestation programs.

Legistlations:

a. ***Vanuatu National Forest Policy***

The Vanuatu National Forest Policy was developed between 1995 and 1997 funded by FAO and UNDP. Dr. Bob Thistlethwaite prepared a background paper, describing the forest situation in Vanuatu, and a discussion paper outlining a range of possible forest policies for Vanuatu. During 1996, comments on the draft policy papers were sought from relevant government departments and from donors. Drafts received wide public consultation through regional workshops before the forest policy was finalised in April 1997. The Government of Vanuatu Council of Ministers formally endorsed the National Forest Policy in November 1998. The Policy sets out the principal national goal for the forest sector is to **"ensure the sustainable management of Vanuatu's forests to achieve greater social and economic benefits for current and future generations".** All the objectives for forest management, conservation, forest development, industrial utilisation, and all research, extension, training, education and forest administration which support forestry development are directed towards that single goal.

The National Forest Policy covers forest management issues, environment and conservation, landowners and communities, forest industries, afforestation and extension, forestry research, forestry training and education, forest administration, and forest revenue. It has specific island policies and sustainable yield estimates by island. The National Forest Policy aims to address a range of constraints and issues affecting the forestry sector. These include: absence of comprehensive national and regional land use plans, lack of forest management plans, gross imbalance between utilisation and reforestation/afforestation, resource security for the future, resource knowledge, lack of forest harvesting plans, institutional weaknesses, industry weakness, inconsistencies in bureaucratic procedures, guidelines and procedures for forest businesses to attract and secure local and international investors in the sector, and the funding and management of protected areas. The policy has been printed in three languages of English, French and Bislama.The present Forestry Act does not reflect fully the objectives and statements of the National Forest Policy. This is one of the main reasons why the Department is taking steps to address this with the implementation of a project to update the Forestry Act in line with the National Forest Policy.

b. Forestry Act and related legislation

- **Forestry Act**

The Laws of the Republic of Vanuatu has a specific chapter [147] covering Forestry. It is arranged into sections relating to the subject areas of forest plantations, utilisation operations, conservation, and protection from fires through to administration, financial and general. The Forestry Act was enacted in 1982 when the Department was still part of Agriculture. As the Department evolved, there has been a need for amendments and a series of 4 amendments to the Forestry Act were passed during 1996 and 1997. These include the Code of Logging Practice, sandalwood management, suspension of logging operations, mobile saw milling operations, the use of the Forestry Fund and the provisions governing utilization operations agreements between

the companies and the landowners. Because these amendments were ad-hoc pieces of legislation, the Department made an application to FAO to fund a full review of the Forestry legislation. The review is to update the Forestry Act and bring it into line with the new National Forest Policy. This review in now underway and revised forestry legislation is expected to be submitted to Parliament before the end of 2000.

- **Subsidiary legislation under the Forestry Act**

There are 15 Orders (sometimes called Regulations) which are subsidiary legislation under the Forestry Act. These cover specific issues and some of the most important ones are outlines below:

- **Ban on export logs (Order No.16 of 1994 – subsequently modified in 1997)**

The 1994 amendment stated that no persons may export logs from Vanuatu. This round log export ban has been changed under the amendments in 1997 to allow log export only under specific circumstances. The Council of Ministers must consider if the circumstances warrant export such as the absence of any local market, a demonstrated higher return to landowners and or the government, or the inability to process a particular species in Vanuatu. If these conditions are met, then up to 20 percent of the licenced volume may be exported as logs or flitches in a year.

- **Control of Mobile Sawmills (Order No.9 of 1996)**

This regulation outlines the registration requirements, licences, conditions and fees and sets a log quota for mobile sawmills on each island. The progressive implementation of the regulations governing the control of mobile sawmills has required significant effort by the Department since the regulations were introduced in early 1997. To date the Department has registered more than 70 of the estimated 100 or so mobile mills existing in Vanuatu. Many of the remaining are thought not to be operating. Several workshops have been run for mobile sawmill operators to assist implementation and compliance with the new government regulations.

