



THE STATE
OF THE WORLD'S

FOREST GENETIC RESOURCES

COUNTRY REPORT

COOK ISLANDS

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.

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THE COOK ISLANDS

COUNTRY REPORTS

for

**The State of the World's Forest Genetic Resources.
(SoW-FGR).**

By;

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MAP OF THE COOK ISLANDS



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THE ESSENTIAL ROLE OF COUNTRY REPORTS

The preparation of Country Reports is the most important step in the process for preparing *The Report on the State of the World's Forest Genetic Resources*. The preparation process should be considered a strategic planning exercise and the report itself a tool for the better assessment and sustainable management of forest genetic resources in your country. Preparation of a Country Report provides an opportunity to engage and stimulate the interests of wide range of stakeholders to reflect on the state of forest genetic resources of your country, on what has been accomplished and what remains to be done and to identify the needs are required to achieve their conservation and sustainable use.

To ensure that their Country Report provides a basis for planning the conservation, sustainable use and development of forest genetic resources at the national level and contributes to regional and global actions; countries should carefully and comprehensively assess:

- The state of forest genetic resources in the country and their roles in production systems, including associated biodiversity and the factors driving changes;
- The current contribution of forest genetic resources to sustainable forest development, and food and agriculture;
- How the contribution of forest genetic resources to sustainable forest development, and food and agriculture can be enhanced, identifying opportunities and overcome any obstacles;
- Needs and priorities for capacity building to enable the conservation, sustainable use and development of forest genetic resources.

2. INTRODUCTION

Genetic resources, including forest genetic resources, are among the most valuable assets that a country processes. The Food and Agriculture Organization of the United Nations (FAO) has for many decades acknowledged the importance of forest genetic resources. In 1967, the FAO Conference recognised that forest genetic diversity was increasingly being lost and requested the establishment of the Panel of Experts on Forest Gene Resources (the Forest Gene Panel), to help plan and coordinate FAO's efforts to manage genetic resources of forest trees. FAO's activities on forest genetic resources are an integral part of the FAO Forestry Programme, and contribute to other programme components, such as national forest programmes, sustainable forest management, tree breeding and plantation development, protected areas management and global forest resources assessments.

For many decades, the Forest Gene Panel has guided FAO's work on forest genetic resources and reporting on progress made to the Committee on Forestry (COFO). This guidance has helped to ensure that forest biological diversity, at all levels, is conserved, managed and sustainably utilized in support of local and national forest development, including food security, poverty alleviation, environmental conservation, economic and social advancement and the maintenance of cultural and spiritual values.

The FAO Commission on Genetic Resources for Food and Agriculture (the Commission) is a FAO intergovernmental body which as at 1 March 2010 has 172 members, and is the only international forum which specifically develops policies for genetic resources for food and agriculture. At its Eleventh Regular Session, the Commission acknowledged the urgency to conserve and sustainably utilize forest genetic resources to support food security, poverty alleviation and environmental sustainability; the Commission also approved the inclusion of forest genetic resources in its Multi-Year Programme of the Work (MYPOW). It also agreed to the preparation of a country-driven first report on *The State of the World Genetic Resources* (SoW-FGR). The Commission recommended that COFO and the FAO Regional Forestry Commissions be fully involved in the preparation of *The State of the World Forest Genetic Resources*, and the work be undertaken in synergy with relevant regional and global programmes and instruments, such as the Convention on Biological Diversity and the United Nation Forum on Forests. The Thirty-fourth Session of the FAO Conference welcomed the Commission's decision to undertake preparation of a report on the SoW-FGR within its MYPOW.

During its 15th Session, the Forest Gene Panel highlighted the importance of examining a number of key issues in assessing the status and trends of forest genetic resources management, including: climate change, bioenergy, poverty reduction, forest products supply enhancement, and new and traditional methods and technologies in genetic conservation and tree breeding. As much as feasible, the impact of these issues on forest genetic resources will be examined in preparation of the SoW-FGR with several of these issues being addressed through thematic background studies. A proposed table of content for the SoW-FGR has been elaborated.

Recognizing the importance of forest genetic resources and the importance of their good management, the Committee on Forestry (COFO), at its Nineteenth Session, in March 2009, supported the recommendation of the Commission on Genetic Resources for Food and Agriculture and the FAO Panel of Experts on Forest Gene Resources that FAO prepare a report on *The State of World Forest Genetic Resources*, for 2013, which would serve as a reference for action at the national, regional and global level. The Committee urged member countries to collaborate with FAO and partner organization in producing this report.

At the Commission's request, FAO prepared for consideration by the Commission, at its Twelfth Regular Session, a proposal for the process of preparation *The State of the World's Forest Genetic Resources*. Including an indicative outline for this first report, an indicative list of thematic studies, for an indicative timetable for undertaking *The State of the World's Forest Genetic Resources*². The Commission endorsed the indicative outline, agreed on the indicative timeline provided in the Strategic Plan 2010-2017 for implementation of the Commission's MYPOW, including the finalization of the draft guidelines for Country Report for Forest Genetic Resources, and the process for countries to officially identify and communicate to FAO their National Focal Points for the preparation of Country Reports. The Commission also agreed to establish an intergovernmental Technical Working Group on Forest Genetic Resources (ITWG) and agreed on its Statutes.

The Commission at its Twelfth Regular Session, stressed that the process for preparing *The State of the World's Forest Genetic Resources*, should be based primarily on Country Reports on Forest Genetic Resources, with support through thematic studies and reports from international organizations as well as inputs from relevant stakeholders. *The Guidelines for the preparation of Country Report for the State of the World's Forest Genetic Resources* presented in this document provided therefore essential strategic information for the preparation of the SoW-FGR and set a basis for the setting country, regional and global priorities. FAO will assist countries on request as resources allow, to prepare their Country Report, including through providing available data and information.

ABOUT THE COOK ISLANDS

The Cook Islands a self-governing territory in association with New Zealand Government consists of 15 islands and atolls that are spread over 2 million square kilometres of the South Pacific Ocean.

The islands are geographically divided into two groups, commonly referred to as the Southern and Northern group islands. The two groups of islands making up the country exhibit marked differences in their social cultural and economic activities. The Northern group islands remain relatively isolated from the Southern group islands, with a boat service once per month or one or two flights per month, (depends on availability of fuel on the islands).

The Cook Islands were form of volcanic activity and coral growth. The islands of Rarotonga (capital) Mangaia, Atiu, Mauke, and Mitiaro are the emergent peaks of extinct volcanoes. The islands of Manuae, Palmeston, Manihiki, Rakahanga, Pukapuka, Nassau, Suwarrow and Tongareva (Penrhyn) are atolls – coral reefs around a lagoon on the top submerged volcanoes. Aitutaki is part atoll and part volcanic.

The total land area of the Cook Islands is 23,261 hectares while its exclusive economic zone covers an area of nearly 2 million square Kilometres or 750,000 square miles. Rarotonga with a total land area of 6,710 hectares, is the largest and most populous island, with over 75% of the population, and is also the administrative centre.

The Cook Islands enjoy a South Pacific moderate climate. The mean monthly minimum and maximum temperatures in Rarotonga, the capital, range between 21° and 28° Celsius. Trade winds blows almost continuously throughout the year from the east. Rainfall is normally spread evenly throughout the year but there is considerable variation from year to year. The island lies within the hurricane belt and severe damaged to crops, housing, coastal areas and harbours can be expected once or twice each decade. The hurricane season lasts from November to March, during which time storms of less than hurricane strength and may also inflict minor damage to the islands.

In the Southern Group the coastal lowlands and low volcanic inlands are man-modified or disturbed ecosystems. The process of transformation began with horticulture of the first settlers, the Polynesians, who arrived as early as 400 BC. The process accelerated, after the arrival of the London Missionary Society missionaries in the 1820s, with the introduction of new food plants, and the growth of commercial horticulture. The rugged limestone makatea of the raised islands and the steep upper-inland of Rarotonga are the only essentially natural terrestrial ecosystems that remain. The Northern Atolls have had their coastal forest replaced by coconut plantations, with the exception of one area on Motu Kotawa on Pukapuka.

In contrast, for terrestrial plants and animals a chance encounter with an island would be unlikely to provide a diverse range of habitats, unless it was Rarotonga or one of the four raised islands. The variety of native flowering plants reflects the ecological diversity: Rarotonga has 170 species; the raised islands have about 100. Aitutaki has forty (40), and the atolls and coral-cays have one to two dozen.

Evolution into new species has also not been common in the Cook Islands because of the limited range of terrestrial habitats. For flowering plants, Rarotonga has 12 endemics; the raised islands vary from one to six, while Aitutaki and the low coral islands have none. In the marine environment there also has been relatively little development of new species.

While noting the relatively low level of native and endemic plants and animals, the biodiversity of the different islands is the plant and animals that generation of the Cook Islanders have used to sustain their culture. It is this diversity of plants and animals that they would like to conserve for their children and grandchildren. It is for this reason that many residents are keen to see then National Biodiversity Strategy and Action Plan move beyond the bookshelf to become an ongoing process of conserving, and sometimes recovering, local plants and animals to share their benefits while using them in an unsustainable manner.

2.1 The Forest Estate

The forest types fall mainly into three main categories, due to the type of land and environment upon which they are established. Like most islands in the South Pacific, customary landowners own most land, although on some islands some parts of the land have been regulated by the Crown to protect water resources and to maintain the integrity of the forest. Table 1.1 summarizes the forest estate in the Cook Islands.

Table 1: Forest cover of the Cook Islands

FOREST TYPE	AREA (ha)	PERCENTAGE OF TOTAL LAND AREA (%)
Coastal	4900	20.5
Makatea	5000	21.6
Atolls	4500	20.5
Plantations	1170	5
Others	1490	8
Total	12560	100%

Coastal Makatea

These forests constitute natural coastal forest and high islands forests with a land area of 11,390 hectares. Vital functions are watershed and coastal protection as well as protection of fauna and flora.

Atoll Forest

These forests are vital to life on the Atolls providing food and medicinal resources, construction and handicraft materials. In addition they protect fauna habitat and provide foreshore defences against storms and erosion. The area covered by this forest is 4,500 hectares.

Plantation Forest

Plantation forests were established by the Ministry of Agriculture (MoA) on private and community owned land, principally for soil erosion control process on Mangaia, Mauke Atiu and Rarotonga. However, the performance of these plantations has been spectacular, recording good growth rates, good form and excellent site stabilisation characteristics. The covered in plantation forest is approximately 1,170 hectares. The plantations have potential for commercial timber production.

The country has established some forest plantations, mainly of *Pinus caribbaea*, various species of *Acacia*, and two species *Santalum*. The distribution and age classes of the plantations are shown in Table 1.2

Table 2 Forest plantations in the Cook Islands

ISLANDS	AGE CLASS		TOTAL
	0 – 10 yrs (ha)	10+ yrs (ha)	
Rarotonga	-	44.72	44.72
Atiu	30	145.34	175.34
Mauke	-	36.11	36.11

Mangaia	180	750.35	930.35
Total	210	976.52	1186.35

LEGISLATION INVOLVED IN THE FOREST OF THE COOK ISLANDS

Despite the fact that forestry plantation activities were started in the 1960s, there is in fact no Forest Act or Policy in the Cook Islands.

However, there are some legislation which touches upon the protection of the environment and its biological constituents. These include:

- ***The Conservation Act 1975*
- ***The Conservation Act 1986/87*
- The National Environment Service (NES) Act 1994/95
- The Ministry of Marine Resources Act 1984
- The Marine Resources Act 1989
- Plant Act 1973
 - *** Plant Introduction and Quarantine Regulations 1976, with Amendment 1980 and 1985*
 - Plant Quarantine Regulation 1993
- Animal Act 1975
 - Amendment 1981 (allowed the importation of rabbits)
 - Animal Disease Regulations 1982
 - Wandering Animal Regulation
- The Biosecurity Act 2008
- International Departure Tax Amendment Act 1984 – established an environment funds
- Natural Heritage Trust Act 1999
- Peace, Order and Good Governance Ordinance 1916-1964

Keys

** and, italics denote legislation revoked by later legislations.

To date no National Forest Action Plan (NFAP) under the Tropical Forest Action Plan (TFAP) has been developed. There is also no operation code of logging practice in the country owing the absence of commercial logging operations.

The Cook Islands is a party to the following conventions that have a direct bearing on the maintenance of Biodiversity:

- 1971 Convention on Wetlands International Importance especially as Waterfowl Habitat (**Ramsar Convention**); and amendment Paris 1982 and Regina 1987.
- 1976 Convention on the Conservation of Nature in the South Pacific (**Apia Convention**)
- 1986 Convention for the Protection of Natural Resources and Environment of the South Pacific Region and related Protocols (**SPREP or Noumea Convention**)
- 1989 Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific
- 1992 The Rio Declaration on Environment and Development
- 1992 convention on the Conservation of Biological Diversity (**CBD or Biodiversity Convention**)
- 1993 Agreement establishing the South Pacific Region Environment Programme
- 1994 Barbados Programme of Action on the Sustainable Development of Small Island Developing States (**Barbados Programme of Action, (BPoA)** (emerged under Agenda 21 of the Rio Declaration)
- 1998 United Nations Convention to Combat Decertification
- 2000 Cartagena Protocol on Biosafety (to Biodiversity Convention)
- 2004 International Plant Protection Convention

As a party to the Convention on Biological Diversity the Cook Islands has committed itself to the followings:

- Watershed protection
- Conserve its endangered species
- Develop a system of protected areas
- Reduce the harmful effects of invasive species and prevent further invasions
- Maintenance and preservation of fauna habitats and integrity of the forest
- Provision of beauty and greenery
- Soil erosion protection
- Provision of medicinal products, fuel and materials of cultural importance.

As a party to the Convention on Biological Diversity the Cook Islands has committed itself to:

1. Conserve its endangered species
2. Develop a system of protected areas
3. Reduce the harmful effects of invasive species and prevent further invasions
4. Use biodiversity in a sustainable manner
5. Preserve knowledge related to biodiversity
6. Ensure an equitable sharing of the benefits of biodiversity

The following strategy and action plan was developed through extensive community consultation and its purposes the development of a series of programmes and mechanisms by which the Government could enable the country to meet its obligations as a Party to the Convention.

1. Theme A: Endangered Species Management

Strategic Goal A1: Conserve Cook Islands Native and important naturalised plants and animals, and provide for their sustainable use.

Action:

- 1) Develop a programme to survey and conserve all endemic flowering plants and other endangered native flowering plants,
- 2) Extend the flowering plant programme (above) to include other types of plants that are endemic or native and endangered,
- 3) Develop a programme to survey and conserve the rarer plants used in herbal medicine (*vai rakau*),
- 4) Develop a programme to survey and conserve endemic animals and rare native animals, covering mammals, birds, and other animals,
- 5) Develop a programme to survey and conserve marine animals harvested for food or financial gain.

Strategic A2: Conserve important agricultural and non-agriculturalised species and provide for their sustainable use (Agro-biodiversity)

Action:

- 1) Develop a programme to survey and conserve the rarer varieties of Wetland Taro, Coconut palm (*niu*), and other traditional agro-varieties and agro-species,
- 2) Develop a programme to survey and conserve the rarer animals of agriculture and home

For examples

The developments of programmes to conserve endangered species were seen as urgent for various native species and for some species and varieties of agricultural and domestic importance. The unique flowering plants such as the Mitiaro Fan-Palm (Iniao), the Te Manga Cyrtandra and the Cook Islands Myoporium (Ngaio) were absorbed into a programme to survey and conserve endemic flowering plants and other endangered native flowering plants. Among the endangered natives included the important timber trees Tamanu (Pacific mahogany), Miro (Portia Tree) and Tou (Pacific Rosewood). The agriculture programme included the conservation of rare varieties of Taro (Colocasia esculentum) wetland taro along with other introduced agro species.

2. Theme B: Invasive Species Management.

Strategic Goal B1: Reduce the adverse impacts of invasive species on indigenous species and ecosystems, and prevent new invasions.

Strategic Goal B2: reduce the adverse impacts of invasive species on agricultural species and ecosystems, and prevent new invasions.

Action:

- a) Develop a programme involving all islands to survey invasive species in natural ecosystems and in the agro-ecosystem,
- b) Develop a community-based programme to eradicate those invasive weeds and animal pests that are not yet widespread on particular islands,
- c) Develop national programmes to assist with the control of the more serious invasive weeds and animal pests in both natural and man-modified ecosystems,
- d) Undertake a multisectoral review of the control of transboundary and inter-island movement of terrestrial and marine plants and animals, and of **LMOs/GMOs (Living Modified Organism/Genetically Modified Organisms)**, with a view to establishing an independent Biosecurity Agency.

For examples

The first programme was to eradicate invasive species that have been recently invaded or other wise still restricted in their distribution on different islands. For example, most islands rated the thorny Sensitive weed (mimosa sp) (rakau pi'kika 'a). The classic example within the programme was Balloon Vine on Rarotonga which has increased dramatically in the last twenty years and now covers many trees on the low lands and in the outskirts of the inland native forest.

3. Theme C: Ecosystem Management.

Strategic Goal C: conserve important ecosystems through a system of protected areas with regulated and monitored activities.

Actions:

1. Establish an independent Suvarrow National Park Authority to administer the Cook Islands' only national park on behalf of all major stakeholders. A management group with the responsibility to conserve the atoll's wildlife, and to monitor and control revenue-generating activities.
2. Develop a programme to select areas to establish a national system of community-based protected areas to protect important terrestrial ecosystems.
3. develop a programme to select areas to establish a national system of community-based protected areas to protect important reef and lagoon ecosystem

For example:

Within two years of signing the Apia Convention 1976 the Government of the Cook Islands declared the uninhabited island (atoll) of Suvarrow a National Park to protect wildlife and other important species and ecosystems.

4. Theme D: Equitable Sharing of Benefits and Access to Biodiversity

Strategic Goal D:

Ensure that the uses of biodiversity, including genetic resources, bring equitable benefits to relevant stakeholders.

Action:

Establish an independent agency to encourage and manage research on biodiversity and its uses, and to ensure that there is an equitable sharing of benefits.

