

**Pacific Agricultural Plant Genetic Resources Network (PAPGREN) &
Pacific Breeders Network Meetings
Suva, Fiji
1st – 5th December 2014**

Plant Genetic Resources for Food and Agriculture

Use it or Lose it



MEETING REPORT

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Food and Agriculture
Organization of the
United Nations



The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



Agricultural Policy Programme



Pacific Agriculture Policy Program



SPC
Secretariat
of the Pacific
Community

1. ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
AusAID	Australian Aid
CePaCT	Centre for Pacific Crops and Trees
COGENT	Coconut Genetic Resources Network
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EU	European Union
HOAFS	Heads of Agriculture and Forestry Services
FAO	Food and Agriculture Organisation of the United Nations
IACT	Increasing Agricultural Commodity Trade
ICG	International Coconut Genebank
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
MOAFS	Ministers of Agriculture and Forestry Services
NZAID	New Zealand Aid
PAPGREN	Pacific Agricultural Plant Genetic Resources Network
PAPP	Pacific Agriculture Policy Project
PICT	Pacific Island Countries and Territories
POETCom	Pacific Organic and Ethical Trade Community
SPC	Secretariat of the Pacific Community
USP	University of the South Pacific

2. INTRODUCTION

The Pacific Agricultural Plant Genetic Resources Network (PAPGREN) and Pacific Breeders Network met in Suva, Fiji on 1-5 December 2014. Discussions were based on the theme: *Plant genetic resources for food and agriculture, use it or lose it*. The meetings were hosted by the Secretariat of the Pacific Community (SPC), and were officially opened by Mr Inoke Ratukalou, Director of the SPC Land Resources Division.

The PAPGREN network was established in 2001 to support work in the region on plant genetic resources. Initial funding came from the New Zealand Government, the Australian Centre for International Agricultural Research (ACIAR) and SPC.

The network is open to all 22 SPC member countries, and the stakeholders include government ministries, farmer groups, planting material networks, universities and others. PAPGREN aims to support national programs targeting the conservation, utilisation, exchange and management of plant genetic resources for food and agriculture (PGRFA).

Funding for PAPGREN ended in 2009. The plant genetic resources activities have continued under different donor-funded projects, using the PAPGREN network. SPC continues to source funding, and submit proposals where possible, to support activities of the network.

One of the highlights for the year is the establishment of the first Pacific Plant Breeders Network in Santo, Vanuatu in May 2014. This was funded by the Benefit Sharing Fund of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture project: *“Strengthening the resilience of Pacific agricultural systems to climate change through enhancing access to and use of diversity”*. SPC works closely with the Vanuatu Agricultural Research Training Centre and member countries on this project.

Experience has shown that when crops are not used, or shared, they can be lost forever. New pest and disease outbreaks, such as the *Bogia* phytoplasma disease affecting coconuts in Papua New Guinea, and frequent man-made or natural disasters, mean people must learn to adapt. It is vital to conserve our major plant genetic resources, as well as optimise their value to us. Pacific countries can conserve their important and historical varieties, either in *ex situ* or *in situ* through the mandate of the Global Crop Diversity Trust.

Pacific crops possess some unique genetic traits. By applying appropriate technologies and other methods, it is possible to identify some of the traits enriched with nutrients, and those resistant to disease and the impacts of climate change. This knowledge can be used to create new varieties through breeding, to ensure Pacific Island communities have improved food security.

The European Union provided funding assistance that allowed the forum on plant genetic resources to take place as an activity of the Pacific Agriculture Policy Project (PAPP), Increasing Agricultural Commodity Trade (IACT), and the UN Food and Agricultural Organisation’s Treaty Benefit Sharing project to promote technical exchanges of expertise and capacity building that contribute to improved Pacific livelihoods.

3. RECOMMENDATIONS

Country Reports and Role of PAPGREN:

1. Acknowledge the importance of ongoing Plant Genetic Resources (PGR) activities in Pacific Island Countries and Territories (PICTs) and urge members to strengthen their national PGR activities, in particular atoll countries, and provide PGR materials to the Centre for Pacific Crops and Trees (CePaCT) for conservation, safety duplication, and for sharing under the multilateral system of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).
2. Welcome the research focus of donor-funded projects aimed at improving the resilience of Pacific Island agriculture, livelihoods and food security. Other donors are requested to provide for capacity building in areas such as crop improvement. The meeting requested SPC to assist members in applying the lessons learned from these projects, in practical and affordable ways.

CePaCT Activities:

3. Acknowledge the work of SPC and promote information sharing through PAPGREN and other international networks. Countries are urged to provide evaluation information to CePaCT on crop diversity.
4. Member countries are urged to look at a cost sharing arrangement for requests to CePaCT that fall outside the coverage of a funded project. This will help SPC to meet rising costs in areas such as biosecurity, shipment of PGR materials and inspections.
5. Seek endorsement for SPC to liaise with USP, Samoa and possibly lease land and premises for a stand-alone laboratory under SPC CePaCT management for the safety duplication of the SPC back-up collections. The current USP facility is quite old and not safe for safe-keeping of the SPC collections.

