



Australian Government

Australian Centre for  
International Agricultural Research

# THE CHALLENGES OF CLIMATE CHANGE:

Testing climate smart agricultural solutions for improved food security.

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## THE CHALLENGES OF CLIMATE CHANGE

Climate change is likely to have far-reaching consequences for agriculture, natural resources and food security – demanding a response that integrates research, development and policy. Because of the disproportionate impact of climate change on the rural poor, priority investments should be directed towards poor agriculture, fish or forest dependent people whose livelihoods are most at risk.

The Australian Centre for International Agricultural Research (ACIAR) is the Australian Government's specialist agricultural research-for-development agency. Funded through the Australian aid program, ACIAR identifies opportunities and brokers partnerships between Australia and developing countries to undertake international agricultural research and capacity building.

ACIAR's research portfolio covers crops, livestock and fisheries, natural resources and forestry, and economics, policy and social sciences. Projects are designed so that new knowledge and innovative practices underpin development in partner countries', and Australian, agricultural systems.

ACIAR research partnerships have developed more resilient farming systems in many countries of the Indo Pacific region. Both mitigation and adaptation to climate variability and change are important components of this research for development.

This brief highlights the wide range of ACIAR activities addressing climate variability in the Indo-Pacific region through climate smart practices (CSA).

## OUR FOCUS

Farmers, small and large, in many countries, have always been vulnerable to extreme weather events and year-to-year climate variability. ACIAR places a high priority on smallholder adaptation to climate change (CCA) issues within projects, especially in the Pacific where fisheries, forests and crops are very much at risk.

ACIAR's focus is based on:

**PREVENTION** developing more climate resilient farming systems

**PREPAREDNESS** developing understanding and preparing management plans for the risks that can't be prevented

**RESPONSIVENESS** responding to forecasts and warnings relating to seasonal issues such to as drought and short term disasters such as fires, cyclones or excess rainfall

**REHABILITATION AND RECOVERY** redesigning to minimise future damage

ACIAR's climate mitigation and climate adaptation work assists smallholder farmers to adapt appropriate management practices and to reduce their losses.



## REGIONAL PROGRAMS



Adi Vani, checks her tomato crop. Photo: Conor Asheigh

### Pacific

In the Pacific ACIAR has commissioned studies to create more resilient and sustainable farming and market systems to address extreme weather events.

- In the Highlands of Papua New Guinea (PNG) a cluster of projects being developed for sweetpotato-based farming systems in the highlands of PNG will help farmers to develop market-oriented production systems that are more resilient in the face of various changes, including adverse weather associated with climate change
- Improving soil health on atolls of Kiribati and Tuvalu, particularly in the outer islands which are the most vulnerable to extreme weather-related isolation and extended dry periods, will benefit the growth of food crops
- Across the Pacific islands, taro and cassava are two key crops vital for the food security. An ACIAR project, Understanding the responses of taro and cassava to climate change, aims to understand the impact of climate change on of the Pacific islands — and on the production systems that are built around them
- In Tonga, an innovative partnership with the Korean-funded APEC Climate Centre (APCC) is allowing agricultural researchers to test the value of using actual climate data and forecasts to support decision-making by taro producers
- Three projects under the Pacific Agribusiness Research for Development Initiative (PARDI) II agribusiness portfolio have climate adaptation dimensions including components of research directed towards making tree crops more resilient in the face of cyclones and other severe weather events



- Another ACIAR project is researching the use of protective structures to shield commercial vegetable crops from excessive rainfall during tropical rainy seasons and reduce the disease problems that otherwise occur during adverse weather conditions
- The productivity and marketing options of smallholder cattle farmers in Vanuatu is being studied, in part to increase the resilience of smallholder farmers to better cope with increased climate variability and shocks
- A project planned for operation in Vanuatu, Solomon Islands, Fiji and PNG is looking to engage with tourism operators in reforestation initiatives to limit catastrophic flooding impacts associated with the severe, and more frequent cyclones, predicted under climate change
- Fish play critical roles in the economic development and food security of coastal people and are subject to the vagaries of climate change. Three contrasting case studies of the role of fish in development across the Indo-Pacific will examine whether it is better to place fish in national and regional food systems as, for example, a source of food in the aftermath of natural disasters, as a source of better nutrition, and income for coastal communities through pro-poor development of mariculture.



Fisherman sell their catch in the afternoon at Lautoka Port. The Lautoka fishing port caters for the local fishing and domestic seafaring market.  
Photo: Conor Ashleigh

## East Asia

Climate change is already having a negative impact throughout East Asia, with evidence of increasing temperatures as well as projections of an increase in monsoonal rainfall in some countries.