5. Theme E: Management of Knowledge Related to Biodiversity.

Strategic Goal E:

Record and maintain records of scientific and traditional knowledge related to biodiversity, with consideration of Intellectual Property Rights.

Actions:

- a) A body should be established to review access to, and the processing of, knowledge on biodiversity and its use, especially medicinal use. The body might be the same as that established to encourage, monitor and manage all research on biodiversity (see theme C)
- b) The programme of the Natural Heritage Project to record all Cook Islands biodiversity with related scientific and traditional information should continue, and it should make such information available to the general public.

For example: Cook Islands Biodiversity Database 2004

6. Theme F: Biodiversity Awareness and Education

Strategic Goal F:

Make biodiversity information more readily available to all stakeholders and interested people

Actions:

- a) A working group should be established to investigate ways to ensure that knowledge of biodiversity and its uses is adequately available to students and the general public
- b) NGOs should be encouraged to include knowledge of biodiversity where relevant.

For example: posters, books and other educational materials published by the Natural Heritage Project.

7. Theme G: Mainstreaming of Biodiversity

Strategic Goal G:

Integrate biodiversity into national and sectoral legislation, policies, plans and programmes

Actions:

A multi-sectoral working group should be established to review the policies and activities of Government ministries and agencies to ensure that they are consistent with a shared responsibility to maintain Cook Islands Biodiversity and related knowledge.

8. Theme H: Financial Resources and Mechanisms for Biodiversity

Strategic Goal H:

Secure long-term financial sustainability for all biodiversity related activities and programmes.

Actions:

Establish a Biodiversity Trust Fund to support the wide range of activities required to conserve Cook Islands biodiversity in an integrated and equitable manner.
The above themes are just examples of activities/programmes to do with the forest genetic resources of the Cook Islands.

Because of the absence of forest-based businesses that utilize tree products, very small economic benefits are derived from the forest. However, opportunities for tourism-based are being identified and

developed. All islands in the Cook Islands have the same tree species occupying the coastal areas. However, species composition is more varied in the Southern group islands. The importance of various species also differs between the two groups of islands. For example, the Northern group islanders use a lot of Ano (*Guettardia speciosa*) for construction where as in the Southern groups this species is used for firewood.

There are also species of trees that only exist on individual islands. One example is sandalwood (*Santalum insulare*) on Mitiaro which is used for medicinal purposes. Other important trees are listed in the following tables.

3. UTILIZATION AND DISTRIBUTION OF FOREST GENETIC RESOURCES

Table 3: Most important trees and there uses;

Species	Location	Distribution	Uses		
			Wood	Medicinal	Food
<i>Acacia sp</i>	S	>1000	Wood – Fi,	-	-
<i>Aleurites moluccana</i>	S	100-1000	Seeds; oil, light	Yes	-
<i>Alyxia elliptica</i>	S	100-1000	Leaves and bark	Yes	-
<i>Artocarpus altilis</i>	N, S	>1000	Timber; Can, Po,	Yes	Yes
<i>Bambusa vulgaris</i>	N, S	>1000	Fishing rod, Beau.,	-	-
<i>Annona muricata</i>	N, S	100-1000	Firewood	Yes	Yes
<i>Bischofia javanica</i>	S	>1000	Fuel, house post	Yes	-
<i>Broussonetia papyfera</i>	S	100-1000	Tapa	-	-
<i>Paraserianthes fulcataria</i>	S	>1000	Can, Fi, Leg. Con	-	-
<i>Barringtonia edulis</i>	N, S	>1000	Fi, Sh	Yes	-
<i>Casuarina equisetifolia</i>	N. S	>1000	Fi, Pro, Con	Yes	-
<i>Carica papaya</i>	N. S	100-1000	Fruits	Yes	Yes
<i>Ceiba pentandra</i>	S	<1000	Fi, cushioning	-	-
<i>Citrus sp</i>	N. S	100-1000	Fruit trees, Fi.	Yes	Yes
<i>Cocos nucifera</i>	N. S	>1000	Pro, Cav, Con, Con	Yes	Yes
<i>Cordia Subcordata</i>	N. S	100-1000	Fi, Cav, Inst	Yes	Yes
<i>Cordyline sp</i>	N, S	100-1000	Beautification. Leis	Yes	Yes
<i>Coffee sp</i>	S	>1000	Fi	Yes	Yes
<i>Calophyllum inophyllum</i>	N. S	100-1000	Fi, Cav, Inst	Yes	-
<i>Cananga odorata</i>	S	100-1000	Fuel, ornamental	-	-
<i>Delonix regia</i>	N. S	>1000	Fi, beautification	Yes	Yes
<i>Dioscorea sp</i>	S	100-1000	Tubers-Food	-	Yes
<i>Eugenia javanica</i>	S	100-1000	Fruits, wood-fuel	Yes	Yes
<i>Eugenia malaccensis</i>	S	100-1000	Fruits, woodFuel	Yes	Yes
<i>Eugenia syzygium</i>	S	100-1000	Fruits, wood-fuel	Yes	Yes
<i>Flacourtia jangomas</i>	S	<1000	Fi, fruits	-	Yes
<i>Gardenia sp</i>	N, S	>1000	Garlands	Yes	-
<i>Guettarda speciosa</i>	N. S	>1000	Cons, Pol, Can	-	-
<i>Hernandia sp</i>	N. S	>1000	Pro, Sha	-	-
<i>Hibiscus sp</i>	N. S	100-1000	Beautification,fi,	-	-
<i>Hibiscus tiliaceus</i>	N. S	>1000	Fi, Pro, Ins, Fb	-	-
<i>Homalium acuminatum</i>	N. S	>1000	Pro, Con, Fi	-	-
<i>Inocarpus edulis</i>	S	100-1000	Nuts-food	Yes	Yes
<i>Litchi sinensis</i>	S	<1000	Fruits, fi etc	-	Yes
<i>Leucaena sp</i>	S	>1000	Fi, Animal feed	-	-
<i>Mangifera indica</i>	N, S	>1000	Canoe	Yes	Yes
<i>Macadamia integrifolia</i>	S	<1000	Nuts, fi. etc	Yes	Yes
<i>Melia azedarach</i>	S	100-1000	Firewood	-	-
<i>Melicoccus bijugatus</i>	S	100-1000	Fruit tree	-	Yes
<i>Morinda citrifolia</i>	N. S	>1000	Fi	Yes	Yes
<i>Pandanus tectorius</i>	N. S	>1000	Cons, Pol	Yes	Yes

<i>Persia americana</i>	S	>100-1000	Fi, fruits	Yes	Yes
<i>Pimenta racemosa</i>	S	<1000	Leaves, Fi etc	Yes	Yes
<i>Pinus caribbaea</i>	S	>1000	Eros, Cons, Pol	-	-
<i>Pisonia grandis</i>	S	>1000	Costumes, carvings	Yes	Yes
<i>Psidium guajava</i>	S	>1000	Fruits etc	Yes	Yes
<i>Pometia pinnata</i>	N, S	>1000	Timber, Firewood	Yes	Yes
<i>Santalum insulare</i>	S (Mitiaro)	<50	Inst, Cav, Medicine	Yes	Yes
<i>Spondias dulcis</i>	S	100-1000	Fruits	Yes	Yes
<i>Syzycium malaccensis</i>	S	100-1000	Fruit tree	Yes	Yes
<i>Syzycium jambo</i>	S	100-1000	Firewood, Fruit	Yes	Yes
<i>Syzycium cumini</i>	S	100-1000	Firewood, timber	Yes	Yes
<i>Terminallia catappa</i>	S	100-1000	Timber	Yes	Yes
<i>Thespesia populnea</i>	S	100-1000	Crafts, furniture	Yes	Yes
<i>Therpersia polulnea</i>	N, S	100-1000	Onst, Cav, Fi, Cons, Can	yes	-
<i>Tournefortia argentea</i>	N, S	100-1000	Firewood, compost	Yes	-
<i>Ximenia americana</i>	N	<1000	Fishing rod, fruit	Yes	Yes

Keys to abbreviations of uses above;

Can-Canoe	Fi-Fire	Leg-Legume	N-Northern Group	Sh-Shade
Pro-Protection	Cav-Carving	S-Southern Group	Pol-Poles	Fb-Fibre
Con-Construction	Eros-Erosion	Inst-Instrument		

Social values are;

- Food and life sustaining values, especially water quality
- Protection from wind, sun, and cyclone storms
- Recreational opportunities, for humans and experience of the natural environment.

Economic values are;

- Timber products
- Non-timber forest products of food, handicraft, medicinal, landscape, fragrant and decorative values
- The enhancement of the natural environment that contributes to the quality of life for the Cook Islanders and gives island APPEAL FOR TOURISM DEVELOPMENT.

4. CONSERVATION OF FOREST GENETICS

Table 4: Threats to genetic resources of most important trees.

Species	Location Group of islands	Threatened at population level	Population Status
<i>Aleurites moluccana</i>	Southern Cooks	Yes	Not enough matured stocks due to land clearance for agriculture and tourism and cyclones etc. <1000
<i>Barringtonia edulis</i>	All islands	Yes	Trees are being destroyed by strong winds and very high seas (cyclones) and crafts etc. >1000
<i>Cassia fistula</i>	Southern Cooks	Yes	Not enough matured stocks. High winds (cyclones) etc. <1000
<i>Cananga odorata</i>	Southern Cooks	Yes	Regeneration very poor and clearance of land for

			new housing, and agriculture, etc. <1000
<u>Casuarina sp</u>	Southern Cooks	Yes	Over use of stocks and very poor regeneration and clearance for new accommodations, strong cyclones etc. >1000
<u>Cordia subcordata</u>	Southern Cooks	Yes	Over use of stocks and regeneration very poor and also clearance of land for new accommodations etc. <1000
<u>Coffee sp</u>	Southern Cooks	Yes	Not enough stocks due to land clearance for new accommodations etc >1000
<u>Delonix regia</u>	Southern Cooks	Yes	Over use of stocks for canoes etc but no replanting of new stocks. >1000
<u>Flacourtia jangomas</u>	Rarotonga	Yes	Very few tree left due to land clearance for new house, etc. <1000
<u>Guettarda speciosa</u>	Northern islands	Yes	Not enough mature stock standing, although, adequate non mature population. <1000
<u>Hernandia nymphaeifolia</u>	All islands in the Cook Islands.	yes	Not enough matured stocks, due to land clearance and high seas, and also the seeds are used for dancing costumes and marbles for kids to play. <1000 trees.
<u>Santalum insulare</u>	Southern islands (Mitiaro only)	Yes	Over-harvesting of mature and non-mature stock. Regeneration poor. Very low population in the wild <50 trees
<u>Thespersia populnea</u>	Some Northern group islands, and all Southern group islands.	Yes	Low generation. Tree population affected through land clearance. Not enough mature stock (100-1000)
<u>Calophyllum inophyllum</u>	Some Northern group islands, and all Southern group islands.	Yes- Southern Cooks Yes-Northern Cooks	Low regeneration. Tree population affected by land clearing. Not enough mature stock (100-1000) A lot of these huge old trees are being felled/destroyed by strong cyclones (winds/high seas) because these grow only in sandy soil. <1000
<u>Pandanus sp</u>	All islands in the Cooks	Yes -On Atiu. Yes-Atolls	Stock affected by mealy bugs which destroyed stocks on Atiu in the 1980s. <100 Lost most of the stocks

	Yulu Eating varieties Timber variety	Yes-Pukapuka Yes-All islands Yes-Pukapuka	during the cyclones. <100 Endemic on Pukapuka only. Used for costume for wrestling and mat – very strong. <100 Need to be conserve as some varieties are going into instinct. Also need to introduce new or other varieties from overseas such as Kiribati etc. <100 This variety is tall, straight, and strong used for buildings etc and needs to be conserved etc. <100
<u>Pisonia grandis</u>	All of the islands in the Cooks	Yes	Cyclones, high winds etc. <1000
<u>Pometia pinnata</u>	Most islands in the Southern Cooks.	Mainly Rarotonga	Low generation. Affected by land clearing for housing. <1000
<u>Prichardia mitiaroana</u>	Mitiaro Fan-Palm	Mitiaro only. Located on the South/West of the island.	Need to be conserve and also to let the Mitiaro Island Administration and councils aware of the potential of this variety can give Mitiaro extra finance, because it is endemic to Mitiaro only etc. (Similar to the <u>Santalum insular</u>). <50
<u>Ximения americana</u>	Penrhyn Island	Penrhyn	Only grows in Penrhyn island. Very hard to grow. <50

4.1.1 Environment values are;

- The provisions of habitat and safeguarding of biodiversity in plants and animals and the full genetic compliment of species that depend on the forest environment
- Watershed and land protection that prevents degradation of soil, resources, streams, farmland and coastlines.

Table 5: Currently recorded Cook Islands Protected Areas

The following table includes protected areas regardless of whether they are called national parks, nature reserves, rau'i, motu, marine reserves, conservation areas or wildlife sanctuaries.

Islands	Type	Name of Area	Total Area	Comments
Cook Islands Water	Whale Sanctuary	Cook Island EEZ	2m Km ²	Established in 2001 for the protection of whales
Takutea	Wildlife Sanctuary	Takutea Wildlife Sanctuary	120 ha	Established 1903, re-established in 1950 by the Takutea Island Trust. Endorsed as a Community Conserved Area under the Atiu and Takutea Environment Regulation 2008. Inclusion of lagoon not determined
Suwarrow	National Park	Suwarrow National Park	160 ha	Established in 1978 under the Prime Minister's Office. Inclusion of the

				lagoon nor determined.
Rarotonga	Nature Conserved Area	Takitumu Conservation Area	155 ha	Established in 1996 under landowner committee to protect endangered native birds and their habitat.
	Nature Reserve	Highland Paradise	32.5 ha	Family operated reserve containing natural features of cultural significance.
	Marine Reserve	Aroa Raii	32.5 ha	Established in 2006 to allow the rejuvenation of Natural resources.
	Marine Reserve	Tokerau Raii	4 ha	Established 2007 to allow the rejuvenation of natural resources.
	National Park	Nikao Social Centre	?	Established in 2000 for Public recreation.
	Marine Reserve	Pouara Raii	5 ha	Established to allow the rejuvenation of natural resources
	Marine Reserve	Aroko Raii	71.1 ha	Established in 1998 to allow the rejuvenation of natural resources
	Marine Reserve	Titikaveka Raii	?	Established to allow the rejuvenation of natural resources
	Marine Reserve	Tikioki Raii	40 ha	Permanent reserve area
	Community Managed area	Takuvaine Water Catchment	229 ha	Established in 2006 under the Environment (Takuvaine Water Catchment) Regulations for species and habitat protection
Aitutaki	Marine Reserve	Ootu Raii	220 ha	Established in 2000 as a 140 ha reserve, additional 70 ha included as restricted entry zone
	Marine Reserve	Motu Kitiu Raii	407 ha	Established in 2000 as a 210 ha reserve, additional 197 ha included as restricted entry zone
	Marine Reserve	Maina Raii 1	128 ha	Established in 2000 as a No Entry reserve, predominantly reef flat
	Marine Reserve	Maina Raii 2	81 ha	Established in 2000 as a Restricted Entry reserve, 80 ha is inclusive of lagoon
Pukapuka	Marine and Terrestrial Reserve	Motu Kotawa	90 ha	Reserved for Yato village, inclusive of entire islet and surrounding lagoon
	Marine and Terrestrial Reserve	Motu Ko	3000 ha	Reserve for Ngake village, inclusive of entire islet and surrounding lagoon
	Marine and Terrestrial Reserve	Motu Uta	50 ha	Reserved for Loto village, inclusive of 30% of the islet
	Marine and Terrestrial Reserve	Motu Nui	10 ha	Reserve for Yato village
Mitiaro	Wetland	Te Roto Nui	?	Reserve for habitat protection and rejuvenation of fresh water eels (<i>Auguilla abscura</i>)
Rakahanga	Lagoon	Te Taha ki Raro	?	
	Marine Reserve	Paerangi	?	
	Marine and Terrestrial Reserve	Te Kainga	?	
Manihiki	Salt-mash lakes	Lake Porea and Tepuka Roto	?	Traditional breeding and raising grounds for Milkfish (<i>Chanos chanos</i>) to supplement food supply during periods of rough seas.

5. PRIORITY ACTION FOR FOREST GENETIC RESOURCES

The Cook Islands have undertaken some evaluation trials of tree species and provenances, focussed on research to find tree species that can establish successfully in plantation in worn out, acid and fertile soil. Of the over 30 species tried, only five were subsequently used in the plantation. These include *Pinus caribbaea*, *Acacia mangium*, *Acacia leptocarpa*, *Acacia auriculiformis* and *Acacia carssicarpa*.

With the possibility of over-harvesting of various important species, the government and communities should be looking seriously at a forest genetic resource conservation program for the Cook Islands. Table 4.1 sets out some of the priorities;

Table 6; list of species identified as high priority in the Cook Islands for Genetic Resource Conservation and activities: (1=high priority, 2= moderate priority, 3= low priority.)

Species		Exploration and Germplasm Collection		Evaluation and Improvement		Conservation	
	Biological information	Genetic and Ecological studies	Germplasm Collection and Research	Field Testing and Evaluation	Selection and Breeding	In situ	Ex Situ
<i>Santalum insulare</i>	1	1	1	1	1	1	1
<i>Calophyllum inophyllum</i>	3	3	1	3	3	1	1
<i>Thespesia populnea</i>	3	3	1	1	3	1	1
<i>Cordia Subcordata</i>	3	3	1	2	3	2	2
<i>Santalum austrocaledonicum</i>	2	2	1	1	2	-	-

Table 7; lists of other damages caused to forest are also of high priorities in the Cook Islands for Forest Genetic Resources are as follows;

Pests & Diseases	Weeds	Animals/Humans
Coconut flat moth (<i>Agonoxena argaula</i>)	Balloon vines (<i>Cardiospermum grandiflorum</i>) and <i>Cardiospermum halicacabum</i>	Wild pigs
Coconut termite (<i>Neotermes rainbowi</i>)	Mile-a-minute (<i>Mikania macrantha</i>)	Wondering goats
	Merremia sp (<i>Merremia peltata</i> , <i>Merremia tuberosa</i> , <i>Merremia umbllela oeientalis</i> , and <i>Merremia vitifolia</i>)	Humans
	Red Passionfruit (<i>Passiflora rubra</i>)	
	Smooth Loofah (<i>Luffa cylindrical</i> var. <i>insularum</i>)	
	Beach Pea (<i>Vigna marina</i>)	
	Grand Morning-glory (<i>Ipomea macrantha</i>)	
	Beach Morning-glory (<i>Ipomea pes-caprae</i>)	
	Giant Mimosa (<i>Mimosa invisa</i>)	

Humans are also part of the forest destruction in clearances for new houses, firewood, art & craft etc.

