COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

COOK ISLANDS

STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE IN THE COOK ISLANDS

Country Report

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Note by FAO

This Country Report has been prepared by the national authorities in the context of the preparatory process for the Second Report on the State of World's Plant Genetic Resources for Food and Agriculture.

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INTRODUCTION

This report is a contribution to the preparation of the Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture. As the agency overseeing implementation of the regional PGR network (PAPGREN), the Secretariat of the Pacific Community received financial support from FAO to assist the country in the preparation of the report. The research division of the Cook Islands Ministry of Agriculture was tasked to compile the report.

The process towards writing the report involved the collection of data from the outer-lying islands in Cook Islands by way of a questionnaire. At one day to the Stakeholders Workshop was organized to collate data from the main Island of Rarotonga.

EXECUTIVE SUMMARY

1. Basic information

The Cook Islands consist of 15 islands scattered over 2 million km2 of the South Pacific Ocean, between 156 and 167 degrees west longitude and between 8 and 23 degrees south latitude. The islands are split geographically in to the Northern Islands and the Southern Islands. Total land area is 237 km2.

TABLE 1

Island	Area (Acres)	Area Km²	Rainfall (mm)	Temperature	
				Min. C	Max C
Rarotonga	16 569	67.1	2 040	20.8	27.0
Aitutaki	4 519	18.3	1 894	22.9	28.3
Atiu	6 643	26.9	1 992		
Mangaia	12 791	51.8	2 044		
Mauke	4 544	18.4	1 575	22.1	27.8
Mitiaro	5 507	22.3	1 842		
Manuae	1 531	6.2			
Takutea	321	1.3			
Southern Islands	**52 425**	**212.3**			
Manihiki	1 333	5.4	2 337		
Pukapuka	321	1.3	2 816	24.5	31.2
Nassau	321	1.3			
Palmerston	519	2.1	1 988	23.4	28.8
Rakahanga	1 012	4.1	2 360	24.2	31.2
Penrhyn	2 420	9.8	1 866	25.6	29.7
Suwarrow	101	0.4			
Northern Islands	**6 027**	**24.4**			
Cook Islands	**58 452**	**236.7**			

Source: Survey, Land & Information Services, Ministry of Works

The climate is tropical with two seasons, a hot and humid summer from October to April, and a warm dry winter from May to September. The two island groups making up the country portray marked differences in their agricultural activities. The Northern Islands remains relatively isolated from the Southern Islands. Agriculture in the Northern Islands is relatively limited. All these islands are atolls, with poor soils for crop production, except mainly for coconuts and some timber and fruit trees. The Southern Islands, including the main island of Rarotonga continues to indulge in a much more diversified agriculture. This group has the benefit of a much cooler climate and a more fertile soil enabling a wider variety of agricultural production. Estimated resident population for the quarter to September 2008 is 12 200.

The population of the country has declined sharply from a high of 18 432 in 1991. The Cook Islands became a self governing nation on August 4th 1965 in free association with New Zealand (NZ). Cook Islanders still maintain NZ citizenship and thus migrate freely between the two countries using a NZ passport. There are more than 70 000 Cook Islanders living abroad, mainly in NZ and Australia.

The continuing migration of the population, particularly from the outer-lying islands to seek employment either on the main island or abroad is a worrying sign for the country.

Much of the remaining residents in the outer islands are made-up mainly of the inactive workforce group. This continuing migration will continue to affect the level of agricultural production as farmers strive to seek labor for the farm, in-turn we increase our import of both fresh and processed produce to meet the demands of the increasing visitor population, estimated at 80 000 per annum.

2. State of food security and trends

Majority of farmers in the country operate on what may be referred to as part-time employment. Such farmers have regular employment and farming provides for additional cash income and the production of mainly root and tree starch staples. Current food production in Cook Islands is insufficient to meet demands. The country is still highly dependent on imported food products, especially considering the increasing visitor numbers to the country.

Limited agricultural production in the country, particularly the main island of Rarotonga, where the majority of visitors reside, is being culminated by the reduction in land areas for such purposes due to increasing housing developments for both tourism and private use.