- **Management and Control of Sandalwood Trade and Exports (Order No.3 of 1997)**

This regulation outlines the licence requirements, conditions and fees, the purchase register, export of Sandalwood and management charges. It gives the Minister the power to declare a Sandalwood trading season, upon advice from the Director of Forests, by specifying the period Sandalwood can be cut and traded. Sandalwood management charge to be used to monitor Sandalwood operations and encourage replanting of Sandalwood.

- **Vanuatu Code of Logging Practice (Order No. 26 of 1998)**

This regulation introduced the Vanuatu Code of Logging Practice and includes provisions for Code amendment, licencing of forest operators, licence fees, harvesting plans etc.The Vanuatu Code of Logging Practice was developed during 1995 with the assistance of the Vanuatu Sustainable Project. The Forestry Act was amended in October 1997 to provide a legal basis for

preparing and amending the Code of Logging Practice and established strong penalties for breaches of the Code. A revised version of the Code was prepared in March 1998 incorporating minor improvements based on experience gained so far. Other important supporting documents were developed in 1997 including improved silvicultural prescriptions using variable diameter species cutting limits for selected forest types, and reduced impact logging (RIL) guidelines.

The Code of Logging Practice Regulations establish requirements for all forest operators to be licensed, for coupe harvesting plans to be approved before logging and for logging completion certificates to be issued before logging machinery is moved. The Forestry Order also defines major and minor breaches of the Code and establishes a series of penalties points for and possible fines for individual breaches. The Forestry Code of Logging Practice is intended to be fully enforced by the end of 2000. The Department is making considerable effort for this to be materialized. Preparations are in place for all operators to be licensed before they can operate machinery. This is to ensure that all operations are according to the code as stipulated in the COLP.

c. Other related legislations

- **International Trade (Flora and Fauna) Act (No. 56 of 1989)**

The International Trade (Flora and Fauna) Act (1989) regulates and monitors the exploitation and importation of species listed in CITES appendices.

- **National Parks Act (No. 7 of 1993)**

This act provides for the declaration of national parks and nature reserve, for the protection and preservation of such areas and connected matters. It covers the declaration of national parks and reserves, the establishment of the national parks board, the constitution of the board, meetings and powers of the board, management plans, local management committee, conservation fund, accounts, annual reporting, offences and penalties. There are no National Parks in Vanuatu declared under this legislation as yet. Moves have been made to amend the legislation to allow for more customary landowner participation and active management.

- **Plant Protection Act (No. 14 of 1997)**

Provides for the exclusion and effective management of plant pests and to facilitate exports of plant produce and other related matters. The Act covers quarantine entry, standards and management of plant pests including surveying and pest management programs. It contains the control of plant exports, movement controls, emergency orders in the event of an unexpected serious outbreak of a quarantine pest, codes of practices, powers of disposal, inspection and Act but amends this Act to exclude all mention of plants. This Act also repeals the Rhinoceros Beetle (Prevention) Act (JR 10 of 1961), the Import of Plants Act (JR 26 of 1964) and the Prevention of Spread of Noxious Weeds Act (JR 8 of 1966).

- **Draft Comprehensive Environmental Legislation, (proposed 1998) ?????**

The purpose of this legislation is to provide for sustainable development in Vanuatu through sound environmental planning and management and the conservation, protection and nvironmentally sound management of all natural resources. Specifically, the proposed legislation is intended to create a comprehensive legal and institutional framework for environmental impact assessment; disaster contingency planning; pollution control and waste management; the management of dangerous and hazardous substances; the management of natural resources and biodiversity conservation.

d. Treaties and Legal Instruments

- **Convention on International Trade of Endangered Species of Flora and Fauna (CITES) (ratified 1989)**

Vanuatu is a Party to CITES which controls the export and import of animals or plants, dead or alive, in whole or in part as listed under Appendices I, II and III. The International Trade of Flora and Fauna Act (1989) regulates and monitors the exploitation and importation of species listed in the CITES appendices.