6. INSTITUTIONS AND RESOURCES FOR FOREST GENETIC RESOURCE CONSERVATION

Recent restructuring of the Cook Islands Government (1996) has meant that certain activities previously done by government, such as forestry activities and services previously provided by the Ministry of Agriculture, have now ceased.

Therefore, at present there is no institution working on forest and tree genetic resources, although on one island, Mangaia, the local government has a forestry and tree planting program in place.

Appendix

7. ENDANGERED SPECIES PROGRAMMES

The developments of programmes to conserve endangered species were seen as urgent for various native species and for some species and varieties of agricultural and domestic importance and values. The unique flowering plants such as the Mitiaro Fan-Palm (Iniao-*Pritchardia mitiaroana*), the Te Manga Cyrtandra (*Cyrtandra lilianae*) and the Cook Islands Myoporum (Ngaio-*Myoporum wilderi*) were absorbed into a programme to survey and conserve endemic flowering plants and other endangered native flowering plants. Among the endangered natives included were the important timber trees Tamanu (Pacific mahogany-*Calophyllum inophyllum*), Miro (Portia tree-*Thespesia populnea*) and Tou (Pacific Rosewood-*Cordia subcordata*).

The agriculture programme included the conservation of rare varieties of Taro (Wetland Taro-*Colocasia esculenta*) along with other introduced agrospecies. Community-based herbal medicine is a fundamental conservation of rarer medicinal (vai rakau) plants, such as the small Tutae Torea (*Lindernia-Lindernia crustacea*), Tiapito (an Adder's tongue fern-*Ophioglossum reticulatum*) and Kava Maori (*Piper methysicum*), the latter having been lost from several islands.

Other endangered species programmes included one for endemic and rare native animal, including birds, and one for marine animals commonly used by the communities for food. The focus in this section of on programmes emphasising species-management.

8. INVASIVE SPECIES PROGRAMMES

The first programme was one to eradicate invasives that have recently invaded or are otherwise still restricted in their distribution on different islands. For example, most islands rated the thorny Sensitive Weed (Rakau Pikikaa-*Mimosa pudica*) as one of their most troublesome agricultural invasive, yet it has only three small populations on Mangaia. Red passionfruit (*Passiflora rubra*) is a major forest invasive on Rarotonga and Atiu, yet on Mauke it is restricted to a small area along one road. Most islands has some invasives for which complete removal or eradication was realistic if decisive action is taken in the near future.

Every island had a programme to reduce the abundance of some of the already widespread and severe invasives. The classic example within the programme was Balloon Vine (*Cardiospermum grandiflorum*) on Rarotonga which has increased dramatically in the last twenty years and now covers many trees on the lowlands and in the outskirts of the inland native forest. Mosquitoes and sandflies (*Culicoides belkini*) needs to be controlled – the latter first appeared on Aitutaki in 1964, and has since spread to Manuae and Mitiaro.

There was much concern about the arrival of new invasives from other countries and from other islands within the country. The Ministry of Agriculture (MoA) recounted their interception of Giant African Snail (GAS) (*Archina fulica*) on a container delivered to a site on Rarotonga – this large snail is a voracious consumer of vegetables. The reflect on invasives in different categories, such as in agriculture, in the marine environment, of medical importance and within the native forest.

It was decided to recommend that Government investigate the practicality of moving away from the traditional New Zealand model of having “quarantine” within mainline Ministries such as Agriculture, Marine Resources, and create an independent multi-stakeholder Biodiversity Agency to control the movement of terrestrial and marine plants and animal into and out of the country (Biosecurity), and between the islands (Internal-Quarantine/Biosecurity). Such an agency would bring a more integrated and uniform approach to the introduction of plants and animals by the general public, the Ministry of Agriculture and Marine Resources.

Inter-island Biosecurity was a major concern with destructive invasives such as the recently-arrival of Coconut Flat Moth () on Rarotonga. Because the islands are physically isolated the distribution of invasive species is irregular. For example, the Giant Sensitive Plant (*Mimosa invisa*), the more destructive-brother of the Sensitive Weed, is presently only on Aitutaki; the parasitic Dodder (*Cuscuta campestris*) is presently on only two islands; and Sicklepod (Pi A'ungakino-*Senna obtusifolia*) is restricted to Mauke where it rates as the community's most troublesome weed. The Ship Rat threatened birds. The urgency of the problem of arrival of new invasives requires immediate action while long term solutions are sought.

9. ECOSYSTEMS AND PROTECTED AREAS

The Cook Islands is a Party to the 1976 Apia Convention (*Convention on the Protection of Nature in the South Pacific*) to develop national systems of protected areas. Within two years of signing, the Government declared the uninhabited island of Suvarrow a National Park, to protect its wildlife. The Convention on Biological Diversity again commits its members to establish protected areas to conserve important species and ecosystems.

The conservation and sustainable use of Suvarrow should be managed by an independent Suvarrow National Park Authority (SNPA), representing the main stakeholders. It was concluded that a representative management group could be entrusted with the responsibility to manage wildlife conservation and environmentally sustainable revenue-generating activities.

10. EQUITABLE SHARING OF BENEFITS AND ACCESS TO BIODIVERSITY

The management of access by foreign people to the biodiversity resources of the Cook Islands, in particular, resources that might be medically beneficial. A "lock the stable" approach was unrealistic and would drive researchers elsewhere and the Cook Islands would simply miss out on the benefits of such research. At present all research undertaken by film makers, historians, anthropologist, doctors, geologists, oceanographers, biologists and so forth are improved and registered by the National Research Committee. Seeing that biodiversity research was such a diverse area that it should be managed by an independent body developed for this specific purpose, and that this group should be pro-active in encouraging research for potentially useful chemicals within our biodiversity.

11. MANAGEMENT OF KNOWLEDGE RELATED TO BIODIVERSITY

There should be programmes to record local plants and animals, and to map and record ecosystems and protected areas, on intellectual property rights, especially that related to the medicinal use of plants and marine animals. This topic was also a focus of attention by the group dealing with "Equitable Sharing of Benefits and Access to Biodiversity".

Initially, protection of knowledge but gradually moved towards ways to benefit from the knowledge. The change in emphasis came about mainly as it was recognised that such of Cook Islands herbal knowledge is similar to that of Tahiti and that in both countries much of the information is already in the public domain. There should be a programme to record the medicinal knowledge of the practitioners who wish to have their knowledge recorded, with full acknowledgement of the informant and the nature of the associated *mana*.

The best way to both protect and benefit from traditional knowledge was to have a specific and pro-active Biodiversity Research Committee with suitable legislated powers to manage the interests of both the knowledge owners and the researchers.

12. BIODIVERSITY AWARENESS AND EDUCATION

Awareness programmes should be included in all biodiversity-related programmes. Unfortunately the Education Curriculum Officers were unable to attend the workshop so it was simply concluded that integrating biodiversity education into the school curriculum was essential and that this should be Figure included as an important programme.

13. MAINSTREAMING

To achieve shared responsibility it is important that policies, administrative and financial activities, at national, district and community levels included biodiversity concerns. This will be continuously process leading to long term sustainability.

14. FINANCIAL RESOURCES AND MECHANISMS

Biodiversity should have a specific Biodiversity Trust Fund to support the wide range of activities required to maintain local biodiversity in an integrated and equitable manner. Such a trust would consist of a board representing the different communities, traditional leaders, and the main Government bodies involved with biodiversity. Because the Government is one of the main beneficiaries of local biodiversity it was concluded that Government should provide the core funding for the Trust Fund, supported where possible by overseas donors.

The Board would table annual reports with audited accounts to Parliament, and make these reports available for wider distribution. The secretariat for the Board could be provided by the National Environment Service (NES), but it would have the power to charge this arrangement if the need arose.

15. CONCLUSION

The signatories to the Convention on Biological Diversity have committed themselves to:

1. Conserve their endangered species;
2. Develop a system of protected areas;
3. Reduce the harmful effects of invasive species and prevent further invasions;
4. Use biodiversity in a sustainable manner;
5. Preserve all knowledge related to biodiversity; and
6. Ensure an Equitable sharing of benefits.

16. RECOMMENDATIONS

There is a need to consider seriously the conservation of forest genetic resources in the Cook Islands especially of the tree species listed on table 4.1. The Government needs to institute a mechanism to allow people to establish new woodlots and to mobilise communities to harvest native trees sustainably so that there is always stock there for future harvest. We also like to encourage and teach our own people that when they harvest any tree he/she must plant one of the same kinds that they have pulled/harvested or cut for future generation. We would like to encourage our outer islands people that after any cyclone, strong/high winds, tsunami etc they should only harvest those trees that were blown over by the cyclone or whatever but not to harvest surviving tree that are still standing and intact.

In the case of the sandalwood (*Santalum insulare*) the species needs careful study to see if it can be multiplied and established at woodlot or plantation level. Perhaps the introduction of *Santalum austrocaledonicum* may remove pressure on this species as it is sought mainly for medicine. For the Cook Islands this is an area where regional assistance is required.

In 1994 a FAO Project for all inhabited islands in the Northern Group (Penrhyn, Rakahanga, Manihiki, Palmeston, Pukapuka and Nassau) to build a small nursery for growing of important trees either for shore protection, erosion, crafts, building, bird sanctuaries etc including fruit trees (limes, lemons, mangoes) etc. This project was successful but then Cyclone Martin hit most of these islands and most of these nurseries were destroyed.

Suggested that NGOs, youth groups, women groups, education, Outer islands, Island Administrations MoA, National Environment Services (NES), etc must be aware and involved in these endeavours to make sure that these forest trees are important for their future generations.

APPENDIXES

Appendix 1

Urgently Needs for the Future of the Forest Genetic Resources (FGR) for the Cook Islands

1) A National Forest Policy (NFP). (Draft)

What is needed an NFP to provide information, directions and guidelines concerning the management and utilisation of the country's forest, or forest based resources for the protection of the environment, social advancement and economic development.

a) Environment Values are:

- The provision of habitat and safeguarding of biodiversity in plants and animals and the full genetic compliment of species that depends on the forest environment.
- Watershed and land protection that prevents degradation of soil resources, streams, farmlands and coastlines

b) Social Values are:

- Food and life sustaining values, especially water quality.
- Protection from the wind, sun and cyclone storms.
- Recreational opportunities for humans and experience of the natural environment.

c) Economic Values are:

- Timber products
- Non-timber forest products of food, handicraft, medicinal, landscape, fragrant and decorative values
- The enhancement of the natural environment that contributes to the quality of life for the Cook Islands and gives island appeal for tourism development.

Objectives

To achieve the goal of NFP it is necessary to define clearly the objectives and implementation programme of such a policy. These objectives are as follows:

Objective 1

To manage and protect the forest in a manner that is acceptable, sustainable, in line with forests, defined, and required functions as determined by the local community.

Forest provide for multiple functions. Identification and categorising of forest functions relative to location and community needs is required. It would then be possible to develop legislation supported by implementation guidelines to ensure the achievements of specified functions.

The interior natural forest of Rarotonga, for example, needs to be maintained and logging should not be permitted under any circumstances. Removal of dead wood for fuel and minor construction maybe allowed but this must be done with care. The main functions of the Rarotonga forest should primary be watershed protection, conservation and landscape.

Objective 2.

To stimulate and encourage community interest and participation in economic development activities related to the wise use of forest and resources derive from them. The utilization of the forest resources should follow sustainable development principles.

The objective relates to the management and sustainable utilization of forests resources, both in the natural forest and plantation forests. Participation of the resource owners will enable resources to be utilized in a way that is transparent and well geared to meet the needs of the developer and must also maintain the values ascribed by the local community.

Objective 3.

To encourage, stimulate training activities, and develop dialogue with resource owners on the need to sustainably protect, manage, and promote the forest resources.

This objective is concerned with creating awareness in forest owners of the need to be safeguard resources, promote protection of those resources and ensure that the skills are available for development of the resources on sustainable basis,

Objective 4.

For the Ministry of Agriculture to provide support through provision of research and advice on matters the sustainable use of forest resources.

This objective is concerned with the executing Ministry of Agriculture (MoA) function in development and utilisation of forest resources in order to promote and facilitate development of the forestry sector in the country.

2. Land Use Policy (Draft).

i. Background

1.1 Introduction;

Land Use planning processes enables government to direct outcomes and protect people and the nation from undesirable outcomes. For example, landscape, cultural and biodiversity information can be used to identify which areas are most appropriate for conservation, which areas are most prone to soil erosion, and any other similar problems. Similarly, the process can be used to determine which areas are most suited for agriculture, tourist development, and urban and industrial development. While land use policies state the intent, the preferred uses are best expressed as delineations on land zoning maps.

Land use planning is also a useful vehicle for coordinating the roles of different government departments. Land use planning forces consideration of all political trade-offs simultaneously and helps to maximise opportunities for sustainable development.

Any proposed land zoning plan and matching land use policy is likely to be more acceptable and implementable if all resource owners and all levels of the political hierarchy have an opportunity to participate in the planning process.

The National Land Use Policy and subsequent administrative decisions create precedents for a different way to administer natural resources and realised sustainable development. In particular, decision-making responsibilities will be shared in new ways that give a more appropriate balance between top-down and bottom-up process.

Land owners needs and local development requirements are often most efficiency recognised by committees.

1.2 Need for a Land Use Policy

A sound land use policy should be emphasis on the needs for sustainable development in the absence of any degradation of the cultural, economic and physical environment. The Land Use Policy document is designed to complement the Environment ACT 2002, the National Environment Strategic Action Framework and Policies relating to Sloping and Wetlands and Foreshore.

Why a Land Use Policy for the Cook Islands? There are three purposes for a policy:

7. An effective national land use policy is equally dependent on informed public opinion as it is on legislation or actions by interest groups. If the principles and thinking underlying such a policy are well known, discussed and understood then implantation of the policy is greatly enhanced. Thus policy can be a powerful educational tool.
8. A policy offers long-term continuity and a framework for national planning and harmonising with government and public interests. Thus, policy can fulfil role in setting standards and again an informed public has an important role.
9. Management decisions are constantly being made, some minor, others having policy implications. Government departments will find it easier to exercise wise judgement if there is precisely written and clearly understood land use policy to serve as a guide. Thus, policy can provide a framework to manage change.

An educational tool, a standard and a guide – these are the three most important functions fulfilled by a formally adopted policy.

The document focuses on the definitions of indicators for sustainable progress and emphasises the needs for development and promotes economically, ecologically and socially sustainable land use.

1.3 Constraints to Archiving Sustainable Development

There are two ways to look at constraints to sustainable development. The first way is the approach of the bottom-up process characterised by extensive community involvement in decision making. The other approach takes a top-down view and recognised the role of government in facilitating structural change and the promotion of development.

Recognising these two routes for decision making, the following are some constraints for sustainable development in the Cook Islands.

- Conflicting institutional objectives of relevant departments, NGOs and community groups;
- Lack of awareness, knowledge and understanding among land owners of the real costs of unsustainable development;
- Inconsistencies between legislation, policies and environmental management plans;
- There is lack of data about and understanding of natural resources and ecosystems;
- Lack of trained personal and resources to carry out the essential tasks of project design, data generation, evaluation and monitoring projects; and
- Inappropriate advice from experts who have not appreciated aspects of the Cook Islands Social, cultural and political realities, especially those that relate to resources use and land ownership.

1.4 Overview of Land Use Issues (ADB, 2006)

The Cook Islands is similar to other Pacific Island countries where land is limited and economic development has increased pressure on the environment and natural resources. The islands are predominantly coastal entities and because of their size and isolation, and the fragile nature of island ecosystems, the biological diversity is among the most threatened in the world.

Over the years, improper and largely uncontrolled development has occurred in environmental sensitive areas such as wetlands, sloping lands and the foreshore, which is now resulting in increased incidents of human health impacts and stress to natural ecosystems. There is concern about the increasing risks of land degradation as a result of unchecked developments such as landfills. Increasing soil erosion is evident especially around the foreshore and slopes. In recent years, 31% of developments on Rarotonga have been concentrated around the foreshore and 36% on sloping lands. Twenty one percent (21%) of development applications under the *Environment Act 2003* required environmental impact assessment. One in three public complaints received by the National Environment Services involves illegal developments.

There is increasing impact from growing numbers of resorts and household buildings that have been and continue to be constructed along the foreshore problems including 13% instances of erosion damage to properties and beaches as a result of landowners making major alteration to foreshore areas. Community concerns have also been raised about loss of public access roads and pathways to the beaches as a result of foreshore development, which highlight the growing tension relating to the land tenure system and the distribution of benefits from land-related developments.

The ecological and economic risk posed by lagoon pollution, beach degradation and the island's high vulnerability to extreme weather and climate events highlights the need to better monitoring and management of current developments. The stresses and impacts from largely uncontrolled development are not limited to Rarotonga.

Unchecked tourism development on Aitutaki highlights deficiencies nationally in the compliance and enforcement of the building code, health regulations regarding septic tanks, and the enforcement of the *Environment ACT 2003*.

All land is customary or native land and the Land Court and the Lease Approval Committee are the sole adjudicators from administering the complex land tenure system and must take cognizance of the intricate weave of customs law and practice in relation to land on the majority of islands.