3. Profile of the agricultural sector

The crop sector in Cook Islands is comprised primarily of family or private owned farms. Crops are produced on small holdings, between 0.25-0.50 acres, mainly for home consumption with excess production for cash sales. Traditional agricultural activities in the country has included, apart from the monoculture cultivation of Taro *Colocasia esculenta,* Cassava *Manihot e sculenta, s*weet potatoes *Ipomoea batatas, and Tarua Xanthosoma sagittifolium*, multi-storey cultivation of *Yams Dioscorea* spp.*, breadfruit Artocarpus altilis*, and other important food and medicinal plants and trees.

At present, agriculture for cash income is made-up of a few commercial farmers and mainly part-time farmers. The dramatic reduction of land on the main island will continue and will have a negative effect on production particularly tree crops. Government has started to put together plans to develop the agriculture in the outer-lying islands. There has been abundant land in these islands which has been in fallow for many years as a result of the migration of the resident population to Rarotonga and abroad. With the high influx of tourists to the country, agriculture on the main island has benefited through increased local sales of crops. The Cook Islands was a major exported of fresh and processed citrus, pineapples, and bananas in the 50's to 70's, however, due to deregulation on the NZ market, the Cook Islands faced stiff competition from other exporting countries.

The contribution of agriculture to Gross Domestic Product has remained the same between 2005 and 2007 at 5.0 and 5.4%, while tourism, the main income earner has increased by 7% from 43.6 to 50.7% for the same period. Although majority of farmers employ family labor, either paid or unpaid, commercial farmers normally employ paid workers and some employ foreign laborers.

4. Recent trends in plant production

Root crop production in Cook Islands has normally taken a subsistence role however, with the changes in the local economy and employment patterns, the country has experienced major changes in agricultural production activities. Farmers on the main island, where there is abundant opportunities for sale of produce has moved from a subsistence to a semi-commercial farming system whereby the bulk of the production is sold for cash.

The changes has also caused significant changes in the types and diversity of food products, and the eating habits of the general population with an increased consumption of imported processed foods such as rice, bread, and potatoes. The changes in crop diversity are also in response to the demands of the restaurants and hotels for a wider variety of food products.

CHAPTER 1

THE STATE OF DIVERSITY

1.1 The main values of plant genetic resources

Crops including Taro *Colocasia esculenta,* Cassava *Manihot esculenta*, sweet potatoes *Ipomoea batatas*, *Bananas Musa* spp., coconut *Cocos nucifera*, and *Xanthosoma sagittifolium* are the main staple food of the Cook Islands. *Yams Dioscorea* spp., and giant swamp Taro *Cyrtosperma chamissonis* are of less importance.

These crops not only are vital for food security but also have social and cultural significance particularly Taro in the Southern Islands, and giant swamp taro in the Northern Islands of the Cook Group. Generally, the production of these crops is at a subsistence level to supplement the daily diet, however, increasing employment opportunities and economic demands within the household has also seen an increase of such crops being sold at the local markets. Other important crops particularly to the southern islands include: Mango *Mangifera indica*, Papaya *Carica papaya*, Guava *Pisidium guajava*, *Citrus Citrus* spp.*,* Passionfruit *Passiflora edulis*, Polynesia chestnut *Inocarpus fagiferus*. *Pandanus Pandanus tectorius* is an important crop in the northern islands.

1.2 Diversity within and between crops

A survey by way of a questionnaire of the level of crop diversity was conducted on the islands in both the southern and northern groups. The survey revealed that the varieties produced in all islands are basically the same with minimal diversity.

There were no more than 10 cultivars of Taro recorded as being cultivated on any of the outer islands including those cultivars used only for leaf production. Considering the other important crops including coconut, bananas, xanthosoma, and sweet potatoes, yams, and giant swamp Taro, no more than 5 cultivars were reported. Although the main island of Rarotonga cultivate 14 cultivars of Taro, including a single cultivar for leaf production only, this also indicates limited diversity within the most important staple in the country. Cultivars for other crops are the same as with the other islands. The limited diversity is an effect of mainly market preference, eating quality, duration to maturity, and yielding potential. This diversity has remained the same over the past 10 years, and limited diversity between and within crops is also anticipated over the same period into the future.