- **Convention on Biological Diversity (ratified 1993)**

The Convention on Biological Diversity expects, as far as possible, each contracting party to establish a system for the protection of in-situ biological diversity and complimentary ex-situ measures for the conservation and research on plants in country of origin of genetic resources.

e. Forestry Legislations:

Laws of the Republic of Vanuatu Chapter 147 Forestry (Revised 1998 – Internally by the Department)) are arranged in sections relating to the subject areas of forest plantations, utilisation operations, conservation, protection from fires through to administration, financial and general. Under the establishment of plantations there are provisions for protection of areas of national or cultural importance. The Minister has powers to exclude areas from logging operations in order to preserve the ecology of an area. The Code of Logging Practice, which is implemented in the Forestry Act, under Part V Conservation, relates to the protection of the environment and promotion of forest development consistent with the principles of sustainable development, and also relates to the protection of non-timber forest values, among other matters.

The implementation of the Code of Logging Practice has been a significant step for Vanuatu in terms of improved forest management and logging practices. Vanuatu has also developed Reduced Impact Logging Guidelines and Silvicultural Prescriptions, not enforced by legislation, but if used in conjunction with the Code of

Logging Practice, are excellent forest management tools to ensure the recovery of the forest post-harvest.

The present Forestry Act does not reflect fully the objectives and statements of the National Forest Policy (see 3.1 below) but the Department is taking steps to address this with the implementation of a project to update the Forestry Act in line with the National Forest Policy.

Following the Amendment Order No.16 of 1994 no persons may export logs from Vanuatu. In 23 July 1993 Forestry Order No. 28 of 1993 prohibited the exploitation of Whitewood (*Endospermum medulllosum*) on Efate for a period of 10 years; however this was repealed in 14 September of the same year by Order No. 33 of 1993.

- **Forestry Act (Control of Mobile Sawmills) Order No.9 of 1996**

This outlines the registration requirements, licences, conditions and fees and sets a log quota for mobile sawmills on each island.

- **Forestry Act (Management and Control of Sandalwood Trade and Exports) Order No.3 of 1997**

This repeals Order No. 22 of 1995. This outlines the licence requirements, conditions and fees, the purchase register, export of Sandalwood and management charges. It gives the Minister the power to declare a Sandalwood trading season, upon advice from the Director of Forests, by specifying the period Sandalwood can be cut and traded. Sandalwood management charge to be used to monitor Sandalwood operations and encourage replanting of Sandalwood.

f. Additional Legislations:

- **The Constitution of the Republic of Vanuatu (1979)**

The Constitution of the Republic of Vanuatu must be the foundation of any Government policy. Forest policy formulation must be guided by Article 7(d), which states that every person, has the fundamental duty to *"...protect the Republic of Vanuatu and to safeguard the natural wealth, resources and environment in the interests of the present generation and of future generations."*

Article 71 of the Constitution states that "…all land in the Republic belongs to the indigenous custom owners and to their descendants". Custom is the basis for land ownership and use of land in the Republic. Non-indigenous persons cannot own land. Perpetual ownership of land is only for indigenous citizens who have acquired

their land in accordance with a recognised system of land tenure i.e. through custom.

- **International Trade (Flora and Fauna) Act (No. 56 of 1989)**

The International Trade (Flora and Fauna) Act (1989) regulates and monitors the exploitation and importation of species listed in the CITES appendices.

- **National Parks Act (No. 7 of 1993)**

This act provides for the declaration of national parks and nature reserve, for the protection and preservation of such areas and connected matters. It covers the declaration of national parks and reserves, the establishment of the national parks board, the constitution of the board, meetings and powers of the board, management plans, local management committee, conservation fund, accounts, annual reporting, offences and penalties. There are no National Parks in Vanuatu declared under this legislation as yet. Moves have been made to amend the legislation to allow for more customary landowner participation and active management.

- **Plant Protection Act (No. 14 of 1997)**

Provides for the exclusion and effective management of plant pests and to facilitate exports of plant produce and other related matters. The Act covers quarantine entry, standards and management of plant pests including surveying and pest management programmes. It contains the control of plant exports, movement controls, emergency orders in the event of an unexpected serious outbreak of a quarantine pest, codes of practices, powers of disposal, inspection and quarantine release, offences, and penalties. It will not limit the provision of the Animal Quarantine and Importation Act but amends this Act to exclude all mention of plants. This Act also repeals the Rhinoceros Beetle (Prevention) Act (JR 10 of 1961), the Import of Plants Act (JR 26 of 1964) and the Prevention of Spread of Noxious Weeds Act (JR 8 of 1966).