Given the increasing development pressure and tourism growth on the Southern group, land is becoming a more valuable commodity in the Cook Islands. In addition there is no land use planning or zoning policies established which causes confusion regarding the use of land for residential, commercial, industrial and agriculture purposes as well as national parks and reserve. Extensive ribbon

development along the coastal strip of Rarotonga continues and is making the island less attractive for tourism and locals.

ii. National Sustainable Development Plan

Living the Cook Islands Vision – a 2010 Challenge

The Cook Islands National Vision embodies the aspiration of the people. This is the vision that the Cook Islands strive for in the “Te Kaveinga Nui”. The National Vision expressed in Maori (and thereafter in English) in this way:

“Te oraanga tu rangatira kia tau kit e anoano o te iti tangat, e kia tau ki ta tatou peu maori e te aotini taporoporo ia e te baseleia”

“To enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment”

10.Land Zoning Definitions for Rarotonga. (Draft)

1. Background

The primary goal of this project is to promote sustainable land use by involving the communities in the formulation, monitoring and evaluation of the land zoning plan for Rarotonga.

Rarotonga is dependent on land for their livelihoods. However, land is in limited supply. It is becoming increasingly scarce as a result of the ever-increasing human population and their needs. The demands for housing, food production, tourism, etc, are greater than the land resources available. The way land is use must change in order to accommodate the increasing population and meet new demands, particularly from the tourism sector. It means land should be used wisely and sustainably. The sustainable use of land will have two general advantages. Firstly, it will help present generation to produce sufficient food and lead sustainable livelihoods. Secondly, it is against this background that land zoning and land use planning come into the picture. Both aim to:

- optimize the actual land use
- resolve conflicts arising between competing uses and between the needs of different interest groups
- choose sustainable options that best meet identified needs
- rehabilitate and conserve natural resources
- support the general development process for all sectors, and
- raise awareness concerning environmental problems and processes among the population and authorities.

All land is Customary or Native Land and the Land Court and the Leases Approval Committee are the sole adjudicators for administering the complex land tenure system.

Given increasing development pressure and tourism growth on Rarotonga, land is becoming a valuable commodity. In addition there is no land use planning and zoning policies established which leads confusion regarding the use of land for residential, commercial, industrial and agricultural purposes. Extension ribbon development along coastal strip of Rarotonga continues resulting in the island becoming less attractive for tourists and locals.

The Cook Islands National Environment Services (NES), in support of an inline with the Rarotonga *Environment ACT 1994-5*, identified five (5) zoning areas for “Activities of Concern”. The zones reflect the areas protected under 1994-5 ACT and established criteria and standards for protection, conservation and preservation of flora and fauna, and common property resources such as land, water and air, where the natural resources have been threatened by human activity. It was intended that the criteria and standards established by the zoning of designated areas reflect and express a sense of community and cultural values towards Rarotonga’s physical environment.

The five (5) Zoning Districts are as follows:

Zone A	Rarotonga Waters
Zone B	Foreshore
Zone C	Streams and Internal Waters
Zone D	Wetlands
Zone E	Sloping Lands

The purpose of the zoning exercise was to establish standards, procedures and minimum and maximum guidelines to achieve the following intensions embodied in the Tu’anga Taporoporo Ipekarea manual.

- Develop guidelines appropriate to the environment of Rarotonga for developmental activities
- Develop minimum and maximum guidelines appropriate to the environment of Rarotonga for development activities

- Establish regulatory procedures and standards for review and approval of all proposed development on the island
- Adopt a development review process.

Three components;

The Rarotonga land zoning project has three (3) main components. This report (component one) provides draft discussions on land zoning concepts and objectives to accompany the draft land zone plan (map) and legend of Rarotonga.

The second component will apply an environmental economics assessment of the draft land zone plan through analysing the economic costs of land degradation and the benefits of sustainable land management. The output from this component will;

- raise awareness on the impacts of land degradation
- facilitate decision making on land use planning by providing information on the full costs and benefits of land use options, and
- provide insight in how the costs and benefits of land use options accurate to different communities and stakeholders.

The third component overlaps with components one and two and though the entire implementation period. This component intends to identify and involve all communities in a series of ongoing collaborative activities with targeted rural communities as the centre of focus. Rural communities will be encouraged to outline their needs using facilitation, rather than a planned intervention, approach. It will be important that this concept of facilitation and resource support is similarly shared by all stakeholders involved in the project – from the outset.

The participatory planning would be conducted four (4) levels of intensity as follows:

- information sharing
- consultation (with rural communities)
- decision making (by rural communities), and
- initiating action (on behalf of and in consultation with the rural communities).

The strength in using the participatory planning approach lies in the process being flexible, adaptive and bottom-up.

2. Land Zoning Concepts and Objectives

Land zones and land zoning

Land zoning, in the context of national and island planning involves the grouping together of units with similar properties and managements so that protection or use of units with similar properties so that the protection or use of those units may be undertaken in a controlled and sustainable manner.

Land zoning is therefore a process which is used to identify parcels of land (Land Zones) which have similar properties with respect to land use, to determine the way in which those lands might be managed and used in a sustainable manner and to formulate procedures to ensure that the use of such lands is determine in accordance with principle of sound land management.

2.1.1 Land Zones

Land zones are unique areas of land where a specified single resource utilisation or a combination of resources used may be undertaken in accordance with the management guidelines and resource use policies as defined. In general terms the definition of a land zone is;

An area of land where the predominant and agreed land uses are compatible with the capability of the land to support those land uses in a sustainable manner in accordance with

national land use policy as defined in respect to the need for development and for conservation.

2.1.2 Land Zoning

The process of land zoning involves the identification, definition, and spatial presentation of land zones and the establishment of procedures to manage the land use which may take place.

Land zoning must take account of:

- The suitability of the land to support and sustain productivity or lifestyle through the application of sound land management and land and biotic resource conservation practices
- National policy in respect to land rights and priorities for conservation and development
- The current land use pattern where officially sanctioned through land allocations, traditional rights or illegal occupation; and
- The social and cultural customs and customary land tenure rights of the land owners and their communities.

2.2 Objectives of land zoning.

2.2.1 The purpose of land zoning.

Land zoning is carried out in most countries as a means of ensuring that land resources are used in a controlled and sustainable manner. The purpose of land zoning then is:

To group together lands of similar capacity and therefore similar management requirements in order to lay down specific guidelines as to use of the land in order to maintain the quality and character of the land.

2.2.2 Requirement for land zoning

For land zoning to be effective the following actions need to be implemented:

- the range of uses to which the lands may be put must be listed and Agreed;
- evaluation of the suitability of the land, in relation to specified management systems, for each of these land uses;
- formulation of a land use policy with respect to;
 - *priorities for land use;*
 - *compatibility between land uses, and*
 - *resolution of land use conflict.*
- A procedure for enforcing conformity with land use policy formulated and the result zonation.

2.3 Products of Land Zoning

2.3.1 Land zoning materials

Land zoning does not produce a land use plan. Land zoning;

Identifies those areas which are best used for a single or range of compatible uses on the basis of the suitability of the land for those uses, the management practices to be adopted and the national policy on land use.

The approach to land zoning as proposed for Rarotonga will produce:

- A map (at a scale of 1:10,000) showing the recommended distribution of land zones;
- Maps at a similar scale showing the distribution of land for which there is a potential risk to the land and the uses to which that land may be put (and hence investment);

- Maps indicating proposed future land policy options and areas where some form of intervention is needed to resolve current land use conflicts; and
- A document detailing the purpose of which each land zone has been developed and the land use activities which may occur within that zone.

2.3.2. Assistance to National Planning from Land Zoning

Land zoning is designed to support the evaluation of land suitability for particular purposes. Additional benefits of land zoning might include:

- provision of a strong land suitability base for upgrading current land and soil resources information;
- a base for the location of future developments and an indicative range of the development options acceptable within the areas identified;
- confirmation of the boundaries of protection areas and indication of the need to make boundary adjustment based on land suitability, land use and environmental sensitivity;
- an indication of the data needs to support more detailed future planning, and
- a basis for formulation of rules/policy for land management and the legislation to enforce that policy.

2.4 Land Zoning Methodology

The steps in developing the land zoning map for Rarotonga and the associated zone guidelines are as follows:

- Collation/compilation of the biophysical spatial sets;
- Ministry of Infrastructure and Planning (MoIP) boundaries of Raui, administrative districts and the marine zones within the lagoons;
- Develop the land zone categories and legend for Rarotonga;
- Using the high resolution Quickbird satellite imagery as the base map (1:10,000 scale) plot the land zones according to the legend; and
- Develop the descriptive guidelines for each land zone and include these into a report for public scrutiny and discussion.

The draft legend for the Rarotonga land zoning map is given in Table 1.

TABLE 1. LEGEND – Rarotonga land zoning map

- 1. Quarrying**
 - Approved for coral sand mining (to come)
 - Approved for rock aggregate exploitation (to come)
- 2. Urban Areas**
 - Commercial use and multi-purpose development
 - Light industrial development
 - Moderate density residential
 - Nucleated settlement areas in rural zone
- 3. Tourism**
 - Commercial development (hotels, motels, etc)
 - Recreational tourism
 - Cultural, historic and sacred sites
- 4. Agriculture Lands**
 - Small holder commercial cropping
 - Wetland taro production
- 5. Water Conservation and Biodiversity**
- 6. Inland Areas Protected for Limited and Approved Land Uses (include, areas for Nature Conservation).**
- 7. Forestry**
 - Exotic plantations
 - Reforestation

8. Protected Areas

- High mountains
- Lagoon (include motus)
- Coastal foreshore
- Coastal high hazard areas
- Raui
- Marine areas within the lagoon

3. Zone Definitions and Guidelines

Quarrying

The major quarrying activities are identified on the basis of their potential environmental impact;

Coral Sand Mining

Increasing demand for coralline sand mined from the relict beach strand for concrete and construction purposes. There are no regulations to control exploitation of sand on private land and this arrangement between the contractor and the land owner to mine sand. The excavated site is commonly used for solid waste disposal. Sand mining directly from beaches ceased in 1997, the exception being the removal of coral cobbles and boulders from the northern coast foreshore for septic tanks soak pits. In the absence of regulation, sand mining cannot be zoned, other than that sand mining is not permitted landward within 30m of mean high water mark (*Environment Act 2002*).

Aggregate Mining

Exploitation of basic volcanic rock aggregate resources from the ground for hard aggregate after crushing. Quarry sites require access sufficient area for deposition of overburden.

Quarrying activities are subject to an Environment Impact Assessment (EIA) process and given approval by National Environment Services (NES), require a management plan that would be executed under the National Environment Act 2002.

Urban Areas

The intent of urban zoning is to demarcate existing urban areas comprising housing, village settlements and supporting commercial and infrastructure and make provision for growth and future development.

Commercial Use and Multi-purpose Development

Privately owned or operated facility or place of business open to the public for sale of goods and services. Example include; restaurants, taverns, offices, retail stores, and car parks. Public facilities offering similar goods and services are also defined as commercial use. Avarua is the only urban centre of note and is the business, economic and government hub. Small nodes of development occur at Nikao, Arorangi, Titikaveka, Ngatangia and Matavera. These also function as social and business sub-centres for the island.

Light Industrial Development

This category includes multi-purpose and light industry activity. It does not include factories that are associated with individual isolated agro-industry (e.g. noni factory) enterprises in rural areas, nor does it include small cottage industries.

These small and medium scales operating are considered to have minimum adverse effect on the environment. The primary industry estate is located at the east end of the airport.

The economic link that ties Rarotonga and the nation to the rest of the world is through the Rarotonga International Airport and the harbour at Avatiu. It is logical for the designated industrial area to abut

the airport and Avatiu port. This category also includes areas set aside for solid waste disposal and areas for disposal and treatment of urban waste.

Moderate Density Residential

The lower region circumscribing the entire island are shown to be entirely moderate density, that is to say that single family detached housing will still be virtually the only dwelling unit being built as well as a patchwork quilt of other land use types at all sorts of intensify levels. The single family home on its 1000m² lot has been the preferred housing type on Rarotonga.

Nucleated Settlement Areas in Rural Areas

This zone provides for new residential communities in accordance with approved building ordinances. Inland Rarotonga is primary steeply sloping land. Residential development can occur in this area on parcels of land with slopes less than 11°. It is envisaged that these areas would be developed by a single developer – laying on all infrastructures (roading, sewerage and utilities). It provides for a different type of residential growth and might see nucleated settlements of up to 20 residencies.

Tourism Activities

- **Commercial Development (hotel, motel, etc)**

This activity includes existing tourism accommodation and related service areas and recreational facilities that are normally either located adjacent to existing tourist areas or in areas with special aesthetic/scenic interest or with high recreational potential. It also recognises land for commercial tourism that will take place in areas to be set aside for expansion or new development.

Development would include the construction of hotels, and resorts and related facilities for foreign tourist. Major recreational development such as golf courses and other sports and leisure facilities would be included where the areas proposed are not immediately adjacent to established urban areas.

One of the primary reasons for defining a commercial tourism development zone is to control the social impacts of tourism. Existing commercial facilities need to be identified and mapped then a development zone for future growth designated.

The Tourism Master Plan recommends the adoption of an internationally recognised environmental accreditation scheme for use in the Cook Islands. Elements in this scheme, designed to provide practical assistance to tourism operators, include; use of alternative sources of energy; conserving energy (including electricity and liquid fuels); applying water conservation and recycling techniques; and minimizing production of solid waste.

Tourism also plans to develop enforceable mechanisms to control land use including: protection of the inland areas; coastal protection (both in terms of building within 30m of high water mark, and construction of structures); hazard zone management; vegetation protection; landscape standards; hillside development standard; protection of wetlands; and enforce appropriate sewage treatment and discharge standards.

- **Recreational Tourism**

The pattern of land ownership in the Cook Islands means there is very little land held in public ownership for conservation or recreation purposes. This activity has been established to preserve and provide for open space and recreation amenities and to allow for tourists to enjoy the natural and cultural heritage of the country. This activity should be confined to regions of high aesthetic/scenic interests or with special recreational character and which will sustain temporary pressure from small tourist groups but are not suitable for the establishment of permanent facilities other than vehicle parking and toilet facilities. Future planning might be given to identifying potential nature reserves and making provisions for a national park. These areas may overlap into areas designated as conservation.

The Tourism Master plan recommends that outstanding natural resources are protected and public access is secured. A transfer of ownership is considered not to be needed to provide long term

protection as this could be organised through a range of mechanisms including the purchase of easements, promotion of covenants, etc.

Tourism seeks to develop a network of national parks and reserve, including a Rarotonga Cloud Zone Park, Manuae, Suwarrow and Takutea; secure public access to the beaches and lagoons by the establishment of reserves and access points at prime locations; protect traditional access ways to the beaches, in particular easements between properties; and secure the rights of public access to the inland tracks.

Cultural, Historic, and Sacred Sites.

It is important that all known cultural, historic and sacred sites are identified and mapped so as to form an integral part of Rarotonga land zoning map. These sites, buildings, structures and artefacts' need to be protected and preserved. Guidelines for the protection and management of these sites should be prepared. Development activities should not disturb these identified sites and any development that potentially affects a site, the developer shall bear the cost of mitigating measures.

Agriculture Lands

These lands are designated preferred agricultural use.

Smallholder Commercial Cropping

Includes all forms of cropping which do not depend on irrigation. Included is the production of rained food crops and commercial agriculture.

This activity includes small holder commercial farms, mainly growing field crops (corn, etc); vegetables (root crops, brassicas, cucurbits, etc); Fruit trees (citrus sp, papaya, noni, etc), other fruits (bananas, pineapples, melons); and subsistence tree crops (coconuts, breadfruits, etc) with free ranging chickens, and small piggeries. Farmer groups may help with input supplies, marketing and simple processing techniques. Production is for local consumption and sale in local markets. Government involvement is in the form of research and extension services.

These lands include the following soil series – Avana, Takuvaine, Matavera, Pouara, Tikioki, Arorangi (Leslie 1980) and are defined in the USDA Soil Capability Classification System as Soil Capability class 1,11 and 111 (Soil Staff, 1951).

Wetland Taro Production

This land use category involves the cropping of natural wetlands supplemented with irrigation and/or drainage techniques.

This activity includes labour intensive production of taro in areas of wetland that circle Rarotonga between the beach strand and the inland terrace and fan systems. These are also restricted areas of terrace irrigated taro on low angle fans.

These wetlands act as natural filters of runoff from the interior. Described as Vaikai soils (Leslie, 1980), they are very poorly drained with a high water table and slow surface runoff. They are an effective buffer zone reducing silt and clay from entering the lagoon system during times of prolonged flooding. Wetlands are defined in The Environment Act 2002 and described further for management purposes in The Environment Policy for the wetlands (NES< 202).

Water Conservation and Biodiversity

This zone is established primarily to prevent accelerated erosion and stabilised soils on steep slopes in order to protect sources of water for domestic agriculture or industrial uses and reducing flooding and siltation in downstream areas. The designated zone covers all the watershed land above the water intakes. Potable water supplies for Rarotonga come from these watersheds. The water intakes connect to the island's water reticulation system supplying the residences, business as well as growers.

There are three major catchments on Rarotonga – Avana, Takuvaine and Avatiu – with a catchment area of 16km² of 37% of the sloping land. Also, three smaller catchments – Turangi, Tupapa and Papua – with a total catchment area of 8km² or 18% of the sloping land and a further 18 smaller catchments that are drained by as many streams on the island.

Included in the zone are lands that are environmentally sensitive, naturally or culturally unique, or have any other attributes that should be considered for protection from any activity that would significantly alter their environmental integrity, balance or functions.

Clearly, there is a need to preserve these ecosystems in order to protect: rare or endangered species; and acceptable level of biodiversity; and areas of understanding scenic beauty. The Takitumu Conservation District is an example of a designated protected area to manage the endangered Kakerori or Rarotonga Flycatcher. Similarly, the active protection given the seabird on the inhabited island of Takutea and Suvarrow. The people of Atiu (Enuamanu) have protected Takutea over the last 100 years and Suvarrow has been a national park since 1978.

Protected for Limited and Approved Land Uses

(incl; Areas for nature conservation)

This zone covers the remaining interior sloping lands that are not designated as water supply catchments (5.1 above). The landscape and vegetation cover is similar and these areas must be managed with care. There has been uncontrolled development in recent years with sediment derived from these areas discharging into the lagoon during floods events, often destroying corals and marine life. Proposed land use should be subjected to EIAs and approval given by NES.

