



# **COOK ISLANDS:**

## **COUNTRY REPORT TO THE INTERNATIONAL CONFERENCE AND PROGRAMME ON PLANT GENETIC RESOURCE**

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# INTRODUCTION

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The Cook Islands, composes of 15 islands scattered over a million square kilometres of ocean. It has 2 distinctive types of 'Islands:

- (a) Northern Group - all coral Atolls
- (b) Southern Group - mainly volcanic origin, with two Atolls

The population of the Cook Islands is approximately 20,000 of which 9678 lives on Rarotonga the biggest of the lot. The Island of Rarotonga lies on latitude  $21\frac{1}{4}$  21's and longitude  $150\frac{1}{4}$  46'E. It is a tropical - almost sub - tropical island during cooler months of the year (June to September) but humid tropical climate during the warmer parts of the year (October to May).

The Cook Islands is one of those unfortunate countries in the Pacific region for not having access to minerals on land, however recent discovery of a large deposit of Manganese nodules beneath the Cook Islands ahead in future if the technology for mining the ocean floor is possible.

According to reports, the Cook Islands Exclusive Economic Zone (EEZ) contains about 60,000 square kilometres of nodules, which in some parts are in densities as high as 60 kilograms per square metre.

Tourism is the number one industry in the Cook Islands. In 1994 there were approximately 57,000 people visited the Cook Islands. About two thirds of these visitors were from New Zealand and Australia while the rest came from countries such as Germany, Sweden, Canada and the United States of America.

Agriculture was once the number one industry, over fifteen to twenty years ago. Agriculture in the Cook Islands is based on small holdings type systems. Farm sizes varies between one thousand square metres and 5,000 square metres. Very few farm-land measure greater than 10,000 square metres.

About one third of the farmers in the Cook Islands are full-time farmers and two third are part time farmers. The current major export crops grown in the Cook Islands are: Papaya (pawpaw) and Taro (*Colocasia esculenta*). Vegetables such as cabbages, lettuces, tomatoes, broccoli, cucumbers, carrots and spring onions are grown best during the cooler parts of the year (May to September) in the Cook Islands. Other times almost all vegetables are imported from



New Zealand. Most of the meat are imported from New Zealand (lamb, beef and chickens other meat such as pork and fish are mainly locally supplied. Other source of meat comes from United States of America in particular, chickens.

Forest in the Cook Islands are still in its natural state. No harvesting of native trees has yet started, however planting of fern land hill slopes with Caribbean pine, (*Pinus caribaea*) mainly for the control of erosion, been very successful in Rarotonga, Mangaia, Mauke and Atiu.



# INDIGENOUS PLANT GENETIC RESOURCES

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Plant genetic resources have been practised for many years in the Cook Islands. Individual planters in the past preferred to make their own collections of top performing staple crops through close observation of characters relative to high yields and disease resistance.

These crops of outstanding yields became recognised, mass propagated and end up being shared amongst the entire communities or country. Crops such as Taro (*Colocasia esculenta*) [one of the staple food] is a good example of germplasm build up for the Cook Islands. Similar crops such as coconut (*Cocos nucifera*) went through years of continuous selection of good genetic characters. The selections for good characters continues, and many of these passed down for generations after generations.

The technology of preserving or holding on to these well liked characters or varieties were simply by perpetual planting, control multiplying for many years. Records in the Cook Islands has shown that some varieties of crops such as Yams (*Dioscorea* spp.) were grown for many generations and are currently on many farms in the Cook Islands. New introductions from outside the Cook Islands have also been common and good lines of these new varieties spread quickly among farmers.

In relation to forest genetic resources, most species are centered inland on the hills and no commercial logging allowed. There are about twenty rare plants among these hills and eighteen endemic plants. In an unpublished, descriptive report based on field work carried out in 1974 and 1975 Sykes (1976, revised in 1983) divided the vegetation of Rarotonga into coastal, lowland and upland zones. The coastal zone consist, scrubs and small raised limestone components areas.

The lowland vegetation zone comprises the low lying, generally level area located between the coastal coral sands and the steep hills, a few hundred metres inland. This zone also includes the lower moderately inclined hilly areas near the coast and the Valley bottoms which in some places penetrates far in the interior of the island. This zone contains the most fertile soil on Rarotonga.