- **Draft Comprehensive Environmental Legislation, 1998 (?????)**

The purpose of this legislation is to provide for sustainable development in Vanuatu through sound environmental planning and management and the conservation, protection and environmentally sound management of all natural resources. Specifically, the proposed legislation is intended to create a comprehensive legal

and institutional framework for environmental impact assessment; disaster contingency planning; pollution control and waste management; the management of dangerous and hazardous substances; the management of natural resources and biodiversity conservation.

g. Treaties and Legal Instruments

- Convention on International Trade of Endangered Species of Flora and Fauna (CITES) (ratified 1989)

Vanuatu is a Party to CITES which controls the export and import of animals or plants, dead or alive, in whole or in part as listed under Appendices I, II and III. The International Trade of Flora and Fauna Act (1989) regulates and monitors the exploitation and importation of species listed in the CITES appendices.

- Convention on Biological Diversity (ratified 1993)

Convention on Biological Diversity expects, as far as possible, each contracting party to establish a system for the protection of in-situ biological diversity and complimentary ex-situ measures for the conservation and research on plants in country of origin of genetic resources.

- Vanuatu Biodiversity Conservation Trust Fund (launched 1998)

The Department of Forests established the Vanuatu Biodiversity Conservation Trust Fund, as it is named, to provide a continuous source of financial assistance for the retention of forests in Vanuatu and related biological conservation. A Trust Fund will be managed by a Trustee, which is Pacific International Trust Company Ltd. The Trustee will answer to a board of Appointors. A Technical Advisory Board will advise the Trustees on matters relating to the running of the Trust Fund with respect to individual projects and use of funds for the retention of forests in Vanuatu and related biological conservation.

Land in the Republic belongs to the indigenous custom owners and to their descendants, under Vanuatu Constitution land decisions rest with the custom owner. The National Forest Policy states that *"forest areas that have special ecological, scenic, historical, cultural, watershed, biodiversity or other environmental significance, shall be protected with the support of landowners. In*

protecting forest areas, education, motivation, and provision of benefits to the landowners will be utilised'. It is hoped that the Trust will be used to compensate landowners for the protection of these and similar areas from development activities, until such times as alternative income sources or benefits can be established.

Chapter 6: The State of Regional and International Collaboration

Almost all of Vanuatu's research and tree improvement programs are undertaken through external project funding, particularly from the Australian Government. Below are the list and brief description of research projects related to improvement of forest genetic resources.

Research Projects and Activities

South Pacific Regional Initiative on Forest Genetic Resources Project (SPRIG)

The SPRIG Project is a regional project covering a number of pacific island countries. The project was implemented by CSIRO, with funding from the Australian Government. SRIG project has several milestones, but two of the outstanding ones for Vanuatu are the work towards testing and promoting local timber and nut species for domestication purposes, and the second one being the development of conservation strategies for selected species.

The tree improvement part of the project involves whitewood, Canarium, Sandalwood and Terminalia catappa. Whitewood was the main winner of the project because germplasm from a majority of provenances were collected and tested for studying and identifying the different characters, used later in other projects for further improvement.

The project developed conservation strategies for Sandalwood, Whitewood, Agathis silbae and Agathis macrophylla. Even though these conservation strategies have not been implemented, each provides a clear guide on how each species should be conserved and are ready to guide implementation of any of those species.

Identification of optimum genetic resources for establishment of local species of sandalwood for plantations and agroforests in Vanuatu and Cape York Peninsula

This project was funded by Australian Centre for International Agriculture Research (ACIAR) and commissioned by James Cook University. The main aim of the project is in

Vanuatu is to collect and analyze sandalwood from populations around Vanuatu for genetic improvement and deployment to the local communities for growing. The project has successfully identified the elite germplasm from the tested populations, and successfully established a grafted orchard from the selected individuals for future sandalwood improvement program.