Forestry

Approximately 60% of the total land area of the Cook Islands is covered by forest. This is relatively high coverage. However, over the years there has been progressive removal of forest.

In this category the activities relate to the planting of forest trees either for eventual timber production or with the objective of re-establishing an effective cover to control land degradation.

Timber Plantation

This zone includes the establishment of commercial viable timber plantation for eventual harvesting. Included are areas where afforestation has taken place with short rotation cycle. The tree species involved are predominately *Pinus caribbaea* with some areas of *Eucalyptus* species. The viability of harvest logging timetable and timber use is yet to be determined.

Reforestation

This zone comprises afforestation or reforestation (replanting) where the primary purposes are conservation of critical lands. Again, the same exotic species have been used. While the harvesting of the crop is uncertain (due to not having a tantalising facility in the country) the canopy will provide a suitable nursery environment for native species to establish and eventually take over.

Protected Areas

High Mountains

The development of a Rarotonga Cloud Zone Park has intrinsic merit in terms of formal protection of outstanding landscape features and extrinsic benefits in terms of developing geotourism attractions. The question is what area of land to zone? Proposal for a Rarotonga Highlands Park were made by the Water Authority and ADB in 1995, as well as a similar recommendation from the Land Commission in 1996. These proposals involve an area of 2,500 hectares and took in all land above 150m above sea level.

In 1998 a NZODA proposal proposed an area of 120ha above sea level which featured some of the highest peaks in the central island region. These land are under Native Customary Ownership but vested in the crown.

Lagoon (*incl; motus*)

The boundaries of the lagoon extend from the foreshore mean high water mark with its seaward limit the outer edge of the reef at low tide. The zone comprises of 17.3% (14m²) of the total area of Rarotonga. The marine ecology has been described as having degraded over the last 50 years. The lagoon is of critical importance. It provides a source of food, recreation and also indirectly provides employment through jobs in the tourism industry.

Protection and management required strict controls on lagoon activities such as the removal of materials, building of inappropriate structures and disposal of waste. More importantly, sustainable land management practices should be implemented with strict controls over land-based activities and affect the quality of water that discharges into the lagoon. The motus at Muri, as part of the lagoon system, must be protected and could be enhanced through planting of appropriate native species.

Coastal Foreshore

Comprising only an estimated 3.1% (2.5km²) of the total of Rarotonga, the foreshore comprises all the beach areas of the island. Most developmental activities are found in the proximity of the foreshore. On the exposed northern coast (Te Au O Tonga Vaka to Ngatangia) the foreshore areas have high coastal ridges and are characterised by coarse coral boulders, cobbles and gravels. This reflects high seas caused by cyclones and tropical storms.

On the west and southern coasts, i.e. Puaikura Vaka and the rest of Takitumu Vaka, of the coral particles are well sorted sands and wider, gentler sloping beaches.

The foreshore is defined as the area between the mean high water mark to a landward distance of 30m.

The foreshore now has very high real estate value. With the continuing importance of the tourism industry on the foreshore, the rate of hotel/motel development has greatly increased. As recreational assets, it provides for most of the private sector employment in the tourism sector. All major tourist resorts are found in the foreshore area.

Thus, the foreshore is a crucial resource asset and must be conserved and managed in a sustainable manner protecting the landscape features, its natural geological functions, recreational assets, etc. Foreshore management objectives would be to protect beaches/ecosystems from further erosion and degradation and preserve the natural aesthetic values of the foreshore.

Coastal High Hazard Areas

These areas are subject to high velocity waters including, but not limited to, storm surges related to cyclonic events or tsunamis. An accurate map which identifies areas that are vulnerable from the impacts of these natural causes.

Raui Areas

Ministry of Infrastructure and Planning (MOIP) to provide boundaries.

Marine Areas within the Lagoon

Ministry of Health and Ministry of Marine Resources to provide boundaries.

Management Strategies

1. Coastal Makatea and High Island Forest

Coastal makatea forests are currently being subjected to human activities, like burning and livestock farming. Due to the difficulty in establishing forest in this area it is essential that natural regeneration be encouraged either through restricting farming in these areas or by enacting and enforcement of appropriate legislation. These forests are characterized by the presence of poorly formed tree vegetations growing on coral rock outcrops. The wood has been used for fuel wood but due to the relative inaccessibility of these areas little is taken. The main value of these forests is shelter and landscape.

The high island forest of Rarotonga is located on the steep central mountains where access is limited, even to people on foot. The fact and the paramount values of water quality and landscape warrant the forest to be held and protected intact with harvest limited to food resources only, primarily introduced animals.

2. Atoll Forest

By definition atoll forests are very low lying, seldom more than a few meters above sea level. With atoll vulnerability to tropic storms and other climate adversities. The needs to maintain forest cover on these atolls are extremely important. Soil fertility is low, leading to the growth of only a few adapted species. Food production without soil improvement is limited to coconut, but protection and habitat is provided for other plants and animals to the ecology and protection functions.

3. Plantation Forest,

Most of the 1,100 hectares (ha) of plantation forests are established in *Pinus caribaea*. All of these forests were planted by MoA on behalf of the land owners for the purpose of soil erosion control and wood/timber production. Other species like *Acacia mangium* and eucalypts were planted but poor performances their plants area were not expanded.

Initial measurements are promising and indicate growth rates of around 15 cubic meters per ha per year with good form and health. For this to be maintained the area planted needs to be kept in good health with minimal risk from fire. Essential tending through timely pruning and thinning is important to avoid competition amongst trees for sunlight and fuel, thereby reducing the quality and value.

With restructuring of Government, MoA's function with regard to forestry development has changed. The new role is limited to the provision of advice and information regarding protection, management and utilization of tree resources and promoting their protection from fire, abuse and over-cover.

The plantation forests are poised to provide their initial yield for post and poles (92,000 poles from 200 ha on Mangaia) which will require preservative treatment for high value end uses. Investment from private or aid sources is now needed to support the development of local enterprises that can capitalise on this resource.

The management of plantation resources will depend on close collaboration, control and coordination of limited parties, land owners, developers and government in order to develop the resource to the benefit of all parties.

Any development associated with the exploitation of these resources should, however, have the followings:

- Management plan – to be approved by MoA which details the followings:
 - Name of plantation, size of c, directions and land zones
 - Logging plan, detailing felling, skidding, directions and land zones
 - Identification of buffer zone, sizes and streams

- Replanting plan – approval of management plan is conditional upon relevant parties agreeing to replant logged-over maybe covered by charging appropriate fees.
- Fire protection plan- approval of management is also conditional upon relevant parties agreeing to follow instructions relating to the use and lighting of fires in the forest plantation. Adequate fire fighting capacity must always be present to ensure no damage is caused to the forest

Other Important Documents that can be part of the FGR are as follows:

1. Environmental Impact Assessment (EIA)

The relationship between the environment, people and development is interconnected. This relationship is dynamic and variable. People impact the environment in which they live and are also impacted by changes in the environment. It is against this situation that Environmental Impact is prepared. It is impossible to acquire complete information on the project, the people and the environment, but it is vital to obtain as much information as possible in order to make wise decisions.

What is **EIA**?

EIA is a formal study used to predict the environmental consequences of a proposed development or activity. **EIA** may include studies of flora and fauna, soil erosion, human health, that is to say all physical, biological, social and economic impacts.

EIA – is the prediction and evaluation of the likely effects that an activity will have on the environment, before the activity starts. This avoids adverse and costly changes in the natural and human environment as a result of human actions.

EIA provides a formalised way of consulting the people who will be affected by a development before it happens. Such consultation helps avoid unwanted social and environmental effects that are not obvious to the developers and to the decision-makers.

EIA also seeks to compare the various alternatives for a project. **EIA** seeks to compare all feasible alternatives and determines an optimum mix of environmental and economic costs and benefits.

EIA is a decision making tool. Its ultimate objective is to aid judgemental decision making by giving the decision maker a clear picture of the potential problems and ways to improve a project's suitability for its proposed environment.

The **EIA** process helps:

- Identify/understand effects
- Identify/understand negative/positive effects
- Project Feasibility and Design
- Consider views of other people
- Modify proposal to control adverse of proposal and effects
- Permitting Authority and affected parties to fully understand details of proposal and effects
- Provide basis for ongoing monitoring after approval
- Permitting Authority decide whether should grant approval (conditions).

An **EIA** is required Under Section 36 of the *Environment Act 2003*, if a project activity causes or it project, or is likely to cause significant environmental impacts. **EIA** is the process of preparing an **EIA** report to accompany an application for a project permit under this section.

EIAs are usually required for (but not restricted to) developments and activities in Specific Areas of Concern.

- Foreshore and Cook Islands Waters
- Inland Waters
- Wetlands
- Sloping Land

2. National Parks and Conservation Areas

The protection of areas and species of special significance is not a new concept in the Cook Islands. The concept of reserves has existed in the Cook Islands for hundreds of years in one form or another.

The imposition of the raii system: a traditional system whereby access to a particular resource or area is forbidden for a given period is still being practised in the Cook Islands.

Although it appears that the raii system aims at the conservation of food resources, rather than a specific environmental protection mechanism, it is in essence the protecting of ecological system in the lagoon and reefs and other marine resources.

Suvarrow Atoll was the first area to be formally established as a **National Park** in the Cook Islands since 1978 for the protection of the wildlife and the marine resources that it possesses. In 2000 the Nikao Social Centre was declared a National Park under the protection of the Environment Act.

The island of **Takutea** a breeding ground for birds has been a **Wildlife Sanctuary** since 1903. The traditional leaders of **Atiu (Eua Manu)** who, are the trustees of Takutea still manage the island as a conservation area for wildlife.

Cook Islands Protected Areas are:

- | | |
|------------------------------|--------------------|
| • Takutea | Wildlife Sanctuary |
| • Suvarrow | National Park |
| • Nikao Social Centre | National Park |
| • Cook Islands Parliament | Raii |
| • Pouara | Raii |
| • Aroko | Raii |
| • Titikaveka | Raii |
| • Tikioki | Marine Sanctuary |
| • Takitumu Conservation Area | Reserve |
| • Aitutaki Ootu | Reserve |
| • Motukitiu Reserve | Marine Sanctuary |
| • Pukapuka Motu Kotaa | Sanctuary |
| • Motu Ko | Sanctuary |
| • Motu Uta | Sanctuary |
| • Motu Nuiā | Sanctuary |

BIODIVERSITY (Biological diversity)

What is **BIODIVERSITY**?

***BIODIVERSITY** is the variability among living organisms from all sources including inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*

Biodiversity thus includes diversity within species that is genetic diversity. This in turns includes “genetic resources” which are defined as “genetic material of actual or potential value.

The Convention on Biological Diversity (CBD) is an international treaty that came into force in 1993. Among the Pacific Island countries, the Cook Islands, Fiji Islands, Kiribati, Federated States of Micronesia, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu are parties to the CBD. As regards territories of metropolitan countries, France, New Zealand, and the United Kingdom are parties, but not the United States.

The impetus for the CBD was global concern over the loss of genes, species and ecosystem, often as a result of human activities, and the realisation that global action was needed to stem this loss. Biodiversity was viewed as valuable in its own right, rather than because of its value to humans. This sometime referred as the “conservation” reason and sometimes as “exploitation” reasons. Both these perspectives are reflected in the CBD, which has the following objectives:

- The conservation of biological diversity
- The sustainable use of its components
- The fair and equitable sharing of the benefits arising from utilisation of biodiversity.

The CBD requires the Parties to develop national strategies, plans or programmes for conservation and sustainable use of biodiversity. Parties are also required to implement, as far as possible, the necessary in situ and ex situ conservation measures.

The CBD attempts to balance the interests of the resource owners and users of biodiversity by reaffirming that while “States” have sovereign rights over their own biological resources, they must also endeavour to create conditions to facilitate access to genetic resources for environmentally sound users by other Contracting Parties. Underlying these provisions were two concerns. The first was that in the past, samples of biodiversity were often collected and removed without the understanding or permission of the resources owners. The second concern was that the benefits from commercialisation of biodiversity, or its derivatives, were rarely shared with them.

RAROTONGA CROSS-ISLAND WALK

Rarotonga is the principal island of the Cook Islands, a country of 15 small oceanic islands in the tropical South Pacific.

The island consists of a narrow coastal plain and a rugged mountainous inland. The outer part of the coastal lowlands, where most of the 12, 188 people (Cook Islands 2001 census of population and dwelling) live, has infertile coral soils. The inner lowlands, to about 30 meters above sea level, have fertile volcanic soils which support the main agriculture crops. The vegetation of the lowlands has been heavily modified by plants introduced since the London Missionary Society made contact with the

Polynesian inhabitants in 1823. In contrast, the mountainous interior, about 70% of the 67km² islands, supports an almost pristine native forest.

One recipe for a perfect day on Rarotonga is to amble with a friend along the Cross-island Walk. There are no dangerous animals in the forest, and the track is suitable for all moderately fit people from 6 to 60 years old. If you lack time for the 4 hour main course, an ideal snack of about 2½ hours is to drive to the car park near the end of the Avatiu Road and walk through the native to Te Rua-Manga (the Needle) and back.

Shoes are recommended; the track often passes over a network of tree roots, and there are a few slippery scrambles, especially in the southern valley. The only stream crossing in the northern valley is easily accomplished with dry feet. However, in the southern valley the track has numerous stream-crossings where it is easier to walk through the water than risk slipping off boulder.

Mosquito repellent will prove its worth if you wish to take your time to have a good look at things along the track. Although it is a good idea to take something to drink with your lunch, the water in the inland streams is clean and safe.

The walk has 3 main sections;

1) Avatiu Road Section (¾ hours)

This section starts at the Ara Metua (literally, Parent road) which is about half-a- kilometres inland from Avatiu harbour. The easy walk along a vehicle road takes you through a typical agricultural area. If you drive up Avatiu road the owners of the upper valley ask you not to drive through their village; *(Please leave your vehicle in the carpark).*

2) Te Rua-Manga Section (1¼ Hours)

This is a energetic uphill walk through native forest from the carpark to the base of the pinnacle, Te Rua-Manga (the Needle). The walk along the ridge from the T-junction to the pinnacle has a couple of short scrambles which are slippery when wet. The base of the Rua-Manga is an ideal place for a lunch stop while you soak in the splendour of Rarotonga.

3) Papua Valley Section (2 hours)

The initial 1½ hours is a vigorous walk, zig-zagging down the stream to the Papua Waterfall (*also called Wigmore's Waterfall*). There are several downhill scrambles but they are no more difficult than the two on the ridge between the T-junction and the Rua-Manga. The secret is to take them slowly. From the Papua Waterfall it is an easy half-hour walk down the valley road to the coastal road, the Ara Tapu (*literally, Sacred Road*).

There are also many very interesting things that you find while taking the Cross-walk.

- i. The Avatiu road section you will cross the Ara Metua traditionally called Te Ara-nui-o-To'i (The great Road of To'i), is the obscured remains of a cultural artefact unique in Polynesia: a paved, round-island road. At this point you are on the inland side of the discontinuous chain of swamps which separate the infertile coastal plain of coral sand from the fertile volcanic soil of the agricultural belt. The natural swampland has been developed into raised plots (*beds*) for growing the Polynesian staple food Taro (*Colocasia esculenta*). The roots provided carbohydrates, while the young leaves are used to make a vitamin-rich dish called rukau
- ii. After the Avatiu Bridge the agricultural development becomes more extensive. Most of the plants including the weeds have been introduced since the arrival of Europeans. These include massive mango (vi) trees, which fruit during the summer; orange varieties (anani) orchards; plots of papaws (nita), also called papaya; avocado (apuka) trees; fields of palmate-leaved cassava (maniotā) with roots of starch and rows of kapok (vavai/mamau) trees with distinctly horizontal branches and long kapok-filled fruits. Although several varieties of bananas (meika) were introduced in pre-European times, the varieties now grown on the lowlands and in the agricultural belt have been brought here in the last 50 years.
- iii. Beyond the Avatiu Power Station the road veers left and passes along the left side of some historic/ancient, terraced taro plots. In pre-European times the tribes lived mainly in the

valleys for protection from each other, and developed elaborate irrigated terraces for taro production.

- iv. Beyond the carpark, walk along the private road past the houses and Avatiu Water Intake. About 350 metres past the water intake you round a corner to the left and have a fine view of Te Rua-Manga in the distance. At this point you are about 100 metres above sea level; the base of Te Rua-Manga is about 350 metres a.s.l.; and the pinnacle itself is about 50 metres high.
- v. A hundred metres up the valley, the vehicle track ends at the abandoned Upper Water Intake. The small man-made pool here, like the many natural pools along the inland streams, is worth a peek for freshwater animals. The two large freshwater prawns are;
 - **Koura-vai Rapa-nui** (Thick-hand prawn), which is usually pale brown with hefty claws, and
 - **Koura vai Tia'aka** (Bracelet prawn), which is dark brown, with long thin arms and a yellow bracelet at the base of the claw.

In addition to the small day-active fish, the inland streams support two blotchy-coloured eels, which are voracious nocturnal feeders. The two species³, which are almost inseparable on external features alone, are traditionally called Tuna Pupu or Tuna Purepure. (3. *Giant long-finned Eel* (*Anguilla marmorata*) and *Pacific Long finned Eel* (*Anguilla megastoma*).

On the left of the track along the stream is an entanglement of Au (*Hibiscus tiliaceus*) trees which has large yellow flowers at night that turn red-brown and fall during the day. The mashed flowers are applied to boils and cuts. The inner bark of younger branches is used to make hula-skirts (*pareu kiriaiu*), and traditionally was also used to make rope (*taura kiriaiu*) and reef-sandals (*tamaka kiriaiu*).

