

# LESSONS FROM THE FIELD

EXPERIENCES FROM FAO CLIMATE CHANGE PROJECTS



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## Foreword

Climate change and food security are intimately linked. Current scenarios show that food production needs to increase by 70 percent by 2050 to meet the demands of an increasing population, yet the agriculture, forestry and fisheries sectors are all highly vulnerable to impacts of climate change. This includes short-term impacts of increased climate variability, and long-term impacts such as shifts in precipitation and temperature patterns, agro-ecological zones and species distribution. To protect livelihoods and food security of future generations, agricultural communities will have to adapt to climate change. This is a massive challenge, especially considering that the groups most vulnerable to climate change impacts are often also the poorest, even without climate related pressures. On top of this, the land-use sectors account for more than 30 percent of global greenhouse gas emissions. However, this could be reduced through a variety of land and forest management practices, not least in developing countries. Agriculture, forestry and other land uses hold a significant mitigation potential which needs to be tapped to minimize climate change.

The Food and Agriculture Organization of the United Nations (FAO) works with climate change adaptation and mitigation and food security as combined targets, supporting the incorporation of adaptation and mitigation strategies into development policies and projects. FAO also recognizes that if adaptation and mitigation actions are to be sustainable, they must be accepted at field level which requires targeting both short- and long-term needs of farmers, herders, fishers and forest-dependent peoples. For example, rehabilitation of degraded land through sustainable agriculture can enhance productivity and often multiply income generation opportunities, thus addressing immediate needs. At the same time, this rehabilitation also builds resilience in farming systems to climate change and contributes to mitigation by sequestering carbon in soil and vegetation. These are potential win-win-win situations, but in order to be successful, policies and technologies need to be evaluated locally every time they are implemented. There are no universal solutions.

Successful development and implementation of sound practices and policies for climate change adaptation and mitigation will require close cooperation and well-planned coordination within and among government institutions, international organizations, private sectors, civil society and local communities. It is also imperative that lessons learned are not lost once projects and programmes are completed. *Lessons from the field* is part of FAO's effort to close loops, promote collaboration and disseminate lessons learned across spatial and organizational boundaries.

A handwritten signature in black ink, appearing to be 'P. Holmgren', written in a cursive style.

**Peter Holmgren**  
Director  
Climate, Energy and Tenure Division  
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# Acknowledgements

*Lessons from the field* was edited by Claudia Hiepe, Lisen Runsten and Christina Seeberg-Elverfeldt with external editorial assistance from Nancy Hart. We are grateful for the contributions of the authors who have enriched this publication with the lessons learned from their projects. Special thanks are given to Marja-Liisa Tapio-Biström and Stephan Baas for reviewing the report and providing valuable input. Assistance was also provided by Marat Murzabekov and layout and design by María Guardia.

The success of the FAO Climate Change Days workshop depended on contributions from a large number of people in FAO headquarters and decentralized offices. The workshop was jointly organized by the FAO Natural Resources Management and Environment Department and the Office of Knowledge Exchange, Research and Extension.

We acknowledge the funding of SIDA for the FAO Climate Change Days in June 2010, which provided the motivational basis for this case study collection. In addition, funding from SIDA as well as the Government of Finland, through the MICCA project, enabled the production of the publication.

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# Background

*Lessons from the field* was inspired by the interactive workshop *FAO Climate Change Days: Share and Learn*, which was held 21–23 June 2010, at FAO headquarters, Rome. The purpose of the event was to discuss and share experiences of past and present FAO climate change initiatives in the field. This publication is an extension of that purpose. The workshop was designed to foster a community of practice on the topic within the organization, and enable good practices that have emerged from work within FAO and other organizations to become part of a knowledge base for improved working practices on climate change in different settings. The workshop brought together around 100 professionals from FAO's regional, subregional, country and headquarter offices to participate in the various sessions. A small number of climate change professionals from the World Food Programme (WFP), the International Fund for Agricultural Development (IFAD) and Bioversity International also participated.