Survey of and inventory of minor crops, including wild food plants have not been undertaken. There is however, an increasing diversity particularly in vegetable crops with new open pollinated and hybrid cultivars being cultivated by farmers. The increasing influx of visitors to the country and changing eating habit of the general population has created market opportunities for more vegetable varieties.

1.3 Factors influencing the state of plant genetic resources in Cook Islands

Although the relative importance of various crops has not changed over the past 10 years, the level of consumption has changed with a large proportion of the younger population consuming more of non- staple crops including imported crops such as rice.

Genetic erosion of plant genetic resources of the different and important root and tree crops are taking place primarily as a result of land developments other than agriculture, introduction of new cultivars, migration of the general population from the outer-lying islands to the main island and abroad, and the general lack of interest of the younger generation in agricultural activities thereby not cultivating certain important social and cultural cultivars e.g. Maoli bananas. Market preference for certain cultivars and pests and diseases are other factors contributing to genetic erosion.

1.4 Future needs and priorities

Information on the state of diversity of Plant Genetic Resources for Food and Agriculture (PGRFA) is minimal. Collating such information through a surveying and inventorying system is not established a high priority within the national policy. Moreover, inadequate financial support through the local budget, staffing and skills are other factors impacting on the collating of such significant information. Government need to immediately impart, through the Ministry of Agriculture, and other line Ministries, a high priority to the monitoring of genetic resources in the country. This should, in addition, be provided financial and technical support.

CHAPTER 2

THE STATE OF *IN SITU* MANAGEMENT

2.1 Inventories and surveys - assessments and priorities

No country-wide evaluation has been carried out to determine the extent of continuing use, conservation and of genetic erosion of traditional crops in farmers' fields and in the islands. Moreover, farmers suggest that traditional crops are undergoing genetic erosion from the shift in social and cultural patterns. Older farmers in some islands do maintain certain important species and varieties of crops, particularly Taro and Maoli Bananas. A systematic survey is needed to document the situation and inventory of genetic resources in farmers' fields.

2.2 On-farm management and improvement of PGRFA

Traditionally farmers cultivate different cultivars of root and trees crops in their farm. This is practiced to maintain crop diversity not only due to the high food values of such cultivars, but also has high cultural and social significance. There is no on-farm participatory plant breeding programmes in the country. Certain farmers produce own seeds for cultivation. Moreover, with the increasing pool of crop varieties conserved *ex situ* with the Ministry of Agriculture, farmers have access to a wider range of planting materials including both important traditional and newly introduced cultivars.

2.3 Restoring agricultural systems after disaster

The National Government, including farmers in unaffected islands/areas provide assistance to affected farmers' in disaster situations, particularly through the provision of planting materials. In 2005, following a severe cyclone, Taro planting materials were provided to the islands of Pukapuka and Nassau as their Taro crop was destroyed due to seawater flooding. Such assistance may also be provided through regional organizations such as FAO and SPC.

2.4 *In situ* conservation of wild crop relatives and wild plants for food production

There are no current activities on policies regarding *in situ* conservation of wild crops and trees. However, with the increasing developments into sloping, swamp, and other marginal lands, these species are being put under threat. Although the Environment Service in the country charged with the responsibility of such developments does not hold legal powers to stop the destruction of such species, they do consider its food, cultural, and social significance in environmental impact assessments.

2.5 State of the art

With the continuous and on-going increase in land developments in the country, *in situ* management of plant genetic resources will continue to remain under threat. The national government should make a national priority, the management and improvement of PGRFA on-farm. The younger generation should be encouraged with incentives provided to continue with the cultivation of cultivars of high food, social, and cultural values. Increased access to planting materials should also be made to farmers to facilitate management of such species and cultivars.