Whitewood Silviculture Project

Whitewood Silviculture Project is again another ACIAR funded project. The project was commissioned by Southern Cross University. The main aim of the project is to research and establish the different silvicultural systems for whitewood for different farming systems. This include testing the whitewood spacing in plantation or monoculture settings, agroforestry setting aas well as with mix species.

Development and Delivery of Germplasm for Sandalwood and Whitewood in Vanuatu

Development and Delivery of Germplasm for Sandalwood and Whitewood in Vanuatu is building on the work of SPRIG project on whitewood and the sandalwood grafted seed orchards established during the *Identification of optimum genetic resources for establishment of local species of sandalwood for plantations and agroforests in Vanuatu and Cape York Peninsula* project. The project is funded by ACIAR and commissioned by James Cook University. The main purpose of this project is to deploy the genetic material of these species to the communities.

With whitewood, the project did further selection of whitewood provenance trials, collect seeds from the selected trees and deploy to other part of the country and establish as improved seed orchards. The sandalwood part includes grafting from the grafted seed orchard, and distributing the grated plants to selected communities to plant and use as seed orchards.

The other component of the research is to do controlled pollination with sandalwood and whitewood. Among these two, sandalwood might be the easiest one to deal with. Whitewood, however, is still found difficult to graft or bud, and the correct process is still investigated.

Cannarium project

The Regional Canarium project, which included Papua New Guinea and Solomon Islands, Vanuatu also, has a small component. The component in Vanuatu was basically small funding for raising and distributing canarium seedlings, and also testing manual nut crackers.

Canarium is the area that Vanuatu still need to research. The interest in this area is will be research into germplasm improvement and development for domestication programs.

Chapter 7: Access to Forest Genetic Resources and Sharing of Benefits arising from their Use

Access to Forest Genetic Resources

Access to forest genetic resources from outside Vanuatu began around the early 80s, with the introduction of exotic species to test their potential for becoming the plantation species for Vanuatu. The exotic species, which includes *Cordia alliodora, Pinus carribea*, Eucalyptus and Acacias were introduced and tested. These species were not doing very well, except for *Pinus carribea* which established itself as a plantation species on Aneityum, while *Cordia alliodora* become an invasive species. The other species were not doing well because they do not fit the local weather conditions. This resulted in the end to the promotion of exotic species for plantations in Vanuatu.

The South Pacific Regional Initiative on Genetic Resources (SPRIG) Project was the next programme which organizes exchanges of forest genetic resources within the south pacific countries. This project did not introduce any new species into Vanuatu but the work in Vanuatu was aimed at improving selected local timber and nut species by collecting and testing of provenances collected throughout the country.

With the question of whether the country has access to or have subscribed to international agreements or accessions for access to genetic resources in the last 10 years, Vanuatu so has not subscribe to any agreements in this regard. The current status and aim of Vanuatu was to continue to develop and improve its local timber and nut species including sandalwood (priority species) through domestication and tree improvement programs. There is an interest however to import and test improved Teak (*Techtona grandis*) from the Solomon Islands in exchange with Sandalwood (*Santalum austrocaledonicum*) seeds. The South Pacific Community has developed a genetic Material Transfer Agreement (MTA) which will be the legal document for the transfer. The MTA contains the benefit sharing agreements which will govern this transfer.

Any subscriptions or accession signed for FGR???

Access to forest genetic resources in Vanuatu remained the same for the last 10 years. The current national programs which are based on improving local tree species, with the main aim of deploying the improved and elite genetic resources to the wider community to include in their planting programs. With the land tenure system in Vanuatu, land and resource owners are the primary targets for the sustainability issues relating to forests, and also the advancement of the reforestation programmes in Vanuatu.

Access to germplam of the local species is quite easy at this stage. According to the current practice, the Department of Forests, through verbal permission, can collect seeds and other vegetative materials from customary or leased land. These arrangements may change in the future, but currently works well. The Department of Forests will prepare itself in time for these changes if it ever comes. With the focus on improving and deploying local genetic resources, Vanuatu indirectly restricts importation of foreign genetic resources, unless a species is selected as part of the national tree improvement program.