- In Laos the most significant threats related to climate change are considered to be flooding at the end of the growing season before the rice harvest, and mid-season drought spells after planting. A 5-year collaborative research project is examining adaptation to climate change through water management and cropping systems adaptation in lowland rice-based cropping systems of two districts in Savannakhet province
- The Adapting to Climate Change in Asia project (ACCA) operating in Cambodia, Lao PDR; India and Bangladesh has developed multiple scale adaptation strategies to: a) support policymakers in the delivery of effective and relevant climate adaptation programs and b) build household capacity to adapt to climate variability in rice-based cropping systems.
- The 'response farming' approach to addressing seasonal variability was the foundation of ACCA's adaptation work in Cambodia based on: crop duration and variety; crop sequencing (including double cropping); time of establishment; use of supplementary irrigation; potential for mechanisation or alternative seeding technologies, and pest and fertiliser application times and rates
- In Lao PDR, the key adaptation practice promoted by the ACCA project was the use of direct dry seeding of rainfed rice. In addition to reduced exposure to early season drought and terminal drought stress farmers were attracted mainly by the prospect of reduced costs and labour for production
- Forests have a key role in climate change mitigation through the implementation of Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanisms. For REDD+ to work there needs to be appropriate arrangements for quantifying changes to carbon stocks from the implementation of practices that reduce deforestation or promote tree growing. There also needs to be systems for efficiently making payments to those who change practices and for ensuring that forest carbon stocks can be monitored over time. Indonesia has committed to reducing greenhouse gas emissions through the implementation of REDD+ mechanisms. One ACIAR forestry project aims to support the development of REDD+ policy and institutional arrangements at the national, provincial and local levels
- In China and Vietnam the project assessing farmer responses to climate change - adjustment policy options aims to design policy to mitigate the cost of adjustment by farmers to climate change and thereby to increase their livelihoods.



Cambodian farmer. Photo: Sally Ingleton





A man holds legumes in Sonaikuri village, Bangladesh. Photo: Conor Ashleigh

## South and West Asia

The rural population of South Asia, notably, the eastern Gangetic Plain (in India, Bangladesh and Nepal), face the perfect storm of poverty, poor infrastructure, severe climatic risk (flooding and droughts) and weak public and private institutional platforms. Currently, agricultural production in this area is low, landholdings are small and farmers have little access to irrigation, credit, quality seeds, fertilizers and extension services. These factors make farmers particularly vulnerable to extreme weather events and general changes in climate.

Improved resilience of cropping systems, changed crop varieties, patterns or production practices, or mitigation of market or climate risks through mechanisms such as insurance or market access are being actively pursued in many ACIAR partnerships in South Asia, including Sustainable and Resilient Farming Systems Intensification (SRFSI).

- The SRFSI project is working with farmers, researchers and institutions to introduce agricultural technologies that increase the resilience of smallholder farmers in the region so they are better equipped to deal with a changing climate. SRFSI field trials have already demonstrated that zero tillage, a key principle of conservation agriculture (CA) can produce equal or greater crop yields when compared with traditional systems, with less input costs; reducing risk for smallholders. In addition, CA has the potential to increase carbon sequestration, minimize farm carbon emissions and improve resilience to climate shocks
- Climate variability and soil water balance work is underway to support more diverse and intensive cropping systems on the East India Plateau. A ClimAnalyser App is being developed to assist professionals to learn about climate variability, soil water balance, and apply this new understanding in their work with smallholder farmers to develop new cropping systems
- In Bangladesh, for example, ACIAR's approach includes research on conservation agriculture, farm mechanisation, saline land management and adaptation to climate change, particularly in rice-wheat and rice-maize systems
- In India, the following are being examined: drought risk; lack of climate information to guide decisions on type and management of crops; rapid rural change with significant social complexity, and perceived agricultural labour constraints. The rainfall visualiser, weather-based agro-advisories, farmer climate clubs and Climate Information Centres (CLICs) merged traditional and scientific knowledge of weather, supporting farmers to make decisions as a season unfolds, while recommendations such as a sowing rule and strategic irrigation between crops increased efficiency of inputs and reduced perceived risk

- Encroaching salinity and lack of irrigation are major constraints to agricultural intensification and adaptation in southwest Bangladesh. Systems modelling and social research on adaptive capacity and household typologies suggest opportunities to manage salinity at farmer and polder level
- In India and Bangladesh, migration is an effective strategy to cope with water scarcity for a majority of landless or (small land holding) farmers. In absence of supporting institutions marginal and small farmers are forced to migrate in a particular season (seasonal migration).

## Africa

In Africa, reduced crop production risk is as important as increased productivity and income and these are being actively pursued in many projects, including Sustainable Intensification of Maize-Legume cropping systems for food security in Eastern and Southern Africa (SIMLESA).

- In east and southern Africa, the vulnerability of food security to climate variability remains a major concern. While maize is the main staple consumed in the region, legumes provide an important source of dietary protein for the poor and are also a significant source of income, especially for women
- Declining soil fertility due to climate change is a significant issue in the region, leading to poor crop performance. Legumes have the ability to improve soil fertility through biological nitrogen fixation and have the capacity to strengthen resilience to climate variability
- Legumes are widely used as an intercrop in maize systems in east and southern Africa, however many factors hamper their production, including low adoption of new and more productive varieties, lack of market access for smallholders, environmental degradation and the effects of climate change
- Further to introducing climate-smart technologies, the project will evaluate the costs and benefits of the new technologies, as well as work with institutions and governments to develop an enabling environment for widespread adoption
- In eastern Africa an ACIAR forestry project, being implemented in Ethiopia, Rwanda, Uganda and Burundi, is conducting research to support widespread scaling up best fit agroforestry options, which will diversify the farming systems and improve resilience to climate change.



A farmer ploughing for maize production with the nitrogen fixing *Faidherbia* trees growing in a woodland setting in the maize field Adama in Ethiopia.  
Photo: Tony Bartlett



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## For further information

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