CHAPTER 3

THE STATE OF *EX SITU* CONSERVATION

3.1 Sustaining and expanding *ex situ* collections

Ex situ crop genetic resources collections in Cook Islands are largely in the form of field genebanks. This is because most of the nationally important crops are vegetatively propagated or perennial. These collections are maintained by the Research Division of the Ministry of Agriculture on the main island of Rarotonga.

TABLE 1
Root crop species and number of accessions conserved by the Research Division, Ministry of Agriculture, Rarotonga

Crop	No. accessions	Characterization	Priorities
Taro (*Colocasia*)	50	Agronomical	Characterization
Sweet potatoes	4	None	
Yams (*Dioscorea* spp.)	6		Further collecting

TABLE 2
Fruit crop species and number of accessions conserved by the Research Division, Ministry of Agriculture, Rarotonga

Crop	No. accessions	Characterization	Priorities
Abiu (*Pouteria caimito*)	1	None	
Avocado	10	Partial	Characterization
Bananas and Plantain	22	Morphological/Agronomic	Further collecting
Carambola	3	None	
Citrus spp.	19	Partial	Characterization, further collecting
Chempadek *(A. integer)*	1	None	
Durian *(Durio zibenthinus)*	2	None	
Jackfruit (*A. heterophyllus*)	3	None	Characterization
Long Kong (*Lansium domesticum)*	1	None	
Litchi/Lychee	3	Partial	Characterization
Mango	8	Partial	Characterization
Matisia (*Matisia cordata)*	1	None	
Nono *(Morinda citrifolia)*	3	None	
Passionfruit	3	Partial	Characterization
Pineapple	3	None	Characterization, further collecting
Pitaya (*Hylocereus* spp.)	2	None	
Pitaya *(Selenicereus* spp.)	1	None	
Pulasan (*Nephelium mutabile*)	1	None	
Rambutan	3	None	
Rollinia *(Rollinia deliciosa)*	1	None	
Santol *(Sandoricum koetjape)*	1	None	
Sweet Tamarind	4	None	Characterization

TABLE 3
Beverage and Spice crop species and number of accessions conserved by the Research Division, Ministry of Agriculture, Rarotonga

Crop	No. accessions	Characterization	Priorities
Cardamom	1	None	Characterization
Galangal	1	None	Characterization
Ginger	1	None	Characterization
Kava	4	None	Characterization

Following the expiration of the leasehold in June 2007 of the land on which the Research Division station was situated, a large majority of the collection of crops were relocated. However, there are still some species and/or accessions of Breadfruit, Citrus, Macadamia, Kava, and Barringtonia (edible) which need to be relocated. This is planned to be carried out in the immediate future. In addition, the immediate collecting of maoli, popoulu, and other important bananas from each of the outer-lying islands should be set a high priority.

The increasing market preference for desert type bananas, coupled with the younger generation not being interested in the cultivation of such types of bananas, has seen a dramatic reduction in number of these important varieties with high nutritional and cultural values.

3.2 Planned and targeted collecting

Funds from SPC was received to support the collecting of important rare bananas (Maoli and Popoulu type), and important yams from the islands of Aitutaki and Mangaia, respectively. During the course of the past few months, four cultivars of bananas namely; Aumarei, Torotea, Tara Puakatoro, and Ta'anga, and three cultivars of Yams namely; Toka, Etene, and Parai were collected from the islands of Aitutaki and Mangaia. These will be maintained in the genebank of the Ministry of Agriculture on the island of Rarotonga. Species and/or accessions remaining at the old research division site will also be relocated.

3.3 Assessment of major *ex situ* needs

The collection in the country can be enhanced by sharing facilities and resources through regional and international collaboration, such as with the Centre for Pacific Crops and Trees (CePaCT) at the Secretariat of the Pacific Community (SPC) in Fiji. The conservation of certain high value crops which are often difficult to multiply, such as the Maoli and Popoulu bananas, can be enhanced via tissue culture at SPC. Moreover, the conservation of PGR's should be accorded high priority with adequate financial and technical support.

