



## Technical assistance

The Centre for Pacific Crops and Trees (CePaCT) is working with international and national agricultural research institutes to establish a 'climate ready' collection of crop and tree species and varieties that tolerate more extreme drought, heat-stress and saline conditions. The collection is in its early stages, but material has been distributed to some countries for evaluation and use. The Centre of Excellence for Atoll Agriculture launched in Kiribati in 2008 with funding from the International Fund for Agricultural Development (IFAD) will assist atoll countries in meeting their specific agricultural research needs.

The regional project, Adaptation to Climate Change in the Pacific Island Region, funded by the German government and jointly implemented by GTZ (German Technical Cooperation) and SPC will assist the agriculture and forestry sectors in Fiji, Tonga and Vanuatu to manage the effects of climate change. Launched in 2009, the project will focus on:

- land-use planning processes and sectoral strategies in forestry and agriculture in Tonga and Vanuatu to ensure they take the expected impacts of climate change into account;
- developing national strategies for adaptation to climate change in Fiji, Tonga and Vanuatu;
- accessing carbon finance for avoided deforestation in Fiji;
- integrating climate change into all advisory services and technical assistance provided by SPC.

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Photo: Simone Tukidia SPC/ICE

## Further reading

FAO. 2008. Climate change and food security in Pacific Island countries. <http://www.fao.org/climatechange/media/17003/0/0/>

IFPRI. 2009. Agriculture and climate change. <http://www.ifpri.org/2020/focus/focus16/focus16br01.asp>

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Sem. 2008. Climate change in the Pacific Islands: Impacts and Scope for Action (prepared for GTZ). Available on request.

UNFCCC. 2007. Vulnerability and adaptation to climate change in small island developing states. [http://unfccc.int/files/adaptation/adverse\\_effects\\_and\\_response\\_measures\\_art\\_48/application/pdf/200702\\_sids\\_adaptation\\_bg.pdf](http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200702_sids_adaptation_bg.pdf)

World Bank. 2000. Cities, Seas and Storms: Managing Change in the Pacific Island Economies. <http://go.worldbank.org/IGWRDY16T0>

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# Agriculture, forestry and climate change

## Purpose

This brief focuses on four questions:

- How is climate change likely to affect Pacific agriculture and forestry?
- What assistance will farmers and resource owners need to adapt to climate change?
- How can agriculture and forestry help mitigate climate change?
- What policies are recommended to promote adaptation and mitigation?

## Key messages

- Climate change is projected to have dramatic consequences for agriculture and forestry in the Pacific. Changes in surface temperature, rainfall patterns, and the severity of tropical cyclones are expected to:
  - directly affect the crops, livestock and agricultural systems that underpin food security and livelihoods in the region; and
  - indirectly affect productivity by disrupting vital ecosystem services, such as maintenance of soil fertility, water regulation and biological diversity, and by altering the distribution of pests and diseases.

- Raising awareness of the likely impacts of climate change amongst all stakeholders is vital to ensuring that the appropriate political and economic frameworks are developed to support effective adaptation and mitigation.
- More detailed information about projected climate changes at regional, national and local levels is necessary to improve our understanding of the vulnerability of agriculture and forestry to climate change. Access to such information is essential to reduce the current uncertainty, and to ensure the effective planning and implementation of adaptation strategies.
- Scientific research is required to develop projections of the effects of climate change on Pacific agriculture and forestry – the models developed for agricultural commodities grown in other parts of the world, such as wheat, maize and rice, have little application here. Mechanisms must also be established to ensure that this research leads to activities on the ground that strengthen the resilience of rural communities to climate change.
- Pacific Island countries and territories (PICTs) can also contribute to global efforts to reduce greenhouse gases by promoting sustainable land and forestry management and protecting forests as important carbon sinks.



Damage to coconut plantation from Cyclone Heta in 2004

Photo: Ilan Kelman

## Significance of agriculture and forestry to the Pacific

Natural resources underpin economic growth in PICTs and the livelihoods and cultural identity of their people. Agriculture and forestry make particularly significant contributions to employment, income and foreign exchange earnings. In Melanesia, up to 80% of the population is involved in agriculture and forestry on a subsistence or commercial basis. Up to 35% of gross domestic product (GDP) in resource rich countries such as Papua New Guinea is derived from agriculture and forestry.

The economic costs associated with natural disasters in the region are already significant. Cyclone Ami (Fiji, 2003) and Cyclone Heta (Niue, 2004) caused damage of FJD 40 million and NZD 5.5 million respectively to subsistence and commercial agriculture and forestry.