Emergency plans for the safety duplication of the Pacific coconut genebank:

6. Seed nuts or embryos from the current Papua New Guinea International Coconut Genebank (ICG) collection to be relocated within PNG, using accessions free of the phytoplasma that causes the Bogia complex. The collection should be re-established in Samoa and Fiji from new planting material acquired from the national collections, in accordance with the decision of the SPC ACIAR coconut meeting in 2012, Samoa. There is a need for PNG and the Coconut Genetic Resources Network (COGENT) to share all information on the ICG collection to the region.
7. Apply other ways of conservation and safety duplication in coconuts, such as the slow growth embryo culture procedure, bonsai plants in screen houses, on-farm conservation that is integral to regional collections, and the establishment of pollen collections for conservation and distribution.

FAO Treaty ratification progress by non-contracting parties:

8. Note the decision of the Pacific Ministers of Agriculture and Forestry Services (MOAFS) meeting in 2012, for non-contracting parties who have not yet ratified the FAO Treaty (ITPGRFA), to do so.

Climate Change: crop modelling, screening methods and vulnerability assessment:

9. Note the crop modelling and Vulnerability and Adaptation methodology for climate change and food security assessment at community level, note also the opportunity for linkages to climate change programmes at national and regional level; requests SPC, USP, CSIRO and other organisations to share V&A and crop modelling tools and training to countries, and to support proposal writing efforts for the seeking of funding from national and regional climate change programmes.

Organic agriculture, niche markets and value chain guide for products:

10. Develop best practice examples of niche organic products and traditional farming systems in association with SPC and POETCom. This includes the identification and development of resistant varieties, climate resilient varieties, open pollinated seeds, and research in this area.
11. Encourage wider consultation on genetically modified organisms, to improve the understanding of the likely implications for the region and its food security.
12. Where appropriate, SPC is requested to assist members to link up with donors whose aid programmes are best placed to support national priorities, particularly with their implementation.
13. Promote the growing of traditional and culturally important plants, and not just those with a commercial value.
14. Note the importance of the agricultural value chain guide for the Pacific Islands to support current and future niche market opportunities.
15. Welcome the World Soil Health Day on 5 December, and urge members to take steps to promote good soil health for sustainable food security and livelihoods.

Pacific Plant Breeders Network: regional training on participatory plant breeding

1. PAPGRENs Pacific Plant Breeders network and SPC to assist members to develop regional proposals for funding by donors. Priority areas include regional crop improvement programs on more resilient crops and for improved nutrition and market traits.
2. SPC to work closely with the University of the South Pacific (USP) and national institutions on developing a curriculum for degree and post graduate courses in priority areas such as plant genetics, plant breeding and others.

3. Prepare and present a report to the 2015 meeting of the Heads of Agriculture and Forestry Services (HOAFS) and MOAFS, on the progress and key achievements of PAPGREN and its work, and seek further endorsement and donor partnership support of PAPGREN initiatives. The meeting requests SPC to facilitate this report and logistical arrangements for inclusion of this item into the HOAFS/MOAFS meeting agenda.

4. COUNTRY REPORTS

The participants presented Country Reports to provide updates on their activities¹. These presentations covered two main areas:

- a) PGR activities in all PICTs
- b) Updates on PGR donor-funded projects (only recipient countries)

Cook Islands

The PGR activities cover the conservation and distribution of crops such as banana, cassava, sweet potato, taro, yams and fruit crops. The distribution of crop varieties reaches farmers in the Outer Islands. Such activities are aimed at strengthening the resilience of agriculture systems to climate change through plant breeding, soil improvement, public awareness and other measures. Some of the work is directed at soil improvement and enhancing horticulture production. Future plans are to strengthen the partnerships in agriculture, educate young people about healthy eating, and support more research into the sector.

Federated States of Micronesia

The AusAID funded ICCAI project aims to build resilience to climate change through crop diversity, and to address the knowledge gaps relating to climate change on the region's agriculture sector. This will help to achieve national food security and nutritional health. Lessons learnt include the importance of genebanks for food security and conservation, maintaining diversity, promotion of local produce, reduction in inferior imported foods, and the regulation of food prices. The challenges include the difficult environment on the atolls, and capacity building.

Fiji

Conservation efforts include field genebanks, cool storage facilities, nurseries and tissue culture. The PGR activities are mainly *ex situ* through eight government research stations. Since joining PAPGREN in 2001, the focus areas for Fiji include PGR management, use of PGR, information sharing and networking, and regional and international initiatives. The impacts of climate change and challenges to food security have prompted Fiji to review its PGR activities to ensure they respond to national priorities. Efforts are in place to make use of these PGR materials through national and donor-funded programmes.

French Polynesia

One of the activities is a field genebank for a Pacific regional collection of bananas. These are carried out in collaboration with partners such as SPC CePaCT and Bioversity International. The banana genebank is another way of promoting conservation and diversity, for improved food

¹ E-copies of the Country Reports are available from SPC-LRD.

security and better livelihoods. There are three sub-groups of banana (Maoli/Popoulu, Iholena and Fehi) that originated in the region. The project aims to provide a safety backup for Pacific bananas, and promote public awareness and scientific research.

