



Improving resilience of food systems



Photo: PNG PACC project.

KEY MESSAGES

- Food security on small islands already faces many challenges. The added risk of climate change could precipitate a crisis for food security across the Pacific islands region, if not addressed.
- Sustainable farming systems – systems that maintain soil health, use water efficiently, respect and promote biodiversity, and produce good yields under current climate variability – are a vital base for building climate-resilient food production systems.
- Improving the resilience of food production systems is one of the three focus areas of the

Pacific Adaptation to Climate Change (PACC) programme. Four of the 14 participating countries – Fiji, Palau, Papua New Guinea and Solomon Islands – have been demonstrating 'no regrets' adaptation measures that include sustainable farming methods, climate-resilient crops, and training in food processing and preservation.

- The mainstreaming of climate risk into food and agriculture sector policy, planning and action is also essential for a resilient food-secure future for the Pacific region.

Food security under threat

The world over, agriculture faces an unprecedented threat from climate change. But agriculture on small islands faces additional and unique challenges.

The fertile coastal plains, where farming is often concentrated, are also in the front line for sea level rise and coastal erosion. As the sea encroaches, soils are becoming salty and waterlogged. On very small islands, and especially low-lying atolls,

moving farms further inland is not an option. On larger islands, moving inland and uphill often means destroying forests, with environmental consequences that add to the problem.

Changing rainfall patterns, and extreme events such as droughts and floods, also pose a critical threat to agriculture on the Pacific islands, where freshwater availability for farming is already precarious.

Ocean ecosystems, vital to island food security, are also in jeopardy. Ocean acidification, overfishing, excessive sedimentation due to soil erosion (usually following deforestation of watersheds), and changes in marine ecosystems mean this long-depended-upon food source is no longer reliable.

Food security is multifaceted, and affected by many and diverse factors, of which climate is just one. Other major factors adding risk to food security in the Pacific include:

- Population growth, and pressure on limited land to produce food for more people;
- A move away from traditional subsistence farming, and increased focus on commercial, and often less sustainable, food production;
- Deteriorating soils, and an associated increase in pests and diseases;
- Changes in socio-economic factors and dietary preferences – notably an increase in dependence on imported foods;
- Dependence on shipping for food supply to many of the remote islands;
- Land tenure issues, and ineffective land use planning and management.

These factors are highly interlinked. With the added risk presented by climate variability and change, food security is far from assured across the Pacific islands region in the coming years.

Adaptation in action – improving the resilience of food production systems

Food security is one of the three focus areas for the PACC programme. Four of the 14 participating countries – Fiji, Palau, Papua New Guinea and Solomon Islands – selected food security as their priority under the programme. They have developed projects that demonstrate a variety of ways to improve the resilience of food production systems within their countries.

The projects address some of the direct impacts of climate change on agriculture, such as saline and waterlogged soils, drought, and reduced fisheries. They are trialling and promoting practical solutions that are relevant and appropriate for Pacific

communities. All project interventions are ‘no regrets’ activities, improving resilience to current climate variability while at the same time building adaptive capacity for future climate change.

Climate-resilient crops and varieties

Crops have different characteristics relating to climate. For example some, like cassava, are more tolerant of drought, while others, for example some species of taro, are more tolerant of waterlogged soils, or saline soils. Within crop species, different varieties also show variations in these characteristics – some have higher degrees of tolerance than others. Exploiting these natural traits through crop breeding programmes is an important way forward to build resilience into agricultural systems.

PACC is working to demonstrate and trial some of these crops and varieties. For example, the PACC projects in Palau and Fiji are trialling salt-tolerant varieties of taro, cassava and sweet potato. This work is being done in collaboration with the Secretariat of the Pacific Community (SPC)’s Centre for Pacific Crops and Trees (CePaCT), the regional centre for conservation and use of genetic resources. The results of the PACC projects are supporting development of CePaCT’s climate-ready collection as well as providing immediate benefits to coastal farming communities.



Climate change is adding to problems such as waterlogged soils. Photo: Palau PACC project.

Improved farming practices

Sustainable farming systems – systems that maintain soil health, use water efficiently, respect and promote biodiversity, and produce good yields under current climate variability – are a vital base for building climate-resilient farming systems. Introducing or restoring good practices that recover the sustainability of island farming is clearly a ‘no-regrets’ approach to adaptation.

The PACC projects are working to promote sustainable farming under various systems in the different pilot sites. In Ontong Java Atoll in Solomon Islands, for example, where the major challenges to agriculture include poor atoll soils, frequent drought and saltwater intrusion, the project is promoting more diverse crop systems and agroforestry; ‘organic’ farming practices such as composting, mulching, and use of manure instead of chemical fertilisers; and raised beds for water retention and to protect against seawater intrusion. In the uplands of Palau, where soils were judged to be too poor for productive farming, new agroforestry systems are being trialled that combine fruit trees and food crops with techniques to maintain and improve the soils.