- vi. A gentle 250 metre walk takes you to the stream-crossing, which is the last place to have a drink of water until you reach the Papua Stream in the southern valley. About 25 metres beyond the stream you enter a clearing with massive boulder on the far side. The two largest tree around the clearing are I'i (*Inocarpus fagifer*) Polynesian chestnut and Mato (*Homalium sp.*). The I'i, which has vertical buttresses up the trunk, was commonly planted in pre-European times. When the nut is removed from its tough fibrous coat it can be either boiled and eaten whole or grated and cooked/baked in the earth oven (*umu*) with coconut cream to make a favourite traditional dish called *kanaka*. The other large tree Mato (*Homalium sp.*) is the most common inland native tree. It typically more than one trunk, each having small horizontal eruptions on the bark. The plentiful surfaces roots of the *Mato* provide sound footing on the track to Te Rua-Manga. This species typically flowers sparsely, except after tropical cyclones when its abundant small blossoms turn the inland forests white. At this point you can see the largest and smallest of Rarotonga's 88 inland ferns. The largest *Anae* (*Angiopteris longifolia*) (*Kingfern*), is obvious with its 3-5 metres fronds. The small Disc Filmy-fern, which consists of a series of flat discs each about 15mm diameter, can be found growing on damp tree trunks.
- vii. The track leads up the ridge to the right of the large boulder. About 120 metres uphill there is a *Pua* (*Fagraea berteriana*). The *Pua* has glossy leaves, and summertime nocturnal white flowers which turns orange and fall during day time. This species, which is a common feature of the razor-sharp ridges of Rarotonga, usually starts life resting on another tree. Although the *Pua* is not parasitic, its network of roots eventually strangles the host plant. Two notable native trees at this point are *Kavakava* (*Pittosporum rarotongense*) and *Kaiatea* (*Weinmannia samoensis*). The *Kavakava* immediately below the seats, is on the left of the track as you sit and look down the ridge. It has oval shiny green fruit and long wavy-edged leaves in terminal bunches. The Polynesian name meaning "bitter", reflects the pungent smell released when the leaves are crushed. The *Kaiatea*, immediately uphill of the seats, is on the as you look up the ridge. This common species is easily recognised by its toothed, compound leaves, each having 3 or 5 leaflets. From here to the T-junctions, the track has five relatively flat sections separated by five steep ones. One of the most common trees along the track is the endemic "Pua *Neinei*" (*Fitchia speciosa*) which has terminal bunches of large leaves with long stalks, and stilt-like roots supporting the base of the trunk. From April to July the *Neinei* has large bright orange flowers. The copious amounts of nectar in the flowers is a flavoured drink of local birds, especially the I'oi (Rarotonga Starling). The large notches in the edges of *Neinei* leaves the nocturnal feeding marks of the endemic *Neinei Weevil*.

A small shrub which is often conspicuous because of its white flowers is “*Ua Motukutuku*” (*Melastoma denticulatum*). The leaves are hairy and have three main longitudinal veins; the purple pulp of the fruit is edible.

Along the track an eye-catching climbing plant is the endemic *Kiekie* (*Freycinetia arborea*), which is a close relative of the lowland Ara Tai (*Pandanus tectorius*). Each branch has a rosette of long, narrow leaves.

- viii. Along the ridge, the scrubby trees with the gnarled trunks and beautiful spiky red flowers are *Rata* (*Metrosideros collina*).

Maire Rakau (*Alyxia stellata*) is the common thin-branched shrub with small opposite leaves which snap and release a white sap when folded. The dried leaves have a pleasant smell and were traditionally worn around the neck on special occasions.

- ix. Common along the valley track is *Kavakava Atua* (*Macropiper latifolium*), a shrub with large, glossy heart-shaped leaves. This native plant is closely related to the Polynesian introduced *Kava Maori* (*Piper methysticum*), which was used to make narcotic drink which induced a state of quite relaxation. After the missionaries stopped the use of the drink, *Kava Maori* became rare as it was not self-propagation.

- x. About 15 metres downstream find the best place to cross and use the roots to scramble up to the track behind the *Turina* (*Hernandia moerenhoutiana*). About 60 metres downstream the stream cascades through a mini-canyon, and the track leads upward onto the eastern slopes. During the summer one of the most common plants along the track is *Kopi Enuu* (*Zingiber zerumbet*). The bulbous flower-head is full of a fragrant liquid which was traditionally used as a shampoo.

Eventually, the track leads down a broad ridge to the last stream-crossing. Near the bottom of the ridge a lone *Nu/Niu* (*Cocos nucifera*) grows on a steep and slippery bank, where special care is required.

After the last crossing, the track passes through areas of sprawling *Au* (*Hibiscus Tiliaceus*) with a carpet-like groundcover of *Toetupu* (*Geophila repens*). This small plant with paired, round leaves has a white flower which develops into a bright red fruit in late summer

- xi. Track eventually enters a fernland. On the edge of the fernland, a tall ladder-like fern is *Moumea* (*Blechnum orientale*), which has its reproductive bodies in a line on each side of the mid-vein on the underside of the leaves (*pinnae*). In the main part of the fernland, the dominant fern is the strong, branching *Tuanu'e* (*Dicranopteris linearis*).

Along the track are several small shrubs with glossy dark green leaves. These are the recently introduced *Tiare Taina* (*Gardenia augusta*) which is close relative of the *Tiare Maori* (*Gardenia taitensis*)

Look carefully before you grab hold of branches for support. Near the end of the steep section there are few *Governor's Plum* (*Flacourtia jangomas*) which has magnificent spines on the trunk and branches.

On the cliff on the west side of the pool, especially above the grotto, there are a few *Rarotonga Cyrtandra* (*Cyrtandra rarotongensis*) This endemic species, which is now rare, has large fleshy leaves and small white flowers.

Also during the crossing using the track you will come across of birds such as the *Kukupu* (*Ptilinopus rarotongaensis*), *I'oi* (*Aplonis cinerascens*), *Rupe* (*Ducula pacifica*), *Karavia* (*Eudynamis taitensis*), *Tavake* (*Phaethon rubricauda*), *Kakerori* (*Pomarea dimidiata*), *Moa Rere-vao* (*Gallus gallus*), *Manu Kavamani* (*Acridotheres tristis*), *Moa Kirikiri* (*Pteropus tongnus*) etc.

Other animals you will find in the crossing are; *Bronze Blue-tailed skink*, *Mournful Geoko*, *Dandy skink* etc, *Ship's rat*, *Norway Rat* etc.

17. ENDANGERED SPECIES PROGRAMMES

The developments of programmes to conserve endangered species were seen as urgent for various native species and for some species and varieties of agricultural and domestic importance and values. The unique flowering plants such as the Mitiaro Fan-Palm (Iniao-*Pritchardia mitiarioana*), the Te Manga Cyrtandra (*Cyrtandra lillianae*) and the Cook Islands Myoporum (Ngaio-*Myoporum wilderi*) were absorbed into a programme to survey and conserve endemic flowering plants and other endangered native flowering plants. Among the endangered natives included were the important timber trees Tamanu (Pacific mahogany-*Calophyllum inophyllum*), Miro (Portia tree-*Thespesia populnea*) and Tou (Pacific Rosewood-*Cordia subcordata*).

The agriculture programme included the conservation of rare varieties of Taro (Wetland Taro-*Colocasia esculenta*) along with other introduced agrospecies. Community-based herbal medicine is a fundamental conservation of rarer medicinal (vai rakau) plants, such as the small Tutae Torea (Lindernia-*Lindernia crustacea*), Tiapito (an Adder's tongue fern-*Ophioglossum reticulatum*) and Kava Maori (*Piper methysicum*), the latter having been lost from several islands.

Other endangered species programmes included one for endemic and rare native animal, including birds, and one for marine animals commonly used by the communities for food. The focus in this section of on programmes emphasising species-management.

Table 8: Endemic plants present in the Cook Islands (Species considered threatened are printed in Bold).

Type	Scientific Name	Common Name	Islands Present
Fern	<i>Phymatosorus katuii</i>	Cook Islands Oak-leaf-fern	4
Fern	<i>Acrophorus raiateensis</i>	Rarotonga Acrophorus	1
Grass	<i>Garnotia cheesemanii</i>	Rarotonga Garnotia-grass	1
Herb	<i>Lepidium sp (undescribed)</i>	Mitiaro peppergrass	1
Herb	<i>Balanophora wilderi</i>	Rarotonga balanophora	1
herb	<i>Habenaria amplifolia</i>	Rarotonga Ground-orchid	1
Palm	<i>Pritchardia mitiarioana</i>	Mitiaro Fan-palm	1
Shrub	<i>Haloragis sp (undescribed)</i>	Rarotonga Haloragis	1
Shrub	<i>Cyrtandra lillianae</i>	Te Manga Cyrtandra	1
Shrub	<i>Cyrtandra rarotongensis</i>	Rarotonga Cyrtandra	1
Shrub	<i>Sclerotheca viridiflora</i>	Rarotonga Sclerotheca	1
Moss	<i>Moenkemeyera rarotongae</i>	Rarotonga Moenkemeyera	1
Moss	<i>Spiridens armatus</i>	Moss	1
Fern	<i>Grammitis cheesemanii</i>	Cloud Grass-fern	1
Fern	<i>Hymenophyllum involucreatum</i>	Rarotonga Filmy-fern	1
Fern	<i>Cyathea parksae</i>	Rough Tree-fern	1
Fern	<i>Pseudophegopteris paludosa</i>	Mist Thelypterid	1
Fern	<i>Asplenium parksii</i>	Park's Asplenium	1
Herb	<i>Peperomia rhomboidea</i>	Cook Islands peperomia	2
Herb	<i>Peperomia wilderi</i>	Rarotonga peperomia	1
Shrub	<i>Geniostoma rarotongensis</i>	Rarotonga Geniostoma	1
Shrub	<i>Geniostoma sykesii</i>	Makatea Geniostoma	2
Shrub	<i>Myoporum wilderi</i>	Cook Islands Myoporum	2
Shrub	<i>Psychotria whistleri</i>	Rarotonga Psychotria	1
Tree	<i>Homalium acuminatum</i>	Cook Islands Homalium	2
Tree	<i>Myrsine cheesemanii</i>	Cook Islands Myrsine	4
Tree	<i>Pittosporum rarotongense</i>	Cook Islands Pittosporum	4
Tree	<i>Meryta pauciflora</i>	Rarotonga Meryta	1
Tree	<i>Coprosma laevigata</i>	Rarotonga Coprosma	1

Tree	<i>Fitchia speciosa</i>	Rarotonga Fitcha	1
Tree	<i>Pandanus arapepe</i>	Ngapatoru Pandanus	2

Table 9: Seriously National Endangered Native Plants Species (excluding endemic species).

Type	Scientific Name	Common Name
Fern	<i>Ophioglossum nudicaule</i>	Adder's tongue- fern
Fern	<i>Ophioglossum reticulatum</i>	Stalked Adder;s tongue fern
Fern	<i>Cheilanthes concolor</i>	Cheilanthes fern
Fern	<i>Antrophyum plantagineum</i>	Antropgyum fern
Fern	<i>Hypolepis dicksonioides</i>	Cloud Ground fern
Grass	<i>Cenchrus calyculatus</i>	Native Burr-grass
Herb	<i>Liparis clypeolum</i>	One-leaf orchid
Herb	<i>Peristylus minimiflorus</i>	Peristylus orchid
Sedge	<i>Gahnia aspera</i>	Dark-flower sedge
Sedge	<i>Isolepis nodosa</i>	Leafless sedge
Shrub	<i>Santalum insulare</i>	Polynesian Sandalwood
Shrub	<i>Gossypium hirsutum var taitense</i>	Upland cotton
Tree	<i>Trema cannabina</i>	Trema
Tree	<i>Terminalia samoensis</i>	Samoan Tropical-Almond
Tree	<i>Hoomalanthhus nutans</i>	Southsea Homalanthus
Tree	<i>Alphitonia zizyphoides</i>	Alphitonia
Vine	<i>Cocculus orbiculatus</i>	Cocculus vine
Vine	<i>Ventilago vitiensis</i>	Ventilago vinnne

Appendix 9.

18. INVASIVE SPECIES PROGRAMMES

The first programme was one to eradicate invasives that have recently invaded or are otherwise still restricted in their distribution on different islands. For example, most islands rated the thorny Sensitive Weed (Rakau Pikikaa-*Mimosa pudica*) as one of their most troublesome agricultural invasive, yet it has only three small populations on Mangaia. Red passionfruit (*Passiflora rubra*) is a major forest invasive on Rarotonga and Atiu, yet on Mauke it is restricted to a small area along one road. Most islands has some invasives for which complete removal or eradication was realistic if decisive action is taken in the near future.

Every island had a programme to reduce the abundance of some of the already widespread and severe invasives. The classic example within the programme was Balloon Vine (*Cardiospermum grandiflorum*) on Rarotonga which has increased dramatically in the last twenty years and now covers many trees on the lowlands and in the outskirts of the inland native forest. Mosquitoes and sandflies (*Culicoides belkini*) needs to be controlled – the latter first appeared on Aitutaki in 1964, and has since spread to Manuae and Mitiaro.

There was much concern about the arrival of new invasives from other countries and from other islands within the country. The Ministry of Agriculture (MoA) recounted their interception of Giant African Snail (GAS) (*Archina fulica*) on a container delivered to a site on Rarotonga – this large snail is a voracious consumer of vegetables. The reflect on invasives in different categories, such as in agriculture, in the marine environment, of medical importance and within the native forest.

It was decided to recommend that Government investigate the practicality of moving away from the traditional New Zealand model of having “quarantine” within mainline Ministries such as Agriculture, Marine Resources, and create an independent multi-stakeholder Biodiversity Agency to control the movement of terrestrial and marine plants and animal into and out of the country (Biosecurity), and between the islands (Internal-Quarantine/Biosecurity). Such an agency would bring a more integrated and uniform approach to the introduction of plants and animals by the general public, the Ministry of Agriculture and Marine Resources.

Inter-island Biosecurity was a major concern with destructive invasives such as the recently-arrival of Coconut Flat Moth (*Agonoxena argaula*) on Rarotonga and has spread all over the Southern Cook Islands and some of the Northern Cook Islands. The good news is straight after identifying the Coconut Flat Moth a bio-control was brought over from Fiji to control it. Recently, since 2008, eight (8) new pests introduction into the Cook Islands has been identified by our Entomologist PhD, Dr Maja Poeschko, but they haven't spread to the outer islands yet with the exception for the Cuban laurel thrips (*Gynaicothrips ficorum*) which is now in Mangaia recently introduced. (*see table below*). Because the islands are physically isolated the distribution of invasive species is irregular. For example, the Giant Sensitive Plant (*Mimosa invisa*), the more destructive-brother of the Sensitive Weed, is presently only on Aitutaki; the parasitic Dodder (*Cuscuta campestris*) is presently on only two islands; and Sicklepod (Pi A'ungakino-*Senna obtusifolia*) is restricted to Mauke where it rates as the community's most troublesome weed. The Ship Rat threatened birds. The urgency of the problem of arrival of new invasives requires immediate action while long term solutions are sought.

Table 10: Community Identified Invasive Plant Species (Species considered most serious are printed in Bold).

Type	Scientific Name	Common Name	Islands Present
Creeper	<i>Cardiospermum grandiflorum</i>	Balloon vine	1
Creeper	<i>Mimosa pudica</i>	Sensitive plant	3
Creeper	<i>Mimosa invisa</i>	Giant Sensitive plant	1
Creeper	<i>Mikania micrantha</i>	Mile-a-minute	3
Shrub	<i>Lantana camara</i>	Lantana	5
Tree	<i>Zyzygium cumini</i>	Java plum	2
Creeper	<i>Derris malaccensis</i>	Derris	6
Creeper	<i>Centrosema pubescens</i>	Centro vine	1
Creeper	<i>Merremia peltata</i>	Peltata Morning Glory	2
Fig	<i>Ficus benjamina</i>	Benjamin Fig	1
Grass	<i>Sorghum bicolor</i>	Grain Sorghum	4
Grass	<i>Cenchrus echinatus</i>	Burr grass	5
Grass	<i>Elephantopus spicatus</i>	False Elephant's foot	3
Grass	<i>Elephantopus mollis</i>	Elephant's foot	5
Grass	<i>Paspalum conjugatum</i>	T-Grass	2
Grass	<i>Btachiaria mutica</i>	Para grass	2
Grass	<i>Panicum maximum</i>	Guinea grass	1
Grass	<i>Chrysopogon aciculatus</i>	Cling grass	2
Grass	<i>Cyperus rotundus</i>	Nut-sedge/grass	3
Grass	<i>Eleusine indica</i>	Wiregrass	1
Grass	<i>Sporobolus pyramidallus</i>	Tall Smut-grass	1
Plant	<i>Ridens pilosa</i>	Beggar's-stick	3
Plant	<i>Solanum capsicoides</i>	Spiny Neclace-berry	1
Plant	<i>Xanthium purgens</i>	Cocklebur	1
Plant	<i>Desmodium incanum</i>	Spanish clover	2
Plant	<i>Ruellia prostrate</i>	Creeping Ruella	1
Plant	<i>Indigofera suffruticosa</i>	Indigo	2
Plant	<i>Pueraria phaseoloides</i>	Tropical kudzu	2
Plant	<i>Senna obtusifolia</i>	Sickle pod	1
Plant	<i>Syngonium augustatum</i>	Leaflet Taro-vine	1
Plant	<i>Cassytha filiformis</i>	Cassytha	1
Plant	<i>Capparis cordifolia</i>	Capparis	1
Plant	<i>Canna indica</i>	Red canna	1
Plant	<i>Cuscuta capestris</i>	Dodder	1
Plant	<i>Caesalpinia major</i>	Yellow nicker	1
Plant	<i>Fimbristylis cymosa</i>	Sand bulrush	1
Tree	<i>Hibiscus tilianceus</i>	Tree hibiscus	6

Weed	<i>Stachytarpheta urticaefolia</i>	Blue Rat's-tail	6
Weed	<i>Sida rhombifolia</i>	Broom weed	3
Weed	<i>Phyllostachys nigra</i>	Balck bamboo	1

Table 11: New Pests discovered on Rarotonga within the last three years
(Maja Poeschko, Entomologist PhD, Ministry of Agriculture, Cook Islands, March 2008)

Date Intercepted	Common Name	Scientific Name	Host (s)	Comments
14 Mar 2007	Glassy-winged sharpshooter	<i>Homalodisca vitripennis</i>	Almost all plants	Introduction of bio-agent from Tahiti was successful
14 Dec 2007	Red-banded mango caterpillar	<i>Dennolis sublinbalis (new)</i> <i>Noorda albizonalis (old)</i>	Mango	Caterpillars bore in fruits and seeds. Pheromone trapping ongoing
21 Jul 2008	Greenhouse thrips	<i>Heliothrips haemorrhoidalis</i>	Avocado	Sever damage on leaves, sprayed with Imidacloprid, no further interception.
8 Aug 2009	Black twig borer	<i>Xylosandrus compactus</i>	Avocado	On imported grafted seedlings brought in from New Zealand, and was dipped in an insecticide mix.
2 Nov 2009	Banana-shaped scale Slender soft scale	<i>Prococcus acutissimus</i>	Litchi	Severe infestation on leaves causing sooty mould.
10 Nov 2009	Cuban laurel thrips	<i>Gynaicothrips ficorum</i>	<i>Ficus benjamina</i> <i>Ficus sp</i>	Severe damaged on young ficus leaves, nuisance for people, attracted to bright coloured cloths, bite, painful when caught in the eyes.
14 Nov 2009	Red-banded thrips	<i>Selenithrips rubrocinctus</i>	Guava, Avocado and Terminalia	Severe damaged on leaves and fruits.
10 Aug 2010		<i>Pseudaonidia trilobitiformis</i>	Desert rose	On leaves and stem.