Kiribati

Root crops and trees are being introduced to diversify the genetic base of the country's food crops, promote sustainable farming and enhance food security. The challenges include taro beetle infestations, poor atoll soils, poor water quality, limited land, and the likely impacts of climate change on low-lying atolls such as sea level rise and saltwater intrusion. Efforts to ship banana and taro quickly to the Outer Islands are hampered by distance, limited transport links and a lack of capacity. The Agriculture Department is working with partners such as SPC to use the existing crops on the atolls, as they are adapted to local conditions.

Marshall Islands

Breadfruit and bananas have been provided under the AusAID Climate Change and Global Crop Trust Fund Regeneration project. Tissue cultured plants and seeds have been made available for root crops, tree crops and vegetables. Seeds and plants have been distributed to farmers and groups in the local community for family and commercial use.

Nauru

A food security program started in 2004 with help from Taiwan as Nauru went through an economic downturn. Two farms were established through a bilateral partnership. One focused on kitchen garden activities and the other covered the breeding of livestock, such as pigs and chickens, for the local communities. The farms are also used to build local capacity in farming skills and sustainable practices. There is limited land on the island as well as serious soil degradation from years of phosphate mining. Regular visits by experts from regional agencies, such as SPC, will be needed to assist with capacity building.

New Caledonia

The PGR activities aim to identify, conserve, characterise and improve the crop varieties. Crop improvements come through the selection of cultivars and rootstocks adapted to local soils and growing conditions. Local growers are provided with clean planting materials to enhance quality and provide for income earning on the local and export markets. The challenges include cost, threats to biodiversity and the need to collaborate at a regional level. Future plans are to strengthen the PGR programme, further improve the crop varieties, and build public awareness.

Niue

Farmers have received crop varieties from CePaCT to add to their stocks. SPC is being asked to help with the collection of taro germplasm, technical assistance and data collection. There will be a greater focus next year on bananas. The new sweet potato varieties are popular with farmers. More studies are requested into taro varieties that will suit the cooler climate on the island. Taro could also be branded to make the product more attractive for export markets. New taro varieties from Samoa will help to generate more income.

Palau

PCC-CRE maintains the active germplasm collection of taro, cassava and sweet potato. One of the activities was the micro-propagation and *in vitro* conservation of taro. Taro and other

planting materials were distributed to farmers during public events such as national holidays and show days. An AusAID project evaluated taro varieties for salt tolerance, partly as a response to the impacts of climate change and to promote food security. Some early problems were encountered with saltwater intrusion. Increasing the height of the dikes on the demonstration farm, and improving the drainage system, addressed these problems.

Papua New Guinea

The National Agricultural Research Institute maintains seven food crop germplasm collections in four NARI sites. The crops include banana, cassava, aibika (bele), yam and sweet potato. There are also several working collections being maintained in different NARI sites. The NARI Highlands Regional Centre (HRC) tissue culture laboratory is responsible for *in vitro* storage of crop germplasm. The laboratory is shared among three organizations: NARI, the Coffee Research Institute (CRI) and the Fresh Produce Development Authority (FPDA) which also conserves and maintains coffee and potato. Five projects funded by the Crop Diversity Trust Fund have been implemented by NARI in the last five years.

Samoa

The field conservation of PGR materials covers tree crops, root crops, nuts and spices, and fruit trees. A new coconut seed garden will be established on a 200-hectare lease of government land. Samoa is ready to act as a safety backup for the Regional Coconut Genebank, as it is free of serious coconut diseases and has strong government support. Some of the land will be used for planting root crops and for the conservation of a banana genebank. The tissue culture laboratory and purchase of technical equipment will proceed in 2015 under World Bank funding. Samoa is working with other partners on plant breeding and other PGR measures.

Solomon Islands

The PGR programme has benefitted from improved crops that are more resilient to the impacts of climate change. This will help to improve food security. Most PGR activities are focused on collection, maintenance, improvement and distribution of materials. The work is carried out in partnership with donor-funded projects. The priorities for the government include capacity building, securing the facilities needed for conservation, formulating policies and regulations governing the movement of genetic resources, and international treaties and material transfer agreements.

Tonga

Natural disasters such as cyclones can cause serious damage to the agriculture industry, and other sectors. The impacts of climate change, pests and diseases and other challenges make it necessary to plan ahead in order to promote sustainable development, food security and income generation. Agriculture and fisheries are the mainstay of the economy and employment, contributing to household income and export earnings. The challenges for agriculture include the impacts of climate change and the need to ensure good nutrition. Crop diversification will help to meet market demand and ensure food and nutritional security.

Tuvalu

There is a narrow gene pool of crops to ensure food security. The main ones are taro, swamp taro, banana, breadfruit and coconut. Vegetables are being introduced for home gardens. Atoll soils are poor and while the soil is being improved with fertiliser and compost, there is not much green matter for compost. A research facility holds a collection of coconuts and citrus fruit. Limited funding is available for agriculture, and the limited land on the atolls means a greater reliance by people on marine resources. While imports are steady, some islands still go through food shortages due to events such as drought.

Vanuatu

Activities include the PGR *ex situ* collection of food crops dating back to the 1980's, as well as *ex situ* collections of cash crops and fruit from the 1960's. A number of donor-funded projects are focused on the regeneration of yams and sweet potato germplasm, the regional banana collection, breadfruit, taro modeling and edible aroids. There is also an evaluation programme of SPC crops. These include crops such as sweet potato, taro, swamp taro, banana, yams, cassava and Irish potato. Most were received in the last two years and are either in the field or a nursery.