Food preservation and food processing

There are also opportunities to improve resilience to climate change after crops have been harvested from the field. For example, food preservation and

processing extends the availability of food during crises when fresh food may be limited. It also adds value to local food crops, making value chains more viable and profitable, and contributing to economic resilience. An important additional benefit is to increase consumption of local food crops and their products, which is seen as a key step towards improving health in island communities.

In Palau, the PACC project is contributing to a ‘Go local’ campaign to promote healthy eating, has carried out training in local food processing and cooking, and has developed a recipe book for local foods. Both the Fiji and PNG PACC projects have also carried out training courses in food processing, mainly for women.

Mainstreaming climate change into food production

All four country project teams are also working to integrate climate change and associated risks into food production and food security. This is being addressed at multiple levels, from raising awareness of climate change and introducing practical ‘no regrets’ farming practices to communities, to supporting government agencies to mainstream climate change into food sector policy and planning.

More information on the PACC food security projects is given in the following boxes.



Learning about food processing.
Photo: Fiji PACC project.

PACC CASE STUDY

Improving crop resilience and drainage systems of lowland farming areas in Fiji

In Fiji, one of the most populous Pacific island countries with nearly 900,000 people, sea level rise combined with flooding from heavy rain is affecting low-lying farms and coastal communities, and current drainage networks cannot cope. This is having a direct impact on food and cash crops, threatening food security and damaging the economy.

The PACC project has been working to improve agriculture at two pilot sites in low-lying coastal areas of Viti Levu. Activities have focused on upgrading the drainage systems, and trialling and demonstrating tolerant crop varieties.

Three kilometres of the drainage network have been improved (dredged). This allowed reclamation of farming land for the crop trials, which involved varieties of taro, cassava and sweet potato. These were tested for characteristics such as saltwater and waterlogging tolerance. Nine varieties have been selected and are now being grown on 10 hectares by 65 farmers. Farmers have also received training in good production practices.

The project has also developed a 'rainfall calculator', to help with design of new drainage systems that take into account future rainfall.

The project team has worked closely with communities in the pilot sites, building awareness and understanding of climate change issues and adaptation needs. For example, in March and April 2013, the PACC team and government partners carried out awareness raising activities in ten schools and eight communities, reaching more than 3,300 students, 150 teachers and 168 community members. Community development plans have been developed in seven of the communities which incorporate climate change adaptation and disaster risk reduction activities.

The team also worked directly with community leaders, engaging them on the research work and giving them training on climate change and the need for adaptation. A total of 18 community facilitators have received training and are now acting as focal points for climate change activities in their villages. This approach is enhancing community ownership as well as building sustainability for the project.

For more information on the Fiji PACC project, please visit the project webpage: <https://www.sprep.org/pacc/fiji>



Collecting data in taro trials.
Photo: Fiji PACC project.

PACC CASE STUDY

A land-to-sea approach to climate change adaptation in Palau

In Palau, sea level rise and saltwater intrusion are making the soils more saline in coastal areas, making it harder to grow crops. Changes in nearshore marine ecosystems are also affecting availability of fish and seafood.

To address these problems, the PACC project has four areas of activity: lowland taro production, upland agroforestry, aquaculture and food processing.

To improve lowland taro production, the project is working with the Secretariat of the Pacific Community (SPC) and farmers in Ngatpang state to identify and test varieties of taro which can grow in higher salt environments. The project team is also building on traditional knowledge to construct dikes that reduce saltwater intrusion into the taro farms.

The project is also carrying out upland agroforestry trials, growing diverse crops and tree crops. Upland farming has not traditionally been practised in Palau because of poor soils, so new techniques need to be introduced such as ridge farming to conserve water, use of fertilisers and compost, and intercropping. Crops being trialled in the new system include bananas, lemongrass, soursop, pineapples, papaya, tapioca and taro.

The project also has a successful aquaculture programme, rearing mangrove crabs and clams for distribution to farmers. Mangrove crabs are a traditional part of the Palauan diet, and are also in high demand by hotels and restaurants. However, numbers harvested from the wild have been dropping, partly due to unsustainable harvesting. The project is addressing this by supplying small crabs to farmers and supporting them to rear the crabs to marketable size in submerged cages. In 2013 the hatchery also released nearly 400,000 crablets into the ocean at two conservation sites, in an attempt to boost mangrove crab populations.

As part of the drive to increase local food production, reduce reliance on imported foods, and address the non-communicable disease crisis, the project is also promoting growing and eating local foods. The food processing component has been carrying out training in local food processing and cooking, mostly with young people. Sixty new recipes have also been developed, substituting locally grown ingredients instead of imported ingredients.

The PACC team is also working to develop a National Strategy for Climate Resilient Agriculture and Aquaculture that will be incorporated into the forthcoming national climate change policy and Joint National Action Plan.

For more information on the Palau PACC project, please visit the project webpage: <https://www.sprep.org/pacc/palau>

Farmers are being supported to grow mangrove crabs, which they can eat or sell to raise income.
Photo: Palau PACC project.