The upland zone includes all the hills 50 m up to 650 m. The upland zone is very unique as it is still entirely covered with native species of which some of these rare plants are located.



## NATIONAL CONSERVATION ACTIVITIES

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Today, a system have been organised to pool these huge genetic resources together for breeding purposes and to preserve them for the future of the people of the Cook Islands. Preserved or stored seeds are not yet carried out in the Cook Islands due to lack of resources and facilities to preserve them. It is the tasks of the Research Division of the Ministry of Agriculture to carry out such duties for the nation.

The Research Division of the Ministry of Agriculture is capable of preserving more plants on sites in the a field, especially the Food crops and Ornamentals. Planting sites are already allocated for future expansion. Germplasm collection of Food Crops and Ornamentals are part of Plant Breeding activities on the Totokoitu Research Station.

The conservation of some on-Farm varieties are also carried out in particular some fruit trees, coconuts, rare palms and Sandal wood trees.

The nature of the national collection of germ plasm centered around mainly Food Crops. The annual crops are normally regenerated yearly, while the perennial crops really depends on the general health of the plant.

Sometimes these plants are regenerated when symptoms of decline (due to disease or natural disaster) shows. Grafting, air layering or marcoting, root and stem cuttings are the main propagation methods used in regeneration of these plants. Tissue cultures and some of the latest techniques of propagation are not yet available in the Cook Islands.

Seed collections of some native species of plants are also carried out, but not for storage, rather for propagation and regeneration of these plants. Facilities for long term seed storage are not available in the Cook Islands.



## IN-COUNTRY USES OF PLANT GENETIC RESOURCES

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The germplasm collections of all food crops on the Research Station are sent to the Outer islands on request. Often these requests come from the Northern Cook Islands growers, especially after a hurricane has been through these islands. Hurricanes in the northern group constantly destroy or kill most taro crops by contaminating taro growing areas with salt water.

At times requests from other Pacific Islands are received for specific varieties of root crops and tropical fruits. An excellent example is the hybrid passion fruit 'King 7' bred exclusively on Totokoitu Research Station. King 7 is well known for its heavy fruiting habit, sweetness and also self-pollinating ability. Requests for King 7 were also received from African countries.





# NATIONAL GOALS, POLICIES, PROGRAMMES AND LEGISLATION

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The Cook Islands national development objectives are:

- (a) Raise the level of prosperity of Cook Islands (to stem further migration);
- (b) Attain a large measure of economic independence;
- (c) Ensure that economic development proceeds in a manner compatible with social, cultural, natural and environmental values;
- (d) Promote a more equitable distribution of the benefits of development; and
- (e) Co-operate closely with Pacific neighbours and other nations in economic affairs and other matters of mutual interest.

In accordance with the development objectives of the Cook Islands Government, the Ministry of Agriculture has adopted the following strategic research goals.

1. Development and maintenance of a base of relevant technical information for support of Biodiversity.
2. Crop diversification on outer islands to stabilize food supplies and incomes.
3. Improvement of diet on the atoll islands through the introduction of new food crops for atoll.
4. Crop diversification on Rarotonga to relieve dependence on pawpaw and vegetables as the principal sources of agricultural revenue.
5. Upgrading the technical capabilities of growers to enable them to take maximum advantage of existing knowledge and new developments.
6. Maintenance of land and water resources by reducing erosion, minimising chemical residues, and preventing physical and nutrient depletion of soils from over cropping.

Adoption of these goal allows evaluation for continuing relevance and progress of the projects towards meeting the development objectives of the Ministry.



## LEGISLATION

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The Cook Islands have a conservation Act but had been considered deficient. There is a need to incorporate:

- 1 an EIA process (Environmental Impact Assessment).
- 2 A sustainable development aspect, enjoying community support and participation through public involvement in the preparation of management plans and EIA process.
- 3 Clear, adequate or acceptable definitions of the foreshore zone, the marine environment and the management of resources therein.
- 4 A broaden council with input from non-governmental organisations and
- 5 An extended application of the act beyond Rarotonga and Aitutaki to the whole nation.
- 6 An adequate coverage of forestry
- 7 Lack of control of mining and quarrying activities.
- 8 Lack of control for removal of vegetation on steep slopes.
- 9 Lack of control on the use of earth moving machinery.
- 10 A need to incorporate traditional conservation principles and practices in the legal systems.
- 11 A need to provide for regulation of the construction of signs to reduce visual pollution; and
- 12 A need to provide for regulation of trimming of trees.