Wallis and Futuna

New taro varieties were planted recently, as work continues with SPC on assistance for taro farming. Some work is underway with local yam varieties to multiply them so as not to lose important traits. The coconut industry is still recovering from damage caused by cyclones, and a replanting programme is continuing. Vegetable growers are trying to increase production. The major staple crops are yams, breadfruit, cassava and bananas.

The participants confirmed the official nominations to be “Focal Points of Contacts” for updating the FAO World Biodiversity Country Status Reports.

Research continues into climate resilient crop varieties sourced from CePaCT and national selections. This includes studies into salt tolerant crops, such as swamp taro, to address the issue of saltwater intrusion in low-lying atolls. The distribution of PGR will benefit further by also involving women's groups at the community level. The limited land area in atoll countries is made more challenging by low soil fertility. This acts as another barrier to improved food security and trade. However, it is also an opportunity to increase food production from the outer islands to feed the main centres.

The wider range of improved taro varieties, in response to threats from pests and diseases, is a positive outcome for island communities. There has been a slow uptake of some varieties in selected markets, due mainly to the taste preferences of target consumers. This needs to be factored into the plans for production, marketing and export. In some island communities, the rapid growth of crop production is placing more stress on soil health, especially with the commercialisation of selected crops. There is a need for appropriate policies and practices for sustainable agriculture to maintain soil fertility for future sustainability.

Agricultural shows and other events are very useful in promoting plant genetic resources and the improved crop varieties. Farmers should be encouraged to do their own conservation of native PGR, as well as support the PGR networks at the national and community level.

5. SPC CePaCT UPDATE

SPC updated the meeting on activities relating to the Centre for Pacific Crops and Trees (CePaCT). Crops available from CePaCT include nutrient rich varieties that are resistant to climate change and diseases - there are now more than 2,000 crop varieties in CePaCT collections. The centre works closely with members to align the SPC work programme with national priorities. There are continuing challenges with resources in terms of staff, funding, time, increased costs of importation and distribution fees, and the lack of evaluation information on crop diversity received from the countries. Regional cooperation is essential to ensure that resources invested in the establishment of regional PGR facilities are optimised for conserving and utilising PGR, and are not lost forever. CePaCT receives long-term grants from the Global Crop Diversity Trust for the conservation and utilisation of the edible aroid and yam collections, under the auspices of the International Treaty on Plant Genetic Resources for Food and Agriculture. SPC noted the proposed building of a new Pacific Village in 2017 to house SPC operations in Suva, Fiji.

Some of the research is using bioreactor systems for selected crops. For example, breadfruit grown using bioreactors have been field ready for planting at 30 weeks, instead of the standard 44 weeks. The breadfruit from this research has better quality and higher survival rates, for less labour and lower costs.

The meeting appreciated the value of CePaCT in conserving traditional collections as well as supporting the countries' PGRFA activities with new improved diversity, and noted the good relationship between SPC and donors, which is reflected in continuing donor support for programmes and services. Where appropriate, SPC was asked to assist members to explore ways of securing donor funds for the implementation of national projects. SPC can assist members in certain areas. For example, SPC is able to assist with the preparation of project proposals, such as ensuring the proposals meet the technical guidelines required by a donor.

6. ORGANICS AGRICULTURE AND BIODIVERSITY

The Pacific Organic and Ethical Trade Community (POETCom) outlined its role as a non-profit organisation operating in 14 Pacific Island countries. The POETCom Secretariat is hosted by SPC – LRD in Suva, Fiji. POETCom aims to grow the organic and ethical trade movement in the region. Most Pacific Island farmers practice traditional agriculture of 'organics by default'. There are currently more than 50 organic licensees and over 12,000 certified organic small holders in the region. Organic agriculture sustains biodiversity by promoting green manuring, minimum tillage, soil protection, mechanical weeding, intercropping and crop rotation. There is a focus on mixed farming, the use of natural substances instead of chemicals, and the promotion of '*in situ*' conservation. POETCom member are keen to work with genetic resources researchers via participating in on farm research, sharing of knowledge, identifying and developing resistant crop varieties, developing open pollinated seeds, and in lobbying for regulations on genetically modified organisms.



Photo POETCom/SPC (L): Organic papaya farm near Sabeto, Fiji. Photo (R): Karen Mapusua sharing POETCom's vision with participants through her presentation.

7. OVERVIEW and IMPACTS of the BOGIA PHYTOPLASMA DISEASE of COCONUT

The Bogia phytoplasma disease has been present for many years, though it is believed to be mainly restricted to areas around Bogia, near Madang in Papua New Guinea. Among the symptoms is leaf yellowing, which can seriously damage or kill the plant. The disease has spread from Bogia and is now within 15 kilometres of the Stewart Research Station of Papua New Guinea's Cocoa and Coconut Research Institute, host for the International Coconut Genebank for the Pacific. Urgent measures are needed to preserve the integrity of the coconut varieties, and other plant genetic resources, at the institute.