Appendix 10.

19. ECOSYSTEMS AND PROTECTED AREAS

The Cook Islands is a Party to the 1976 Apia Convention (*Convention on the Protection of Nature in the South Pacific*) to develop national systems of protected areas. Within two years of signing, the Government declared the uninhabited island of Suvarrow a National Park, to protect its wildlife. The Convention on Biological Diversity again commits its members to establish protected areas to conserve important species and ecosystems.

The conservation and sustainable use of Suvarrow should be managed by an independent Suvarrow Nation Park Authority (SNPA), representing the main stakeholders. It was concluded that a representative management group could be entrusted with the responsibility to manage wildlife conservation and environmentally sustainable revenue-generating activities.

Appendix 11.

20. EQUITABLE SHARING OF BENEFITS AND ACCESS TO BIODIVERSITY

The management of access by foreign people to the biodiversity resources of the Cook Islands, in particular, resources that might be medically beneficial. A “lock the stable” approach was unrealistic and would drive researchers elsewhere and the Cook Islands would simply miss out on the benefits of such research. At present all research undertaken by film makers, historians, anthropologist, doctors, geologists, oceanographers, biologists and so forth are improved and registered by the National Research Committee. Seeing that biodiversity research was such a diverse area that it should be managed by an independent body developed for this specific purpose, and that this group should be pro-active in encouraging research for potentially useful chemicals within our biodiversity.

Appendix 12.

21. MANAGEMENT OF KNOWLEDGE RELATED TO BIODIVERSITY

There should be programmes to record local plants and animals, and to map and record ecosystems and protected areas, on intellectual property rights, especially that related to the medicinal use of plants and marine animals. This topic was also a focus of attention by the group dealing with “Equitable Sharing of Benefits and Access to Biodiversity”.

Initially, protection of knowledge but gradually moved towards ways to benefit from the knowledge. The change in emphasis came about mainly as it was recognised that such of Cook Islands herbal knowledge is similar to that of Tahiti and that in both countries much of the information is already in the public domain. There should be a programme to record the medicinal knowledge of the practitioners who wish to have their knowledge recorded, with full acknowledgement of the informant and the nature of the associated *mana*.

The best way to both protect and benefit from traditional knowledge was to have a specific and pro-active Biodiversity Research Committee with suitable legislated powers to manage the interests of both the knowledge owners and the researchers.

Appendix 13

22. BIODIVERSITY AWARENESS AND EDUCATION

Awareness programmes should be included in all biodiversity-related programmes. Unfortunately the Education Curriculum Officers were unable to attend the workshop so it was simply concluded that integrating biodiversity education into the school curriculum was essential and that this should be included as an important programme.

Appendix 14.

23. MAINSTREAMING

To achieve shared responsibility it is important that policies, administrative and financial activities, at national, district and community levels included biodiversity concerns. This will be continuously process leading to long term sustainability.

Appendix 15.

24. FINANCIAL RESOURCES AND MECHANISMS

Biodiversity should have a specific Biodiversity Trust Fund to support the wide range of activities required to maintain local biodiversity in an integrated and equitable manner. Such a trust would consist of a board representing the different communities, traditional leaders, and the main Government bodies involved with biodiversity. Because the Government is one of the main beneficiaries of local biodiversity it was concluded that Government should provide the core funding for the Trust Fund, supported where possible by overseas donors.

The Board would table annual reports with audited accounts to Parliament, and make these reports available for wider distribution. The secretariat for the Board could be provided by the National Environment Service (NES), but it would have the power to charge this arrangement if the need arose.

Appendix 16.

25. CONCLUSION

The signatories to the Convention on Biological Diversity have committed themselves to:

11. Conserve their endangered species;
12. Develop a system of protected areas;
13. Reduce the harmful effects of invasive species and prevent further invasions;
14. Use biodiversity in a sustainable manner;
15. Preserve all knowledge related to biodiversity; and
16. Ensure an Equitable sharing of benefits.

Appendix 17

Table 12: Endemic species still existent in the Cook Islands.

Seriously endangered species are marked with asterisks (***) and printed in bold type.
Key: E/ck = Endemic of the Cook Islands; 1 = on one island, 2 = on two islands

Plants

Plant			Botanical name	Local name
Moss	E/ck1	FISSIDENTACEAE	<i>Moenkemeyera rarotongae</i>	Rarotonga moenkemeyera
Moss	E/ck1	SPIRIDENTACEAE	<i>Spiridens armatus</i>	
Fern	E/ck1	GRAMMITIDACEAE	<i>Grammitis cheesemanii</i>	Cloud Grass-fern
Fern	E/ck4	POLYPODIACEAE	*** <i>Phymatosorus katuii</i>	Cook Islands Oak-leaf fern
Fern	E/ck1	HYMENOPHYLLACEAE	<i>Hymenophyllum involucreatum</i>	Rarotonga Filmy-fern
Fern	E/ck1	CYATHEACEAE	<i>Cyathea parksiae</i>	Rough Tree-fern. (Panga Tua-tartara)
Fern	E/ck?1	THELYPTERIDACEAE	<i>Pseudophegopteris paludosa</i>	Mist Thelypterid
Fern	E/ck?1	ASPLENIACEAE	<i>Asplenium parksii</i>	Park's Asplenium
Fern	E/ck1	ASPIDACEAE	*** <i>Accrophorus leucorhahis</i>	Rarotonga Acrophorus
Herb	E/ck2	PIPERACEAE	<i>Peperomia rhomboidea</i>	Cook Islands Peperomia
Herb	E/ck1	PIPERACEAE	<i>Peperomia wilderi</i>	Rarotonga peperomia
Tree	E/ck2	FLACOURTIACEAE	<i>Homalium acuminatum</i>	Cook Islands Homalium
Herb	E/ck1	BRASSICACEAE	*** <i>Lepidium n.sp.Sykes</i>	Mitiaro peppergrass
Tree	E/ck4	MYRSINACEAE	<i>Myrsine cheesemanii</i>	Cook Islands Mysine

Tree	E/ck4	PITTOSPORACEAE	<i>Pittosporum rarotongense</i>	Cook Islands Pittosporum
Shrub	E/ck1	HALORAGACEAE	*** <i>Haloragis n.sp.Sykes</i>	Rarotonga Haloragis
Herb	E/ck1	BALANOPHORACEAE	*** <i>Balanophora wilderi</i>	Rarotonga Balanophora
Tree	E/ck1	ARALIACEAE	<i>Meryta pauciflora</i>	Rarotonga Meryta
Shrub	E/ck1	LOGANIACEAE	<i>Geniostoma rarotongensis</i>	Rarotonga Geniostoma
Shrub	E/ck2	LOGANIACEAE	<i>Geniostoma sykei</i>	Makatea Geniostoma
Shrub	E/ck2	MYOPORACEAE	<i>Myoporum wilkei</i>	Cook Islands Myoporum
Shrub	E/ck1	GESNERIACEAE	*** <i>Cyrtandra lillianae</i>	Te Manga Cyrtandra
Shrub	E/ck1	GESNERIACEAE	*** <i>Cyrtandra rarotongensis</i>	Rarotonga Cyrtandra
Shrub	E/ck1	CAMPANULACEAE	*** <i>Selerotheca viridiflora</i>	Rarotonga Selerotheca
Tree	E/ck1	RUBIACEAE	<i>Coprosma laevigata</i>	Rarotonga coprosma
Shrub	E/ck1	RUBIACEAE	<i>Psychotria whistleri</i>	Rarotonga Psychotria
Tree	E/ck1	ASTERACEAE	<i>Fitchia speciosa</i>	Rarotonga Fitchia
Palm	E/ck1	ARCACEAE	*** <i>Pritchardia mitiaroana</i>	Mitiaro Fan-palm
Tree	E/ck2	PANDANACEAE	<i>Pandanus arapepe</i>	Ngaputoru Pandanus
Grass	E/ck1	POACEAE	*** <i>Garnotia cheesemanii</i>	Rarotonga Garnotia-Grass
Herb	E/ck1	ORCHIDACEAE	*** <i>Habenaria amplifolia</i>	Rarotonga Ground-orchid

Annex 18.

Table 13: Native Species seriously Nationally Endangered

Excluding the endangered native species that are endemic and denoted in the above table with three asterisks (***), the following are native species that are seriously nationally endangered.

Plant			Botanical name	Local name
Fern	N	OPHIOGLOSSACEAE	<i>Ophioglossum nudicaule</i>	Adder's-tongue Fern
Fern	N	OPHIOGLOSSACEAE	<i>Ophioglossum reticulatum</i>	Stalked Adder's-tongue Fern (Tiapito)
Fern	N	SINOPTERIDACEAE	<i>Cheilanthes concolor</i>	Cheilanthes fern
Fern	N	VITTARIACEAE	<i>Antrophyum plantagineum</i>	Antrophyum Fern
Fern	N	DENNSTAEDTIACEAE	<i>Hypolepis dicksonioides</i>	Cloud Ground Fern
Vine	N	MENISPERMACEAE	<i>Cocculus orbiculatus</i>	Cocculus vine
Tree	N	ULMACEAE	<i>Trema cannabina</i>	Trema
Shrub	NEPse	SANTALACEAE	<i>Santalum insular</i>	Polynesian Sandalwood (A'i)
Shrub	N?	MALVACEAE	<i>Gossypium hirsutum var</i>	Upland cotton
Tree	N	COMBRETACEAE	<i>Terminalia samoensis</i>	Samaoan Tropical-almond

Tree	N	EUPHORBIACEAE	<i>Homalanthus nutans</i>	Southsea Homalanthus
Tree	N	RHAMNACEAE	<i>Alphitonia zizyphoides</i>	Alphitonia
Vine	N	RHAMNACEAE	<i>Ventilago vitiensis</i>	Ventilago Vine
Sedge	N	CYPERACEAE	<i>Isolepis nodosa</i>	Leafless sedge
Grass	N	POACEAE	<i>Cenchrus calyculum</i>	Native Burr-Grass
Herb	NEsPX	ORCHIDACEAE	<i>Lipris clypeolum</i>	One-leaf orchid
Herb	N	ORCHISACEAE	<i>Peristylus minimiforus</i>	Peristylus Orchid
Sedge	N	CYPERACEAE	<i>Gahnia aspera</i>	Dark-flower sedge

Appendix 19.

Table 14: Identified Endangered Plant Species

Biological identification per the Cook Islands Biodiversity and Natural Heritage Database;

Keys: W = Wild/Natural ecosystems; and D = Domestic/Agricultural ecosystems; and P = is Plant and A = is Animal

Rank	Botanical Name	English Name	Local Name	Notes
Rarotonga-Te-Au-O-Tonga (Tupapa, Takuvaine, Avatiu, Nikao)				
W1	<i>Cordia subcordata</i>	Pacific Rosewood	Tou	
W2	<i>Ophioglossum reticulatum</i>	Stalked Adder's-tongue fern	Ti'apoto	
W3	<i>Tacca leontopetaloides</i>	Pacific arrowroot	Pia maori/Pia-ei	
W4	<i>Sophora tomentosa</i>	Silverbrush	Poutukava	
W5	<i>Abelmoschus moschatus</i>	Muskmallow	Aute	
W6	<i>Pipturus argenteus</i>	Pipturus	Oronga	
D1	<i>Piper methysticum</i>	Kava shrub	Kava maori	
D2	<i>Solanum viride</i>	Garland berry	Poroiti	
D3	<i>Epiphyllum oxypetalum</i>	Queen-of-the-night cactus	Tiare-ora-varu	
D4	<i>Artocarpus heterophyllus</i>	Jackfruit	Kuru papa'a	Kuru tiaki
Rarotonga-Takitumu (Matavera, Ngatangia, Titikaveka)				
W1	<i>Tacca leontopetaloides</i>	Pacific arrowroot	Pia maori	Pia-ei
W2	<i>Lindernia crustacea</i>	Lindernia	Tutae torea	
W3	<i>Peperomia pallida</i>	Glossy Peperomia	Pikimato	Check D
W4	<i>Musa troglodytarum</i>	Mountain banana	Utu	
W5	<i>Ficus tinctoria</i>	Dye fig	Mati	
W6	<i>Chamaeyce fosbergii</i>	Polynesian Beach-spurge	Totototo	
D1	<i>Piper Methysticum</i>	Kava shrub	Kava maori	
D2	<i>Leucas decemdentata</i>	Leucas	Pu'eikao	
D3			Renga maori	Not in database
D4	<i>Solanum viride</i>	Garland berry	Poroiti	
Rarotonga – Puaikura (Arorangi)				
W1	<i>Elacocarpus tonganus</i>	Polynesian Elacocarpus	Karaka	

W2	<i>Ficus tinctoria</i>	Dye Fig	Mati	
W3	<i>Bischofia javanica</i>	Bischfia	Koka	
D1	<i>Leucas decedentata</i>	Leucas	Pu'eikao	
D2	<i>Musa troglodytarum</i>	Mountain banana	Utu	
D3	<i>Lindernia crustacea</i>	Lindernia	Turae torea	
Aitutaki – agro-domestic (plants)				
P1	<i>Solanum viride</i>	Garland berry	Poroiti	
P2	<i>Anona squamosa</i>	Sugar apple	Naponapo	Tapotapo maori
P3	<i>Vitex trifolia</i>	Medicinal Vitex	Rara	
P4	<i>Plumeria rubra</i>	Frangipani	Tipani enua	
Aitutaki – wild (plants)				
P1=	<i>Cordia subcordata</i>	Pacific Rosewood	Tou	
P1=	<i>Thespesia populea</i>	Portia tree	Miro	
P3	<i>Peporomia pallida</i>	Glossy Peporomia	Pikimato	Check ID
P4	<i>Ficus tinctoria</i>	Dye fig	Mati	
P5	<i>Eleurites moluccana</i>	Candelnut	Tuitui	
Mauke – wild (plants)				
P1	<i>Cyrtosperma merkusii</i>	Atoll taro	Puraka	
P2	<i>Musa troglodytarum</i>	Mountain banana	Vei	Utu
P3	<i>Leucas decedentata</i>	Leucas	Nuroa	Pu'eikao
P4	<i>Kyllinga nemoralis</i>	White Kyllinga	Neke enua	
P5	<i>Phyllanthus virgatus</i>	Early Phyllantus	Matakura	Moemoe enua
P6		Tow Seaweed	Remu ponini and kotaa	Check ID
P7			Po'oto	ID???
P8	<i>Zyzygium malaccensis</i>	Malay apple	Kaika tavake	Kaika maori
Mauke – agro/domestic (plants)				
P1	<i>Dioscorea alata</i>	Winged yam	U'i	
P2	<i>Xanthosoma sagit</i>	Tarua	Taro tarua	
P3	<i>Solanum viride</i>	Garland berry	Poroiti	
P4	<i>Cocos nucifera</i>	Coconut palm	Nu Pokura/Kere	Particular variety
P5	<i>Talinium paniculatum</i>	Talinium	Pi Mori	
P6	<i>Capsicum frutescens</i>	Chilli pepper	Oporo	
P7	<i>Tacca leontopetaloids</i>	Pacific Arrowroot	Pia maori	
P8	<i>Passiflora quadrangularis</i>	Giant Granadilla	Maratini	
P9	<i>Vanilla planifolia</i>	Vanilla	Vanira	
Mitiaro – Wild (plants)				
W1	<i>Santalum insulare</i>	Polynesian Sandalwood	A'i	Including Maramia
W2	<i>Pandanus tectorius complex</i>	Pandanus	Rau makatea	Variety for fish basket
W3	<i>Alyxia stellata</i>	Alyxia	Maire	
W4	<i>Tacca leontopetaloids</i>	Pacific arrowroot	Pia maori	
D1	<i>Solanum viride</i>	Garland berry	Poroporo	Poroiti elsewhere
D2	<i>Vanilla planifolia</i>	Vanilla	Vanira	
D3	<i>Leucas decedentata</i>	Leucas	Nuroa	Pu'eikao
D4=	<i>Cananga odorata</i>	Perfume tree	Matao'i	
D4=	<i>Musa troglodytarum</i>	Mountain banana	Ve'i	Utu