Sharing of benefits arising out of the use of forest genetic resources

Forest and trees are important for the livelihood of the people of Vanuatu for many centuries. Forests and forest products form a significant part of the culture and custom. Forest genetic resources have been supporting life and keeping the environment and biodiversity intact.

Forest genetic resources in Vanuatu have a wide range of use. While the range of goods and services cannot be quantified, it is common that forests provide food and nutritional supplements, medicine, fuel wood, building materials, shelter, improve soil nutrition and several other environment benefits. Forests and forest products are increasingly becoming an economic commodity, generating income for the local communities, and at the same time creating jobs for employees in the forestry sector. Therefore, forest genetic resources are used primarily by forest dwellers and owners.

Forest genetic resources in Vanuatu are owned as part of the land, and belong to customary landowners. The Department of Forests accessed these resources for research and improves with permission from the owners of the acquired genetic material. While there are no formal agreements on the distribution of the improved genetic materials, the government is committed to re-distribute the improved materials to their original owners. As part of the national reforestation programs, the genetic materials will also deployed to all parts of the country interested in growing the species. This will ensure a wide range of beneficiaries of the material.

The work on forest genetic resources improvement in Vanuatu has just begun around 10 years ago. Because trees have a long gestation period, meaning that results can only be achieved after one or two decades, and the material can be distributed thereon. While waiting, the Department of Forests needs to develop a strategic plan that will guide the distribution of forest genetic resources. The plan should be developed in a manner that it directs the wide distribution of genetic resources for wider benefit sharing as well addressing conservation issues.

□ Chapter 8: The Contribution of Forest Genetic Resources to Food Security, Poverty Alleviation and Sustainable Development

Forests and forest genetic resources contribute enormously to food security, poverty alleviation and sustainable development. For the rural population of Vanuatu, forests acts as a safety net, a green and free super market and hospital; an important valueless commodity. Sustainable management of forest resources contributed directly to

Food security and poverty alleviation

Forest genetic resources are not only contributed to food security because it provide food through fruits, seeds, shoots or back; but most importantly forests housed the whole terrestrial biodiversity, thereby hosting game and provide conditions for other for crops to grow. Forests and trees are also important to food security because it maintains soil stability and enhanced soil fertility.

A methodology for promoting forests genetic resources to address food security and poverty alleviation is through agroforestry practices. The reforestation programme with communities in Vanuatu is promoted mainly through agroforestry. This method of farming has been long used by the ancestors, and is one of the most effective farming system where trees are inter-planted with agriculture crops it maximizes land benefits. This type of farming is more cost effective and less time consuming compared to a monoculture tree crop. The association of the two different crops results in trees providing shade, windbreak, soil fertility and stability. The end products are perennial and annual agricultural crops over several rotations and fuel wood timber and posts when the trees are harvested.

Forest genetic resources and sustainable development

Forest genetic resources in Vanuatu has contributed significantly to livelihood and sustainable development of the country. During the 1990s, log royalties to the rural communities has seen some development in the rural communities. Also, the utilization of these resources have also created significant job opportunities to the local communities, and also access through roads to rural communities.

Sandalwood for instance, occurs naturally mainly in remote areas in Vanuatu. It appeared also to be the only main source of income in these areas, putting the children in school. Therefore, with the overall use of genetic forest resources in Vanuatu, it continued to become obvious that these resources have contributed very significantly to rural community development by meeting social, economic and environmental needs. Thus to ensure sustainability of these community needs, it is important that these important forest genetic resources are sustainably used, developed and conserved.

National Programs for distribution and benefit-sharing of forest genetic resources

Vanuatu has made progress towards distribution and benefit-sharing of forest genetic resources. Programs undertaken so far have been directed towards community empowerment and germplasm distribution.

Through the South Pacific Secretariat (SPC), the Food and Agriculture Organization (FAO) and the New Zealand Government, the Department of Forests has trained over 10,000 farmers throughout the six provinces of Vanuatu. These training were specific to raising and managing seedlings in the nurseries and woodlot establishment and management. Through this program, more than 25 community and private forestry nurseries have been established throughout the country. As part of the program, the Department of Forests supply and distributed planting material to these nurseries, who then raise and distribute to their respective farmers.

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