Photo (L): Phytoplasma impact on coconuts (Photo by University of Florida). Photo (R): Impact of phytoplasma on bananas in PNG (Photo by Tony Gunua).

8. EMERGENCY RESPONSE for the SAFETY DUPLICATION of the PACIFIC COCONUT COLLECTION

Due to uncertainties with the Bogia disease and its spread, there is an urgent need to put emergency plans in place for the safety duplication of the Pacific coconut genebank collection in a new location. The Global Crop Diversity Trust is leading this activity in collaboration with SPC, Bioversity International for the International Coconut Genetic Resources Network (COGENT), PNG Cocoa and Coconut Institute Limited, Food and Agriculture Organisation of the United Nations (FAO) and ACIAR. The Pacific coconut genebank is held under the terms of Article 15 of the International Treaty on Plant Genetic Resources for Food and Agriculture. The meeting discussed how fresh samples of coconut varieties should be collected and re-established in other Pacific Islands. In 2012, an SPC/ACIAR meeting endorsed a proposal for Fiji

and Samoa to host the safety duplication of coconuts, for the Pacific genebank collection. The collection should be re-established from new planting material acquired from the national collections and for PNG material collected from non-infected areas to be subjected to biosecurity approval. With regard to the current International Coconut Genebank collection near Madang, unsprouted nuts should be vigorously tested before they are rescued, to ensure they are free of the phytoplasma.

Any germplasm that is free of the phytoplasma leading to Bogia disease should be established on an island off the mainland of PNG, away from the existing Pacific field genebanks in Madang. There is a need for PNG and the Coconut Resources Network (COGENT) to share all information on the International Coconut Genebank collection to the region. Other measures should also be considered for conservation and the safety duplication of coconuts. These include research into cryopreservation methods, the slow growth embryo culture procedure, bonsai plants in tissue culture and screen houses, on-farm conservation that is integral to regional collections, and the establishment of pollen collections for conservation and distribution.



Photo (L): Dr Paula Bramel from the Global Crop Diversity Trust seeking the views of PAPGREN members on the safety duplication of the Pacific coconut field genebank collection in Madang, PNG. Photo (R): Group discussions on the emergency plans for the field genebank.

9. FAO INTERNATIONAL TREATY on PLANT GENETIC RESOURCES for FOOD and AGRICULTURE

The meeting was updated on the progress of non-contracting parties who are considering the ratification of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The non-contracting parties acknowledge the benefits of ratification, and are continuing to facilitate the appropriate measures required through their national processes. The Treaty is a tool for food security given that no country is self-sufficient in plant genetic resources. In 2012, Pacific Ministers of Agriculture endorsed a recommendation for countries that have not ratified the FAO Treaty, to do so. This will make it easier for the Pacific Islands region to access a global gene pool of more than 1.6 million plants that are important for sustainable global food security. This is a moral obligation on all countries to safeguard them against biological, natural and made-made disasters.

The Treaty covers a number of important crops under Annex 1. However, the Pacific Islands together with other regions in the world have discussed ways of enhancing the functioning of the multi-lateral system (MLS) and the benefit sharing fund of the Treaty so that more funds flow into the Fund to benefit developing countries. One measure is the possibility of expanding

the crop coverage to include all plant genetic resources for food and agriculture (PGRFA). The idea is for the seed industry sector and other users of the PGRFA to utilise this material, which means more income. Australia and SPC are representatives from the South West Pacific on the working group assigned for this task and which will report their findings to the 6th Governing Body meeting in 2015. Other non-Annex 1 crops held by CePaCT were discussed for sharing, including *bele* and pandanus. However, countries generally agreed to share these crops within the region for now without putting them in the Treaty's MLS. Currently CePaCT only conserves *bele* and pandanus collections without sharing, and there was no point for CePaCT just to conserve collections without the countries utilising them – the crops are there to share and use in order to save them. Some views were expressed that crops whose genetic profiles are not in the public domain can be shared on a bilateral basis, by mutual agreement.

A range of activities is also available under the Treaty for contracting parties, including regional projects. Two pre-proposals have been accepted for funding consideration in 2015 under the 3rd call by the FAO Treaty Secretariat. One involves Pacific bananas and the other looks at technology transfer involving aroids. The main beneficiaries for these projects – and future ones - will be the contracting parties.

Two videos were shown on some of the activities supported by the FAO Treaty. The first showed farmers in Uruguay producing their own seeds for planting. The National Institute of Agricultural Research in Uruguay also provided potato seed varieties matched to the needs of local farmers. Collaboration amongst the different conservation strategies (*in situ* and *ex situ*) also benefits communities and researchers. The second video looked at the operations of the Potato Park in Peru, which hosts hundreds of potato varieties. The sharing of potato varieties by farmers in Peru with Ethiopian farmers ensures food security for these communities. One project combines the conservation of native varieties with traditional knowledge to improve production and ensure food security. These lessons are shared with farmers from other countries as a bridge between different systems of traditional knowledge. Funding from the FAO Treaty helps to support this work.



Photo (L): Restoring Samoa's food security through use of taro lines acquired from the Treaty's multilateral system. Photo (R): Nutrient-rich sweet potato from the International Potato Centre (CIP) based in Peru available in the Treaty's multilateral system acquired by SPC to support food security.