PACC CASE STUDY

Drought-resistant crops and farming systems in PNG

The PACC project in PNG is focusing on the issue of drought, which has caused major food shortages in recent years in parts of the country. Work is focusing on the three village communities of Kivori in the Kairuku-Hiri District of Central Province. Activities include demonstrating drought-tolerant crops and farming systems, and improving seed supply of drought-tolerant varieties.

The project currently is working with 20 farmers to grow drought-tolerant taro, cassava and sweet potato. Trials have shown increased yields with the tolerant varieties, and demand for these varieties from other farmers is increasing.

The team has also developed a low-tech, low-cost irrigation system which the farmers can easily set up and manage.

The Kivori Cooperative Society has been established, to support the farmers and help them to work together to address challenges, and to expand and reach new markets.

Training has been carried out in food processing, with a focus on women.

The project has contributed to two major policy documents – a strategy document on addressing food security in drought-prone areas of PNG, and a climate-smart agriculture development policy framework for the country.

For more information on the PNG PACC project, please visit the project webpage: <https://www.sprep.org/pacc/png>



A demonstration plot at Kivori Kui. Photo: J. Ernest.

Atoll permaculture in Solomon Islands

In Solomon Islands the PACC project is focusing on enhancing food production in low-lying areas, with a first pilot in Ontong Java Atoll trialling permaculture farming systems.

In the early stages, the project team carried out a vulnerability and adaptation (V&A) assessment to clarify the issues and the adaptive capacity, and prioritise needs. The V&A highlighted poor soils, saltwater intrusion into soils, and drought as some of the key challenges for agriculture. Recommended adaptation options included introducing an 'atoll permaculture' system of mixed cropping and agroforestry; using salt-tolerant, disease-resistant, quick-maturing crops; the use of raised beds to protect against saltwater intrusion; developing a good seed supply system; using organic manure instead of chemical fertilisers; and pest and disease control and quarantine. The importance of improving soil health was emphasised.

The project went on to develop demonstrations of the recommended permaculture systems. The systems are designed to be low-maintenance and high-yielding, and incorporate good management practices to restore soil health while producing good yields of diverse food crops.

The project has also set up a hybrid solar dryer in Honiara to demonstrate preservation of food by this method, which can then be shipped to atoll communities in times of need. Training in processing and preservation has been carried out, with a focus on women's groups.

Activities have begun at a second pilot site at Sikaiana. A V&A assessment was carried out which clarified a need for training in backyard farming, with a focus on women. As a result, 30 women and six young men were trained in simple farming methods appropriate for small-scale farming in atoll conditions.

A major achievement in mainstreaming has been the drafting and then endorsement (in June 2012) of the national Climate Change Policy, which is now being implemented.

For more information on the Solomon Islands PACC project, please visit the project webpage: <https://www.sprep.org/pacc/solomonislands>



Atoll permaculture in Ontong Java.
Photo: Solomon Islands PACC project.

Conclusions

Food security for the Pacific islands depends on sustainable and climate-resilient farming systems that can supply island communities with the majority of their food needs. Post-harvest interventions to increase the shelf-life of foods and add value are also important.

The PACC projects have demonstrated some practical, 'no regrets' activities that are building blocks for such systems. These include sustainable farming practices to

maintain soil health, techniques for water conservation and irrigation, and crops with tolerance to climate-related conditions such as waterlogging and saline soils.

Sector policy and planning that integrates climate risks is also key to a truly resilient food-secure future. All four PACC country teams have made significant advances in mainstreaming climate at a strategic level in their countries.

The PACC programme

The PACC programme is the largest climate change adaptation initiative in the Pacific region, with activities in 14 countries and territories. PACC is building a coordinated and integrated approach to the climate change challenge through three main areas of activity: practical demonstrations of adaptation measures, driving the mainstreaming of climate risks into national development planning and activities, and building and sharing knowledge in order to build adaptive capacity. The goal of the programme is to reduce vulnerability and to increase adaptive capacity to the adverse effects of climate change in three key climate-sensitive development sectors: coastal zone management, food security and food production, and water resources management. PACC began in 2009 and is scheduled to end in December 2014.

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Building and sharing knowledge under the PACC programme

The PACC Experiences series covers topics where PACC is building experience and knowledge. Aimed at national and regional decision makers, climate change practitioners, and concerned communities and individuals, each one explains a key issue relevant to climate change adaptation in the Pacific, and draws on experiences within the PACC projects to describe the practical realities, lessons learned, and implications for both policy and practice. PACC Experiences includes webspace at www.sprep.org/pacc/experiences where additional experiences, case studies and lessons learned are available on the different topics.

The PACC Experiences series is complemented by the PACC Technical Report series. This series is a collection of the technical knowledge generated by the various PACC activities at both national and regional level, and is aimed at climate change adaptation practitioners in the Pacific region and beyond.

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