In February 2008, Cyclone Gene cost Fiji more than FJD 45 million as a result of damage to agriculture (excluding the sugar industry), infrastructure, utilities and property. In addition, the government had to provide food rations worth FJD 1.7 million

<sup>1</sup> Asian Development Bank. Key Indicators 2008.

<sup>2</sup> McKenzie et al. 2005. The Economic Impacts of Natural Disasters in the Pacific. Technical Report. University of the South Pacific (USP) and the South Pacific Applied Geoscience Commission (SOPAC).

<sup>3</sup> ReliefWeb. 2008. Press release on tropical Cyclone Gene rehabilitation. Accessed from <http://www.reliefweb.int/rw/RWB.NSF/db9005ID/MUMA-7BT93K?OpenDocument> on 14 February 2008.

Table 1. Projected increases in surface air temperature (°C) and changes in rainfall by region (%), relative to the 1961–1990 period.

Air temperature	2010–2039	2040–2069	2040–2069
Northern Pacific	0.49 to 1.13	0.81 to 2.48	1.00 to 4.17
Southern Pacific	0.45 to 0.82	0.80 to 1.79	0.99 to 3.11

Rainfall	2010–2039	2040–2069	2040–2069
Northern Pacific	6.3 to +9.1	–19.2 to +21.3	2.7 to +25.8
Southern Pacific	3.9 to +3.4	–8.23 to +6.7	–14.0 to +14.6

Source: IPCC 4th Assessment Report – Table 16.1 and 16.2



Photo: Taito Nakalevu



Photo: Bernadette Masianini

## Effects of climate change

Changes in temperature, rainfall patterns (Table 1), sea level and the intensity of extreme weather events such as cyclones are projected to:

- affect the type of crops that can be grown and reduce agricultural yields due to greater heat stress, more frequent and intense drought conditions or waterlogging, increased flooding of river catchments and more soil erosion;
- favour the establishment and spread of new pests and disease vectors, further threatening the production of crops and livestock;
- result in loss of productive land due to increased coastal erosion and contamination of groundwater by saltwater intrusion;
- further erode biological diversity and disrupt ecosystem services vital to food security, such as pollination and soil enrichment;
- alter the function and species composition of forests, affecting their ability to provide important ecosystem services such as water cycle regulation, maintenance of soil fertility and conservation of biodiversity;
- increase saltwater intrusion in atolls, further limiting what can be grown in these environments and exacerbating existing threats to food security.

## Adaptations required

The performance of agriculture and forest systems under stress depends on both their inherent genetic capacity and the integrity of the ecosystem in which these systems are managed. Adaptation strategies must combine development of improved crop varieties and animal breeds with the integrated management of natural resources needed to sustain their productivity and ensure they continue to provide the vital services needed by people and the environment.

All stakeholders will have to work together to raise awareness of the impacts that could result from the magnitude of changes projected under current climate scenarios for the Pacific. Diversifying production systems and building on traditional practices will be crucial in enhancing community resilience. Some of the main adaptations required include:

- collection, evaluation and distribution of crop and tree varieties and livestock breeds that can tolerate climatic extremes (drought, heat-stress, salinity);
- development and promotion of farming systems more suited to changing environmental conditions, such as traditional agro-forestry systems;
- promotion of sustainable land and forestry management and land-use planning to minimise the projected impacts of climate change on agriculture and forestry, such as more regular inundation and soil erosion.

## Mitigation opportunities

Agriculture and forestry provide cost-effective options for reducing greenhouse gas emissions. Forestry resources in larger PICTs represent important carbon sinks. Financing mechanisms for afforestation/reforestation under the Clean Development Mechanism (CDM) and the proposed Reduced Emissions from Deforestation and Degradation (REDD) and voluntary markets could assist these countries to increase and maintain these vital carbon stores. However, there are challenges in accessing carbon financing. Generating sufficient carbon credits to overcome the significant transaction costs is difficult in small countries. Mechanisms also need to be established for resource owners to receive the intended benefits.

Sustainable land management practices, including reduced tillage, agro-forestry systems and organic production can also increase both above and below ground carbon reserves.

## Initial recommended policy actions

- Encourage diversification within agriculture and forestry by promoting the use of a wide range of crop, tree and livestock species and varieties within different production systems.
- Increase awareness among stakeholders at all levels of the likely effects of climate change on agriculture and forestry, and the adaptations needed to maintain the benefits of these sectors.
- Support climate-change driven research and development in the agriculture and forestry sectors and facilitate the sharing of information.
- Implement flexible land use and agriculture and forestry practices that can respond effectively to the uncertainties of climate change.
- Establish monitoring and evaluation systems to determine the success of adaptation strategies.

The diversification at the centre of these policies will not only help the agriculture and forestry sectors adapt to climate change, it should also make them more resilient to economic shocks.



Photo: Diane McFadzien