10. CLIMATE CHANGE CROP MODELLING, VULNERABILITY ASSESSMENT and SCREENING METHODS

The potential impacts of climate change are likely to greatly affect Pacific Island communities, many of who rely on agriculture for food security and their livelihoods. Crop modelling is among the methods being used to understand climate change, and what these changes might mean for the region. This knowledge will help to provide better mechanisms for responding and adapting to climate change. Field trials and crop modelling with crops such as taro and cassava have identified a number of promising initiatives, with more research planned or underway. The modelling indicates what the changes in weather and climate could mean for certain crops.

Although some scenarios remain uncertain, Pacific staple food production is expected to be susceptible to climate change, based on current trends. Food production is expected to become more challenging. Possible adaptations include the use of different crop varieties, a change in farming methods including growing times, and other measures. The transfer of technology can be via trial and error; analogy (what works in one place might work in another with similar conditions), and simulation (testing how a technology performs before transferring it). The Vulnerability of Pacific Agriculture to Climate Change is the focus of a publication due out in 2015 under the AusAID International Climate Change Adaptation Initiative. Global data is currently lacking in information and studies on the Pacific.

There is a need to identify resilient crops, and resilient cropping systems, against extreme climate change events and to plant accordingly. Access to improved data on weather, climate and soils is important and will provide better options for policymakers, farmers and other stakeholders. Climate modelling needs to be made simpler for the benefit of policymakers and farmers. For example, some tests can be colour coded. This method is much easier for rural farmers to understand and apply than expecting them to use the more technical measures, such as parts per million (ppm). When designing possible solutions, the capacity of the community to implement them must be taken into account. Screening methods were also outlined, using the example of screening for drought tolerance in four edible aroids (giant taro, taro, swamp taro and *Xanthosoma*), *in vitro* as part of SPC CePaCT research. These crops are important staples in most PICTs. The research is seeking to identify crop resilience to different climate change conditions for sustainable food and nutritional security, as well as to provide guidelines for future application. The results could form the basis for further work in this area, and a draft report is expected in early 2015.

Highlights were presented for an SPC/USAID project on Climate Change and Food Security Assessments in the Pacific. Food security in the region is under threat and needs to be addressed in an integrated manner. Participatory approaches empower communities to understand their own issues and identify solutions. Better coordination between regional agencies and governments help to strengthen the ownership and sustainability of activities at the national and community levels. Policies and legislation should also be aligned. The meeting broke into three groups for simulation training on how to conduct a Climate Change Vulnerability Assessment using a number of vulnerability assessment tools. The formula used was $V = E \times S / A$ (Vulnerability = Exposure x Sensitivity / Adaptive Capacity). The groups simulated

the responses from sample communities in the Cook Islands, Solomon Islands and Tuvalu. They noted perceived changes that will have an effect on Pacific agriculture and food production, some of them in ways that threaten the food security of Pacific Island communities.



Photo: Vulnerability Adaptation Assessment Training by the SPC Food and Nutrition Security Team.

11. AGRICULTURAL VALUE CHAIN GUIDE for the PACIFIC ISLANDS

A presentation on the Agricultural Value Chain Guide published in 2014 outlined some of the features of this resource tool. An agricultural value chain is a way of describing the different ‘links’ required to take a product from the farm to the end consumer. The Guide outlines the steps required to understand and support each of the actors along the way, such as seed suppliers, growers, harvesters, transporters, marketers, retailers and consumers, etc.

The Guide notes 12 key lessons from Pacific Island value chain studies, including:

- The most successful value chains are built around niche markets and/or seasonality.
- Gradual stepwise development is a feature of successful niche market value chains.
- Bulk commodities are now shifting slowly toward niche market exports.
- Premium quality products are imperative for the commercial viability of niche market exports from small remote locations.
- In successful value chains, agribusinesses ‘pull’ the products through the chain.
- There is a need to respond to the ‘tyranny of isolation’ and diseconomies of scale, if farmers from outer-island and interior locations are to benefit from value chains.
- Technology plays an important role in providing market access and improving efficiency.
- There is a need to provide smallholder farmers with the necessary information and technical skills.
- Market access constraints for export market value chain development are very difficult to resolve.
- There is a role for public-private partnerships in value chain development.
- Longer-term financial viability can depend on more sustainable production practices being adopted.
- Continuing donor and technical assistance is likely to be needed for many chains to reach sustainable profitability.



Photo (L): Dr Andrew McGregor discusses the value chain guide. Photo: Andrew McGregor (R): Sharing with Vanuatu pepper farmers the raw material quality requirements of the niche market processor and exporter.

12. BREEDING PRINCIPLES & PRACTICALS

These presentations looked at how plants are being changed to suit our needs. Subsistence farming and organic agriculture dominate food production in the Pacific. One aim of plant breeding is to diversify and break down the cycle of mono-cropping (normal clonal propagation): another is to broaden the genetic base. The skills required for plant breeding include a need to plan ahead, good seed storage, awareness of the constraints with money and labour, and having backups of the planting stock in different places.