3.4 State of the art

A small tissue culture lab was established at the old research division site mainly for maintaining tissue cultured materials received from abroad, and propagating of flowers including orchids and anthuriums. This, however, is no longer accessible to the Ministry of Agriculture. A tissue culture facility could be set-up with the Ministry of Agriculture as an option to the expansion of *ex situ* conservation of PGR.

CHAPTER 4

THE STATE OF USE

4.1 Distribution of plant genetic resources

To-date, the country has not established a mechanism to record the distribution of samples of conserved plant genetic resources to breeding programmes. Over the past 10 years, none of the samples within the Ministry of Agriculture Research Division PGR collection were utilized in any breeding activities. In addition, the distribution of PGR for breeding purposes can be assisted with the recent launching of the FAO funded Database on Fruit Trees in the country.

4.2 Utilization and enhancement of use of PGR

Improved use of plant genetic resources in the country is hampered by a lack of characterization and evaluation, documentation, insufficient capacity for plant breeding, lack of capacity, coordination amongst stakeholders, and weak policies for development.

However, there is interest in the development and commercialization of certain species, in view of nutritional significance, and the increasing growth in the tourism sector. Such species include; Musa fe'i, *Pometia pinnata*, *Psidium guajava*, jackfruit. There is also interest in the development of local varieties and species (coconut, breadfruit, banana), through value adding, particularly in the outer islands, to cater for the local and visitor populations. Products such as: body and massage oils, dried fruits, juice, and confectioneries have high potentials.

4.3 Seed supply systems and role of markets

There are no current seed production activities in Cook Islands. Importation for sale of open pollinated and mainly hybrid vegetable seeds from Japan, Australia, Taiwan, and New Zeland are done by the private sector.

Efforts to increase and improve the utilization through processing and value-adding of various crops, including both root and fruit, and either diversity or nutrition-rich have been sought through trainings conducted on some of the islands with external funding and technical assistance. The national government see this as a high priority area especially for the outer-lying islands to facilitate the movement, increase shelf-life, and reduce freight costs on shipping products to the main island and abroad.

4.4 Crop improvement programmes and food security

There is no formal-sector crop improvement program in Cook Islands.

CHAPTER 5

THE STATE OF NATIONAL PROGRAMMES, TRAINING NEEDS AND LEGISLATION

5.1 National programmes

The stakeholders workshop in September 2008 suggested that the Ministry of Agriculture remain as the coordinating body for PGRFA activities in the country. It should manage a central germplasm database, in-conjunction with the fruit trees database being developed under the national FAO project on fruit trees development. In addition, it should act as the focal point for international PGR contacts, including requests for germplasm by overseas researchers and countries. To facilitate the undertaking, legislation needs to be implemented in harmony with existing related legislations to provide guidelines for PGR use, conservation, and exchange.

5.2 Networks

A regional workshop on agricultural PGR in the Pacific: "Formation of a Regional Network for Conservation, Management and Use" was held in September 2001 in Suva, Fiji, organized by the Secretariat of the Pacific Community and the International Plant Genetic Resources Institute and attended by representatives of several South Pacific countries.

Participants at the meeting launched a regional PGR network, the Pacific Plant Genetic Resources Network (PAPGREN), developed a regional action plan, and agreed that national PGR stakeholder workshops would be organized in each partner country to strengthen national coordination. The Cook Islands is a founding member of PAPGREN.

5.3 Education and training

Most research staff currently involved in germplasm use, conservation, and distribution has not received formal training in the field. However, they have much hands-on experience in the field of PGR and continue to adequately manage the *ex situ* collections. There is a need to provide training in the area of data collection and management.

5.4 National legislation

In August 2008, the new Biosecurity Bill was passed in parliament. The bill allows for the protection of plant genetic resources through phytosanitary means and a total ban on the importation of certain species and cultivars of plants from certain countries.

5.5 Information systems

Inadequate efforts have been made to develop a national information management system to support efforts to sustainably use, develop, and conserve plant genetic resources. The development of a suitable database, similar to the fruit trees database developed under an FAO regional project for food security is a priority for the Ministry of Agriculture research division to facilitate the management and use of data on plant genetic resources.