## INTERNATIONAL COLLABORATION

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One of the early collaboration work in the Cook islands, in relation with aspects of the international plant genetic resources system was banana breeding, directly looking for Black Leaf Streak disease resistance strain of Cavendish bananas. This collaboration work was carried out with the University of West Indies during the late 70s.

Currently this collaboration is taken over by ACIAR (Australian Center for International Agricultural Research) in Canberra. Work on this subject now includes tissue culture and cytoplasmic or cell manipulations in order to achieve leaf spot disease resistant Cavendish varieties.

The Cook Islands also work in collaboration with other Agencies such as the South Pacific Commission Agriculture Division on Root Crops Genetic Resources. Outstanding cultivars of root crops from other island countries in the region were shared and tested locally for taste and acceptance.

Similarly IRETA (Institute for Research and Extension Training in Agriculture) at the University of the South Pacific carry out collaboration work in relation to Food Crop plant genetic resources. Again tissue culture was the major technology.



## NATIONAL NEEDS AND OPPORTUNITIES

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There is a need for assistance in the following area:

- (a) Small financial assistance for purchasing of small equipment for seed storage and preservation to house the seed collection, etc.
- (b) Small financial assistance in partnership with the local Government in setting up a plant Aboretum and small shelter to house some of these special plants.
- (c) Short term training of three officers on Food Crops and Ornamentals preservation and database inventory.
- (d) Short term training of one officer on tissue culture and cytoplasmic propagation.
- (e) Assistance in purchasing of text books related to Plant Genetic Resources preservation.
- (f) Small financial assistance in surveying and data mapping of rare plants and other food crops in the outer islands.



# PROPOSAL FOR A GLOBAL PLAN OF ACTION

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The Cook Islands propose for the FAO Secretariat for the International Conference and Programme for Plant Genetic Resources (ICPPGR) for:

- (1) A Plant Gene Bank to be built somewhere central in the Pacific region to hold and preserve rare plant seeds and various propagules to prevent these plants from extinct.
- (2) Regional training of national personnel in the areas of seeds, plant tissue culture preservation.
- (3) Training in Data Base recording and graphic plant survey.
- (4) Prepare an inventory of endemic and rare plants for each island countries in the Pacific Region; for these plants to be preserved.
- (5) A regional meeting discussing genetic resources issues, policies and selecting sites central to all the Pacific Islands where a Gene Bank should be located.



# LISTS OF GERMLASM COLLECTION OF FOOD CROPS IN THE COOK ISLANDS

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## AVOCADO (*Persia spp*)

Both the Guatemala and the Mexican Lines are present in the Cook Islands, however there are several very good crosses known in the Cook Islands. Some of the selected ones are:

### Pempton

Sel 1 (Mahutaariki)

Sel 2 “ “

Sel 5 (Sam Napa)

Sel 9 (Bill Hosking)

### Introduced Varieties

Hass

Shavil

## BANANA (*Musa spp*)

The main lines held at Totokoitu Research Station are:

Cavendish type	Genome
New Guinea cavendish	AAA
Chinese cavendish	AAA
Mons Mari	AAA
Hochuchu	AAA
Grande Naine	AAA
Umalag	AAA
Hsein Jen Chiao	AAA
Williams	AAA
JD Special	AAA



Non Cavendish types	Genome
Sucrier (Pisang mas)	AA
SH3362	AA
SH3142	AA
Amas	AA
2390-2	AAAA
SH3436	AAAA
TUS	AAAA
Calypso	AAAA
Ladyfinger	AAB
Horn Plantain	AAB
Pacific Plantain	AAB
Pisang rajah	AAB
Bluggoe	ABB
Ducasse (Pisang awak)	ABB
Vei (Uatu or Utu)	?

### **BARANGTONIA** (*Barangtonia spp*)

There is only one edible variety grown on the Research Station.