Climate change and biological disasters are never ending threats, hence the need to access and produce resilient crop diversity to enable traditional farming to adapt and survive in a changing environment. To produce resilient crops more plant breeders are needed to sustain the knowledge and pass it on to future generations. A strategic approach and tools to sustain food security will help to build local capacity in plant breeding. Involving farmers in the plant breeding is the new approach, whereby the most widely adopted varieties are due to farmer participation in the selection and evaluation process. The regional training is part of the SPC FAO Treaty Benefit Sharing Fund project, and is supported by EU PAPP and IACT. Participants at the PPBN meeting included focal points from the Ministries of Agriculture, non-governmental organisations, farmer groups and university representatives.

The first meeting of the PPBN was held in Vanuatu in May 2014, attended by contracting parties to the Treaty in collaboration with the Vanuatu Agricultural Research Training Centre. The PPBN aims to strengthen the network and collaborate amongst Pacific breeders using the major staple crops such as taro, Xanthosoma, yam, cassava and sweet potato.



Photos (L to R): Various stages of yam breeding showing flowering, pollination, seeding and potting of new yam hybrids in the nursery. (Photos by Dr K. Abraham, yam breeder consultant from India working on a world bank project in Vanuatu).

Two prominent plant breeders in the region, Dr Roger Malapa of Vanuatu and Moafanua Tolo Iosefa from Samoa conducted the regional training and are leaders in the network. Breeding programs have been carried out in the past. However, many plant breeders have retired and are not being replaced fast enough by a new generation, leaving a vacuum. One important aspect of the training is to train more women plant breeders. Most of the work is carried out by men, but in some countries such as Palau, women are the farmers.

The Pacific has its successful breeding program, such as the SPC-led multi-donor funded taro breeding program based in Samoa and PNG, together with other partners. This has resulted in taro leaf blight (TLB) resistant varieties, some of which are now being exported. These new varieties have been rated highly over the traditional varieties by PICTs and members of the SPC-EU International Network for Edible Aroids.

The sweet potato breeding program by the Vanuatu Agricultural Research and Training Centre produced some very good hybrids that are suitable for atoll conditions and are undergoing virus indexing at SPC CePaCT for sharing. In some countries, plant breeding guidelines have been developed for use by local farmers. For example, SPC Samoa has developed a manual for dealing with the taro leaf blight – which devastated the industry in 1993 - and shows how this staple crop recovered through 20 years of taro breeding. It also highlights the risks of taro leaf blight to other countries, and suggests ways for farmers to avoid the disease.



Photos (L to R): Various stages of sweet potato breeding from flowering, pollination, seedling and field evaluation (Photos by Dr R. Malapa, Director /Plant Breeder, VARTC)

13. FIELD TRIP and TRAINING

The participants visited the SPC Plant Genetic Resources genebank at the Centre of Pacific Crops and Trees (CePaCT) and were briefed on activities at the centre. The Fiji Ministry of Agriculture organised a visit to a successful elderly farmer, Mr Akuila in the Batiki settlement of the Naitasiri Province, who showed that anyone could be self-sufficient. More than 15,000

local chickens are raised on the farm along with a variety of crops. Training was also held at Fiji's Koronivia Research Station. This involved practical sessions on crop breeding using approaches for Participatory Plant Breeding and Participatory Varietal Selection. The root crops used for the training included cassava, sweet potato, taro and yams.



Training was provided by Savenaca Cuquma of the Fiji Ministry of Agriculture on the mass propagation of material for planting through the use of tuber mini-set and vine-cutting methods. These methods were part of the technology transfer learnt from the FAO Treaty Benefit Sharing project meeting held in Vanuatu. Participants have learnt new low technology methods, such as slicing tubers into many pieces with a bud present, dusting with ash, and placing them vertically prior to sprouting. Mature yam vines are trimmed into internode sections, and planted individually in paper cups containing a porous soil mixture with good drainage. In this way, farmers can get more planting material.



Manuel Alacgan, Senior Engineer shared his knowledge with participants on a “raised/ elevated cultivation model”, an approach for using waste material, buckets and containers, bamboo, etc. for vegetable farming. Simple irrigation systems can be used. This model has proved useful for atoll countries due to the limited land space available and increased urbanisation. Some participants were learning these simple farming models for use in their own countries. Participants also viewed Fiji's breeding program carried out in the screen house using Samoan breeding line material from SPC CePaCT and local varieties.



14. CONCLUSION

The meeting adopted the Recommendations arising from their discussions. In closing, the Acting Deputy Director of SPC-LRD, Food and Nutrition Security Program, Dr Siosua Halavatau thanked the participants for their valuable contributions. He also acknowledged the donors who provided funding for the meeting such as the EU Pacific Agriculture Policy Project (PAPP), the EU Increasing Agricultural Commodity Trade (IACT) project and the FAO Access Benefit Sharing Treaty project. Sincere appreciation was extended to the Fiji Biosecurity Authority of Fiji for their continued support of CePaCT as well as to the Ministry of Agriculture for coordinating the visits and for the use of their training premises. The meeting paid tribute to PAPGREN members who have passed away. The contributions of current members who might not attend future PAPGREN meetings were greatly acknowledged. The participants thanked the SPC Land Resources Division, and staff, for their generous hospitality and excellent meeting arrangements.