D6	<i>Mirabilis jalapa</i>	Four-oclock flower	Tiare moe	
Mangaia-Endangered all				
W1	<i>Terminalia glabrata</i>	Polynesian Tropical-Almond	Taire	
W2=	<i>Callopyllum inopyllum</i>	Polynesian Mahogany	Tamanu	
W2=	<i>Cordia subcordata</i>	Pacific Rosewood	Tou	
W4	<i>Barringtonia asiatica</i>	Barringtonia	Utu	
D1	<i>Solanum viride</i>	Garland berry	Poroiti	
D2	<i>Piper methysticum</i>	Kava shrub	Kava maori	
Other plants mentioned; <i>Dioscorea pentaphilla</i> -Finger leaf yam- Maararau/Pirita, <i>Ananas comosus</i> -Pineapple-painapa(Riply Queen), <i>Cymbopogon citrates</i> -Lemon grass-Ti Varani, <i>Cananga odorata</i> - Perfume tree- Mato'i, <i>Citrus sinensis</i> - Sweet Orange- Anani(Maori), <i>Cyrtosperma merkusii</i> -Atoll taro-Puraka, <i>Kyllinga brevifolia</i> -Green Kyllinga-Tumu Enuu, <i>Lindernia crucea</i> -Lindernia-Tutae toora.				
Atiu-Wild (plants)				
P1	<i>Dioscorea alata</i>	Winged yam	U'i Teve	Check D
P3	<i>Pandanus tectorius complex</i>	Pandanus	Ara taatai	
P4	<i>Cananga odorata</i>	Perfume tree	Motooi	Domestic
P5	<i>Citrus sinensis</i>	Sweet orange	Anani maori	Check ID, domestic
Other plants mentioned, <i>Acrostichum aureum</i> -Leather fern-Pi'akato, <i>Geophila repens</i> -Geophila-To'etopou, <i>Musa troglodytarum</i> -Mountain banana-Utu, <i>Abelmoschus moschatus</i> -Musk mallow-Vavai tara.				
Atiu-agro/domestic (plants)				
P1	<i>Colocasia esculenta</i>	Wetland taro	Taro Atiu	Niue
P2	<i>Citrus aurantifolia</i>	Lime	Tiporo	
P3	<i>Manihot esculenta</i>	Cassava	Maniota	Manihot
P5	<i>Persia americana</i>	Avocado	Apuka	
P6	<i>Musa nana</i>	Cavendish banana	Meika kina	Meika Amoa
Other domestic plants mentioned; <i>Averrhoa carambola</i> -Carambola-Raparapa, <i>Anona muricata</i> - Soursop-Kataaraapa, <i>Syzygium malaccensis</i> -Malay apple- Kaika Makatea, <i>Citrus limon</i> -Lemon-Remene, <i>Gardenia taitensis</i> -Tahitian gardenia- Tiare Maori/Tahiti, <i>Dichrocephala untergrifolia</i> - Medine daisy- Takatakai'ara, <i>Broussonetia papyfera</i> - Paper Mulberry-Aute, <i>Terminalia catappa</i> - Tropical Almond- Kauariki.				
Penrhyn-wild (plants – nearly lost)				
P1	<i>Pandanus tectorius</i>	Pandanus	Hara Ngangie	A variety of edible pandanus
P2	<i>Pandanus tectorius</i>	Pandanus	Hara Vaevae	As above
P2	<i>Pandanus tectorius</i>	Pandanus	Hara Tavai	As above
P3	<i>Cordia subcordata</i>	Pacific Rosewood	Tou	
P4	<i>Hernandia nymphaeifolia</i>	Lantern tree	Puka	One tree in Omaka
P5	<i>Timonius polygamus</i>	Timonius	Turamoa	On two motu (islets) only
<i>P.S. Edible Pandanus varieties propagated by cuttings, not by seeds. There were nine varieties; (Hara Ngangie, Tavai, Vaevae, Tueka, Kura, Sakatu, Moenga, Kina and Soamimi)</i>				
Penrhyn- agro/domestic (plants)				
P1	<i>Musa sp</i>	Bananas	Maika	Meika
P2	<i>Cucurbita pepo</i>	Pumpkin	Mautini	Motini
P3	<i>Citrullus lanatus</i>	Water melon	Mereni	
P5	<i>Hibiscus rosa-sinensis</i>	Scarlet Double-hibiscus	Kaute kumukumu	

Table 15: Community Identified Invasive Plant Species that the people find most troublesome

Rank	Botanical Name	English Name	Local Name	Notes
Rarotonga, Te-Au-O-Tonga – Weed (wild & domestic (Tupapa, Takuvaine, Avatiu))				
P1	<i>Sorghum bicolor</i>	Grain sorghum	Tarapi	
P2	<i>Cardiospermum grandiflorum</i>	Grand Balloon-vine	Kopupu Takaviri	
P3	<i>Mimosa pudica</i>	Sensitive plant	Rakau Pikikaa	
P4	<i>Biden pilosa</i>	Beggar's-tick	Piripiri kerekere	
P5	<i>Mikania micrantha</i>	Mile-a-minute weed	Maire i te miniti	
P6	<i>Ficus benjamina</i>	Benjamin fig	Tamarumaru	
P7	<i>Cenchrus echinatus</i>	Burr grass	Piripiri putaputa	Parango
P8	<i>Elephantopus spicatus</i>	False Elephant's foot	Tapuae erepani	
P9	<i>Paspalum conjugatum</i>	T-grass	Mauku Taravao	
Rarotonga, Takitumu – weeds (wild and Domestic) (Matavera, Ngatangiia, Titikaveka)				
P1	<i>Solanum capsicoides</i>	Spiny-necklace-berry	Poroiti taratara	
P2	<i>Brachiaria mutica</i>	Para-grass	Mauku para	Usually Mauku Puakotoro
P3	<i>Xanthium purgens</i>	Cockleburr		
P4	<i>Mimosa pudica</i>	Sensitive plant	Tatani Pikikaa	Rakau pikikaa
P5	<i>Desmodium incanum</i>	Spanish Clover	Tita Paniora	Local named coined
P6	<i>Lantana camara</i>	Lantana	Tataramoa	
P7	<i>Cenchrus echinatus</i>	Beach burr	Piripiri parango	
Rarotonga, Puaikura (Arorangi) –weed (wild and domestic)				
P1	<i>Brachiaria mutica</i>	Para grass	Matie puakatoro	
P2	<i>Cardiospermum grandiflorum</i>	Grand Balloon-vine	Kaka taviri	Kopupu Takaviri
P3	<i>Elephantopus spicatus</i>	False Elephant's-foot	Tapuae erepani	
P4	<i>Xanthium purgens</i>	Cockleburr		
P5	<i>Mimosa Pudica</i>	Sensitive weed	Rakau Pikikaa	
P6	<i>Ruellia prostrata</i>	Creeping Ruellia		
Other weeds mentioned; <i>Cynodon dactylon</i> -Bermuda grass-Mauku oropapa, <i>Commelina diffusa</i> -Commelina-Mauku vai, <i>Vigna marina</i> -Beach pea-Poue, <i>Croalaria pallida</i> - Streaked Rattlepod- Maniva)				
Aitutaki-weeds (wild and domestic)				
P1	<i>Mimosa invisa</i>	Giant Sensitive weed	Pikikaa papaa	
P2	<i>Brachiaria mutica</i>	Para grass	Mauku tara	Usually Para Karati
P3	<i>Panicum maximum</i>	Guinea grass	Tinikarati	
P4	<i>Chrysopogon aciculatus</i>	Cling-grass	Tumu-enua	
P5	<i>Cenchrus echinatus</i>	Burr grass	Piripiri	
P6	<i>Biden pilosa</i>	Beggar's-tick	Piripiri Niroa	Also Piripiri kerekere
P7	<i>Indigofera suffruticosa</i>	Indigo	Initiko	
P8	<i>Elephantopus mollis</i>	Elephant's foot	Tapuae erepani	Check ID
P8	<i>Elephantopus spicatus</i>	False Elephant's foot		
P9	<i>Canavalia cathartica</i>	Purge vine	Kaka poti	
P10	<i>Hibiscus tiliaceus</i>	Tree hibiscus	A'u	
Other weeds mentioned; <i>Chamaesyce fosbergii</i> -Polynesian beach-spurge- Totototo, <i>Cyperus rotundus</i> - Onion grass- Mauku oniani)				
Mauke-weeds (wild and domestic)				
P1	<i>Pueraria phaseoloides</i>	Propical Kudzu	Kudzu	

P2	<i>Senna obtusifolia</i>	Sickle pod	Pi-aungakino	
P3	<i>Elephantopus mollis</i>	Elephant's-foot	Tapuae erepani	
P3	<i>Elephantopus spicatus</i>	False Elephant's-foot	Tapuae erepani	
P4	<i>Stylosanthes guianensis</i>	Tropical lucerne	Mauku puakatoro	
P5	<i>Syngonium augustatum</i>	Leaflet Taro-vine		
P6	<i>Syzygium cumini</i>	Java plum	Kaika	
P7	<i>Derris elliptica</i>	Derris	Ora Papua	
P8	<i>Sorghum bicolor</i>	Grain sorghum	Tarapi	
P9	<i>Cechrus echinatus</i>	Beach burr	Parango	
P10	<i>Ruellia prostata</i>	Creeping Ruellia		
Other weeds mentioned; <i>Azolla filiculoides</i> -Azolla water-fern, <i>Capparis cordifolia</i> -Pacific Caper- Papiro, <i>Chamaesyce prostrate</i> -Creeping spurge, <i>Vigna marina</i> -Beach pea-Poue, <i>Lantana camara</i> -Lantana-Tarataramoa)				
Mitiaro-Weeds (wild and domestic)				
P1	<i>Mimosa pudica</i>	Sensitive weed	Tita Avare	Rakau Pikika'a
P2	<i>Cyperus totundus</i>	Nut Sedge	Tita Oniani	Mauku Oniani
P3	<i>Chechrus echinatus</i>	Burr grass	Parango	
P4	<i>Cgrysopogon aciculatus</i>	Red cling-grass	Tuakura	Tokura
P5	<i>Bidens pilosa</i>	Beggar's-tick	Piripiri	
P6	<i>Elephantopus spicatus</i>	False Elephant's-foot	Tapuae Erepani	
P7	<i>Stachytarpheta urticaefolia</i>	Blue Rat's-tail		
P8	<i>Sida rhomabifolia</i>	Broom weed	Tita Purumu	
P9	<i>Cassytha filiformis</i>	Cassytha	Tainoka	
P10	<i>Capparis cordifolia</i>	Capparis	Kopara	
Other weeds mentioned; Nut grass-Tita oniani, Pandanus-Rauara Tai, Bermuda grass-Matie, Crinum Lily- Riri Enuu.				
Mangaia-Weeds (wild and domestic)				
P1=	<i>Centrosema pubescens</i>	Centro vine	Bluebell	
P1=	<i>Phyllostachys nigra</i>	Black bamboo	Koe Tiapani	
P1=	<i>Canna indica</i>	Red canna	Tiare Papaa	
P1=	<i>Cuscuta campestri</i>	Dodder	Tiae	
P1=	<i>Pennisetum purpureum</i>	Elephant grass	Giant weed	Not Giant Reed (<i>Arundo donax</i>)
P1=	<i>Mimosa pudica</i>	Sensitive weed	Rakau Pikikaa	
Other wild weeds mentioned, Balsam weed, Red passionfruit, Mile-a-minute, Water lily, Albizia, Rakau Papua, Blue Rat's-tail, Tini Karati, Tira (Chinaberry), Pig's weed, Ruellia-Kissingplant, Desmodium, Purumu.				
Atiu – Weeds (wild and domestic)				
W1	<i>Lantana camara</i>	Lantana	Tataramoa	
W2	<i>Caesalpinia major</i>	Yellow nicker	Tutae Oroenua	
W3	<i>Merremia peltata</i>	Peltate Mornig-glory	Kurima	
D1	<i>Cyperus rotundus</i>	Nut Sedge	Oniani	
D2	<i>Sorghum bicolor</i>	Sorghum grass	Tarapi	
D3	<i>Paspalum conjugatum</i>	T-grass	Mauku Taravao	
Other wild weeds, Kaika (Java plum, Kaka (Water vine)				
Other domestic weeds; Poepoe (Job's-tears, Piripiri (Beggar's-tick)				
Penrhyn – weeds (wild and domestic)				
W1	<i>Cenchrus echinatus</i>	Beach burr	Piripiri	
D1	<i>Cenchrus echinatus</i>	Beach burr	Piripiri	
D2	<i>Biden pilosa</i>	Beggar's-tick	Piripiri kerekere	
D8	<i>Eleusine indica</i>	Wire grass	Mauku	
D7	<i>Cyperus rotundus</i>	Nut grass	Mauku Oniani	
D5	<i>Sporobolus pyramidalis</i>	Tall smut-grass	Mauku	
D4	<i>Sporobolus pyramidalis</i>	Broom weed	Mauku purumu	
D6	<i>Fimbristylis cymosa</i>	Sand Bulrush	Mauku	
D3	<i>Desmodium incanum</i>	Spanish Clover	Pikipiki	Specimen not

			seen. ID?
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Annex 1.

Table 16: TIMELINE WORK PLAN

SR#	ACTIVITY	OUTPUT	TIMELINE
1	Nomination and approved of the National Focus Point (NFP), by Mr Anthony Brown, Secretary of Agriculture	Nomination sent to LRD/SPC.	November 2010
2	National Focus Point (NFP) Regional training workshop in Nadi funded by FAO and SPC/LRD	FGR preparation process and thematic studies	January 2011
3	Nominations of National Committees (NCs), Working Groups (WGs) and Stakeholders	Approved by Secretary of Agriculture as Chairman of the project	February 2011
4	Proposed budget and timeline work plan submitted to SPC/LRD for processing	SPC/LRD submitted budget and timeline work plan to FAO/SAP/TCPF programme	2-3 week February 2011
5	Proposed budget and timeline work plan	FAO/SAPA /TCPF funds	3 week February 2011
6	Re-submit budget proposal to FAO/SAPA as a TCP proposal	Draft	February-April 2011
7	Hiring of National Consultant	Depends on approval of TCP proposal.	April – May 2011
8	Meeting with all NCs, WGs and Stakeholders to outline their responsibilities etc	MoA's conference room	May 2011
9	Collecting information and data etc	SoW-FGR report in progress	May – June 2011
10	1 st draft of the SoW-FGR report with NCs for review	MoA's conference room	July 2011
11	Collect more information and data etc	2 nd draft	August 2011
12	2 nd draft of the SoW-FGR report with the NC's for the second time	MoA's conference room	September 2011
13	Final draft	MoA	October 2011
14	Final draft with NCs for approval	MoA's conference room	October – November 2011
15	Cook Islands SoW-FGR report sent to FAO/Rome copies to FAO/SAPA and LRD/SPC	MoA	November 2011

Annex 2.

NATIONAL FOCUS POINT

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Annex 3.

Table 17: NATIONAL COMMITTEES (NCs)

Name	Position	Responsibilities
Mr Anthony Brown, Ministry of Agriculture (MoA)	Secretary	Chairman
Mr Vaitoti Tupa, National Environment Services (NES)	Secretary	Member
Ms Donna Numa, Ministry of Infrastructure and Planning (MoIP)	Acting Director	Member
Ms Tuaine Marsters, Non-Government Organisation (NGOs)	President	Member
Tou (Travel) Tetava Ariki, House of Arikis (HoA)	President	Member
Mr Ben Ponia, Ministry of Marine Resources (MMR)	Secretary	Member
Ms Claudine Henry, Ministry of Justice (MoJ)	Acting Secretary	Member

Annex 4.

Table 18: WORKING GROUPS (WGs)

Name	Ministry/Island Administration	Responsibilities
Mr Gerald McCormack	Cook Islands Biodiversity (CIB)	Director
Ms Elizabeth Munro	National Environment Services (NES)	Staff
Mr Ian Karika	Takitumu Conservation Area	President
Mr Arona Ngari	Meteorological Services (MS)	Chief
Mr Tiria Rere	Ministry of Agriculture (MoA) Livestock	Director
Mr William Wigmore	Ministry of Agriculture (MoA) Research	Director
Mr Ngatoko Ngatoko	Ministry of Agriculture (MoA) Biosecurity	Director
Mr Otheniel Tangianau	Ministry of Infrastructure and Planning (MoIP)	Staff
Mr Teuanuku Koroa	Mangaia Island Administration	Snr Ag Officer
Mr Maara Mataio	Atiu Island Administration	Snr Ag Officer
Mr Fred Charlie	Aitutaki Island Administration	Snr Ag Officer
Mr Tokai Ngaiorae	Mitiaro Island Administration	Snr Ag Officer
Mr Taukea Rau	Mauke Island Administration	Snr Ag Officer
Mr Andrew Vaeau	Penrhyn Island Administration	Island Secretary
Mr Moto Finiasi	Manihiki Island Administration	Snr Ag Officer
Mr Toto Setephano	Rakahanga Island Administration	Island Council Member
Mr Neiao Topetai	Nassau Island Administration	Snr Ag Officer
Mr Neiao Neiao	Pukapuka Island Administration	Snr Ag Officer
Mr Marsters	Palmerston Island Administration	Snr Ag Officer

Table 19: STAKEHOLDERS

- Titikaveka Organic Farmers Association
- Rarotonga Nita Growers
- Cook Islands Biodiversity
- National Environment Services
- Ministry of Justice
- Ministry of Infrastructure and Planning
- Ministry of Agriculture
- Ministry of Internal Affairs
- Takitumu Conservation Area
- Meteorological Services
- Non-Government Organisation
- Surveyors – Private

Table 20: BUDGET

ACTIVITY	MONTH	MONTH	MONTH	MONTH	BUDGET ESTIMATE (USD)
National Focal Point/National Committees/Working Groups/Stakeholders/ National Consultant/meetings etc	November 2010-February 2011				4,000.00
Identification and reviewing of existence relevant information		February - April 2011			1,500.00
Preparing and finalising of draft reports etc			April – November 2011	December 2011	1,500.00
Technical support, GIS resources, Mappings, Remote sensing, etc					1,000.00
Transport (Fuel etc)					500.00
Stationeries, Outer islands phone calls, faxes, emails etc					1,500.00
Total					USD10,000.00

26.Acknowledgements

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- Mr Otheniel Tangianau, Director of Outer islands, Ministry of Infrastructure and Planning, Rarotonga, Cook Islands;
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- To all the hard working National Committees, Working Groups, Stakeholders, NGOs etc.
- To all those I have forgotten to mentioned;

MEITAKI MAATA

ATAWAIWOLO

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28. Photos