Edible *barangtonia*

### **BELLE** (*Hibiscus spp*)

Rukau viti rau punupunu

Rukau viti rau pataratara

Ruaku viti rau totovei

### **CARAMBOLA** (*Averrhoa carambola*)

Arkin (sweet type)

Sri Kembegan (sweet)



Canjang (sweet)

Local selection (astringent type)

? (from SDA farm, Sweet type)

? (from Tuti Taringa, sweet type)

## **CASHEW** (*Anacardium occidentale*)

K90

Atiu sel 1

Atiu sel 2

## **CASTARD APPLE** type fruit (*Annona spp*)

Castard apple (*Annona reticulata*)

Sweetsop (*Annona squamosa*)

Cherimoya (*Annona cherimola*)

Palethorpe pride

Fino de Jete

Bays

White

Atemoya (*Annona equamosa x cherimola*)

Pink mammoth

Sel 1 (seedlings)

Soursop (*Annona muricata*)

## **CASSAVA** (*Manihot spp*)

Tauira

Kerekere

Tea

Rengarenga





Tanga

Rau maruana

Rau Kaatea

## CITRUS

Root Stock

Since 1977 when this trial was planted, yields had been recorded for comparison between Rarotonga seedless and late Valencia on Trifoliata and Mandarin rootstocks.

Rarotonga seedless continued to show slightly better than late valencia in terms of performance. Overall the Trifoliata rootstock yields better for both the Rarotonga seedless and Late Valencia than the Mandarin rootstock. The trees in this trial have been bearing for at least fourteen to fifteen years and evidence of decline production is obvious due to factors such as shading, aging and increased competition.

Four different rootstock were studied. These were: Mandarin, trifoliata, Troyer citrange and Rangpur lime planted at the standard spacing of 7.3 m by 7.3 m. Rarotonga seedless continued to show higher yields on both mandarin and trifoliata than Late Valencia. However Rarotonga seedless performed poorly on

Troyer and Rangpur lime where as late Valencia showed satisfactory yield and also seems to have larger fruits.

### **Oranges** (*Citrus spp*)

List of Citrus Collection on the Totokoitu Station.

### **Oranges**

Rarotonga seedless (*matavera*)

Late Valencia

Patterson River

Harwood Late

Mauke Local Orange

Rio Orange



NZ Jaffa

Lengrum

## **Mandarins**

Burgess

Satsuma

Fremont

Clementine

Richards Special

Murcott

Nova

Soverign

## **Tangelo**

Orlando

Dancy

Miniola

Ugli

## **Grapefruit**

Pomelo

## **Tangor**

Ellendale



## Lemon

Villa Franca

Myer

Rough Lemon

## Lime

West Indian Lime

Tahiti lime

Local thornless.

Tiporo

Rangpur

## COCONUT (*Cocos nucifera*)

The collection includes the hybrid crosses made locally:

Nu Papua

Nu Viti

Nu Pia

Nu Mangaro

Nu Potopoto

Nu Rakita (Large Nuts from Atiu)

Spicata

Nu Malay

## Guava (*Psidium guajava*)

Large Pink (ex Hawaii)

Medium Pink (ex Africa)

Medium White (ex Africa)



Vietnamese White (ex Queensland)

Cherry Guava

Local Guava (Pink)

## **JACK FRUIT** (*Artocarpus spp*)

Kuru papaa Rakita (Large type)

Kuru papaa Kaoreore (medium Type)

Kuru papaa Rikiriki (Small type)

## **KUMARA** (Sweet Potatoe)

There are 16 different varieties of Kumara on the Station and these are maintained (planted) biannually as a gene pool source to supply the growers on Rarotonga and the Outer Islands.

A new pink flesh (Carrot colour) variety, introduced from New Caledonia was also on observation.