5.6 Public awareness

Promoting public awareness of PGR is highlighted by the Ministry of Agriculture research division through fieldays, workshops, media (TV, radio, newspaper), school visits, and at annual World Food Day celebrations. There is, however, a need for greater promotion and awareness of PGR with emphasis on the nutritional significance of various crops and species in an effort to further promote the use and conservation by the general population.

CHAPTER 6

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

6.1 International networks and programmes

As a member of the Pacific Plant Genetic Resources Network, the Cook Islands have access to genetic materials at the CePaCT at SPC. Over the past 8 years, germplasm of leaf blight resistant and tolerant taro, scab resistant and shorter duration to harvest sweet potatoes, black leaf streak resistant and tolerant bananas, and *Dioscorea rotundata* (African yams) have been sought from SPC. These germplasm are being maintained in an *ex situ* field collection with the Ministry of Agriculture, and some have been distributed to farmers and to some of the outer islands.

The programme on Development of Sustainable Agriculture in the Pacific under SPC, and the Fruit Trees Development programme for the Cook Islands have also facilitated through financial and technical means the distribution, use, and management of plant genetic resources, along with the adoption of sustainable agricultural practices, increased availability of crop species and cultivars, and improved crop production practices.

6.2 International agreements

The Cook Islands ratified the Convention on Biological Diversity (CBD) in December 1993. The activities of the CBD are being coordinated by the Environment Services in the country. The CBD has one of the main goals as the fair and equitable sharing of the benefits arising from the use of plant genetic resources.

In 2004, the Cook Islands ratified the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). This will facilitate the access of the country to the global pool of genetic resources of important food crops in the world.

CHAPTER 7

ACCESS TO PLANT GENETIC RESOURCES, SHARING OF BENEFITS DERIVED FROM THEIR USE AND FARMERS' RIGHTS

7.1 Access to PGR

During the course of the past 10 years, germplasm of leaf blight resistant and tolerant taro, scab resistant and shorter duration to harvest sweet potatoes, black leaf streak resistant and tolerant bananas, and *Dioscorea rotundata* (African yams) have been received from SPC. These germplasm are being maintained in an *ex situ* field collection with the Ministry of Agriculture, and some have been distributed to farmers and to some of the outer-lying islands.

Plant genetic materials has always been introduced from CePaCT SPC under a materials transfer agreement and the national government through the Ministry of Agriculture has not encountered any difficulties in maintaining or enhancing access to plant genetic resources located at SPC and with other organizations. Since the Cook Islands have ratified the ITPGRFA, it abides by the Multilateral System of Access and Benefit Sharing.

7.2 Fair and equitable sharing of the benefits of the use of PGR

Semi-commercial and commercial farmers within the different islands cultivate different species and varieties of crops. Few farmers, particularly the older generation of farmers maintain certain important varieties with either good eating qualities, or have social and customary significance. Majority of the produce of the farmers, especially the root staples are cultivated mainly for home consumption while surplus may be shared with families and for cash income generation. With the introduction of improved plant genetic materials such as the disease resistant bananas, farmers are assured of reduced disease problems and higher productivity and harvest.

7.3 Implementation of Farmers' Rights

With the Cook Islands signing the CBD and the ITPGRFA farmers can be assured of their rights to equitable sharing of benefits arising from the utilization of PGRFA. Moreover, farmers also can participate in decision making at the national level on the conservation and use in a sustainable manner of plant genetic resources.

CHAPTER 8

THE CONTRIBUTION OF PGRFA MANAGEMENT TO FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

PGRFA management is vital to provide support to countries threatened by food shortage so they can solicit assistance from regional and international organizations, to source genetic materials to ensure food security in the event of climate change and other forms of disasters. The maintenance of the *ex situ* collections of root and fruit crops is a major positive step towards the conservation of PGRFA in the country. However, there may be a need for a duplicate collection of these important cultivars on another of the outer-lying islands. Moreover, the general public and younger generations, most probably through the education system is made aware of the significance of PGR diversity, and the need to protect such diversity for sustainable to ensure food security in the country.