ANNEX 1 PARTICIPANTS

Pacific Agricultural Plant Genetic Resources Network (PAPGREN) & Pacific Breeders Network Meetings, Suva, Fiji

1st – 5th December, 2014

Theme: “PGRFA: *use it or lose it*”

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The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



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ANNEX 2 AGENDA

Monday, 1st December 2014 Chair – Fiji (Savenaca Cuquma)	
	<p>Welcome – SPC (Valerie S. Tuia) Opening Prayer – Dr Aurora Del Rosario, Palau Opening Address – Mr Inoke Ratukalou, Director – Land Resources Division Objectives and Overview of the meeting – Valerie S. Tuia, Genetic Resources Coordinator Participants Introduction</p>
	<p>Country Reports Presentation 10-15mins per participant on:</p> <ul style="list-style-type: none"> c) PGR activities in all PICTs <ul style="list-style-type: none"> i) Conservation (#collections-field, screen-house/nurseries, tissue culture, % losses), ii) Utilization (use and distribution of germplasm), iii) Safety Duplication (within and outside of countries) iv) Evaluation/Recommended varieties of SPC–CePaCT crops received in the last 5 years d) Updates on PGR donor-funded projects (only recipient countries) <ul style="list-style-type: none"> • AusAID ICCAI • FAO TREATY • NZAID - Evaluation of SPC Crops • EU-INEA • Global Crop Diversity TRUST – Regeneration • TRUST/Bioversity International – Pacific Regional Banana Collection • ACIAR PARDI – Taro and Breadfruit • ACIAR/CSIRO – Understanding response Taro and Cassava (crop modelling) • Confirmation of country reps “official nominations” to be “Focal Points of Contacts” for updating the FAO World Biodiversity Country Status Reports.
	SPC CePaCT update on its research activities including climate-resilient collection (5-10 mins)
	Brief discussion/questions and answers on project activities
	Issues and Concerns from the meeting
	End Day 1
Tuesday, 2 nd December 2014 Chair - Cook Islands, William Wigmore	
	Recap day one (5 mins) – Palau, Dr Aurora Del Rosario
	<p>Overview of the Coconut phytoplasma – Bogia (Tony Gunua, SPC Plant Pathologist) Overview on the Emergency Response for the safety duplication of the Pacific Coconut Collection (Dr Paula Bramel, Deputy Director, Global Crop Diversity Trust)</p>
	Group discussions & Recommendations
	<p>Presentation (10 – 15 mins) by the non-contracting parties to update on the TREATY Ratification (e.g. Cabinet Submission) by PNG, Vanuatu, Solomon Islands, Nauru, Niue, Tuvalu, An update was provided by SPC FSM office on progress by FSM on their ratification Watching of the FAO Treaty videos: (1) Sharing a Treasure from Peru to Ethiopia and (2) I produce that seed myself.</p>
	Group Discussions & Recommendations

	End Day 2
Wednesday, 3rd December 2014 Chairs - French Polynesia (Mr Julien Drouin) and Solomon Islands (Clement Hadosaia)	
	Recap day 2 (5 mins)- French Polynesia
	Climate change crop Modelling presentations – USP and Fiji (Poasa) (10-15 mins each)
	Training on conducting Vulnerability Assessment to Climate Change - Dr Siosua Halavatau, Dean Solofa, Gibson Susumu, SPC
	Group Discussions/Recommendations Agricultural Value Chain Guide for the Pacific Islands – Dr Andrew McGregor, Kokosiga
	Presentations on Breeding Principles & Practicals – Dr Roger Malapa, VARTC & Mr Tolo Iosefa, SPC)
	Group Discussions/Recommendations
	Field Trip to Mr Akuilas farm, Batiki Settlement, Natasiri Province and CePaCT, Narere
	End Day 3
Thursday, 4th December 2014 Chair – PNG (Dr Toshiro Shigaki)	
	Recap day 3 (5 mins) – Marshall Islands (Henry Capelle)
	Practical sessions on Crop breeding (yam, sweet potato, cassava, taro,) using Participatory Plant Breeding and Participatory Varietal Selection approaches (Dr Roger Malapa & Mr Moafanua Tolo Iosefa) Training on tuber mini-set and vine-cutting propagation methods (Savenaca Cuquma) Raised/Elevated cultivation models for vegetable farming using recycle material (Mr Manuel Alacgan, Fiji MOA)
	End Day 4
	Training to be held at Fijis Koronivia Research Station
Friday, 5th December 2014 Chair – Tuvalu (Itaia Lausaveve) and co-chair Vanuatu (Dr Roger Malapa)	
	Recap Day 4 (5 mins) – Samoa
	Discussion on the FAO Treaty pre-proposals (Valerie S. Tuia) Discussion: Sharing of non-annex 1 crops and enhancing the function of the Multi-lateral System of the FAO Treaty including expansion of the crop coverage (William Wigmore and Valerie S. Tuia) Role of the FAO Commission on Genetic Resources for Food and Agriculture & updating of the report for the World Biodiversity (William Wigmore)
	Final Discussions on important issues raised
	Final Recommendations
	Wrap up & Closing by Acting Deputy Director, LRD FNSP, Dr Siosua Halavatau
	End of Meeting