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Finlay	Orange flesh
Rokini	Deep red
Shelton	Red skined White Flesh
Totokoitu	Finger like leaves
Tauira	Long tubers with white flesh
Tiare	Round tubers and yellow flesh
Tiara	Long and thin tubers, purple skin & Yellow flesh
American	Multi shaped tubers, purple red skin white flesh
Okinawa 1	white skin with purple Flesh
Okinawa 2	white skin, mottled purple flesh
Okinawa 3	Purple red skin, flesh colour is purple
Toru Marama	Heart shaped leaves with pointed tip
Kavamani	Palmate leaves, stem green with streaks
TIB 2	from tissue culture (UNDP-FAO 1986)
TIS 3017	tissue culture

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## LYCHEE (*Lychee chinensis*)

- Local ex-Tereora (5 trees)
- Simiona no 1
- Simiona no 2
- Simiona no 3
- Simiona no 4
- Takafuji
- Mauritius
- Kwa Luk
- Brewster
- Pot Po Hung
- Hueng Lai
- Wo - Mai-Chi

New introduction - Kaimana (2 trees)

## MANGO (*mangifera indica*)

Cultivars held at Totokoitu are:

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Tahitian	Vi Rapa
Kent	White Pirree
Florigon	Nam-dok-mai
Tommy Atkins	Aronamis
Banana Callo	Labbie
Kensington	Mapulehu
Wandering Jew	Haden
Shibala	Vi Oka
Pope	Malay apple
Vi Tinito	Houré Piho
Vi Povaru	Vi T Matenga

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## PASSIONFRUIT (*Passiflora edulis*)

A back cross breeding programme utilizing the purple x yellow hybrid E23 (ex Redlands Horticultural Research Station, Queensland) and Niue yellow (as the recurrent parent) to develop a small flowered self compatible yellow fruited vine.



The progeny:

S 10

From the second backcross:

7.11

7.26

13.18

## **PAPAYA** (Papaw) *Carica papaya*

The local collection consist of the following:

Vi Nita Enuua

Vi Nita Raroarua

Vi Nita Papua (Dwarf trees with Large elongated Fruit)

Waimanalo Solo

Line 8

Line 7

Mutant (sel from waimanalo with Pink Flesh)

Sunrise Solo (Pink)

Sunset Solo

Thailand sel 1

Thailand sel 2

## **PINEAPPLE** (*Ananas comosus*)

Varieties of Pineapples available on the Station:

Smooth Canine

Jumbaca

Ripley Queen

Ara Tangitapu (Island of Mauke)

**PUMPKINS** (*Cucumis spp*)

Mautini enua

Mautini Raroaroa

Mautini rengarenga

Mautini Tinito

**TARO** (*Colocasia spp*)

Current collection are:

Hapuu

82002/56 (Veou)

83001/38

Kaiuliuli tea

160/32

123/70

191/46

160/31

123/98

Kaiuliuli Mura

White Moi

106/5

Alafua Sun Rise

123/02

Moko Rukau

Niue matie (Rakahanga)

Niue (Brown)

E952 (New Caledonia)

E940 “ “

E960 “ “

Tiitii

Tata

**TARUA** (*Xanthosoma spp*)

Tarua Matie Tumutumu

Tarua Ra roaroa

Tarua Totovei

***Alocasia macrorrhiza*** (Kape)

Kape Enuua

Kape Matie

Kape Nukini

***Cyrtosperma chamissionis*** (Puraka)

Puraka Enuua

Puraka Rau riki

**TAVA** (*Pormetia pinata*)

Tava Enuua

**YAM** (*Diocorea spp*)

Ui 'Turi

Ui 'Etene

Ui 'Toka

Ui 'Sel 1

Ui 'Sel 2

Ui 'Sel 3

Ui 'Sel 4

Ui 'Sel 5

Ui 'Sel 6





## COFFEE

Varieties on Totokoitu Station

Cultivar

Blue Mountain T977

Marogogipe T978

Caturra rojo T2308

Caturra amarillo T3386

K7 T2737

Catimor T8655

Catimor T8695

Catimor T8660

Caturra rojo T5276

Catuai amarillo T5268

Pache de Guatemala T3645

Kaope enua

## VANILLA

Tahitian

Mexican

Sel Samoa

Sel Tonga

Local Mutant

## KAVA (*Piper methysticum*)

Four Kava cultivars were received from Vanuatu on 19th December 1991. These were:-

*P. methysticum* cv Damu

*P.* “ cv Onolulu



P. “ cv Mata Karo-kosa Balava

P. “ cv Vau

These cuttings were propagated in the shade house and were transplanted in the field on the 10th July 1992.

Generally these plants are growing well.

Local Kava

Kava Maori