Although climate change is a rather new topic for field programmes, the event revealed a wide variety of experiences gained from past and ongoing projects of different types. This inspired the compilation of this series of case studies in order to illustrate some of the challenges and success factors identified in projects and, in turn, avoid loss of tacit knowledge and inspire continuous knowledge sharing among colleagues. The workshop participants contributed with cases from their own work. This publication, the result of that effort, provides an overview of experiences from 12 projects and programmes across Africa, Asia, Latin America and the Caribbean that addressed climate change adaptation and mitigation, disaster risk management and food security in the agriculture, forestry or fisheries sectors. The experiences and views expressed are those of the authors, reflecting personal accounts of project implementation processes. The lessons learned are highly contextualized – which is the reality of field work – and should thus be read as insights into the complexities of working processes in the field rather than as official outcomes or recommendations of the projects.

Climate change has been mainstreamed into FAO's multidisciplinary activities in agriculture, forestry, fisheries, aquaculture, livestock, economics, rural development and food security. *Lessons from the field* illustrates the integrated approach that FAO takes towards climate change adaptation and mitigation, showcasing how climate change considerations have been integrated into project activities while addressing FAO's mandate to "raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy." The case studies highlight interactions between adaptation and mitigation and identify various strategies that exist to combine both targets – some providing multiple benefits, others requiring complex trade-offs.

Through programmes and projects, FAO provides assistance to national institutions for incorporating climate change considerations into development plans and strategies. Currently, FAO is assisting in the implementation of more than 100 climate change projects and programmes in all regions of the world. All technical units of FAO – including the Departments of Agriculture and Consumer Protection, Economic and Social Development, Fisheries and Aquaculture, Forestry, Natural Resources and Environment, Technical Cooperation and the FAO Legal Office – address climate change through their work. The Climate, Energy and Tenure (NRC) Division within the Natural Resources and Environment Department provides overall coordination on cross-sectoral climate change activities.

More information and outcomes from the *FAO Climate Change Days: Share and Learn* event can be found at <http://www.fao.org/climatechange/ccdays>.

# Executive summary

*Lessons from the field* provides an overview of experiences from 12 projects and programmes across Africa, Asia, Latin America and the Caribbean. Each case addresses an aspect of climate change adaptation and mitigation, disaster risk management and food security in the agriculture, forestry and fisheries sectors. The documented experiences range between issues of (i) project design, (ii) technologies/methodologies, (iii) data needs and (iv) capacity development and coordination.

This publication is produced as a product from the *FAO Climate Change Days: Share and Learn*, an interactive workshop on FAO's climate change work in member countries, which was held 21-23 June, 2010 at FAO headquarters in Rome. The purpose of the event was to initiate a community of practice on climate change field work in FAO, connect professionals within the organization and promote sharing of experiences to improve the effectiveness of project implementation.

Although climate change is a rather new topic for field programmes, the workshop highlighted the wide variety of experiences that has been gained in past and ongoing projects. As a result, this series of case studies was commissioned to exemplify some of the challenges and success factors identified through the projects and, in turn, to avoid loss of tacit knowledge by inspiring continuous knowledge sharing among colleagues. Participants of the workshop contributed with cases from their own work.

Global climate change is a complex problem which requires innovative project design and management strategies on the ground. The case studies illustrate the fact that the project models of the past, which addressed issues in isolation and with a short-term focus, were not sufficient. It is necessary to tackle climate change adaptation and mitigation holistically, across sectors and institutional levels, with short-, medium- and long-term considerations.

## Project design

**Integrated approach.** Understanding vulnerabilities to and impacts of climate change on local livelihoods calls for integration of various methodologies. Information on the local factors that influence vulnerability and coping capacity, such as microclimatic variations, farming systems and socio-economic differences, should be combined with findings from downscaled climate and climate impact models to inform development planning and policy processes. Due to the uncertain nature of climate impacts, adapting to climate change has to be a dynamic process, involving integration of local and scientific knowledge and encourage field testing of this information by farmers as well as policy-makers. The methodology thus has to be adaptive but also inclusive, ensuring that the involvement of relevant actors is not neglected. Early involvement of local stakeholders and capacity development of implementing actors have proven to be worthwhile investments. Community empowerment and resilience of farming systems to climate change increase when information is effectively delivered to communities, thereby increasing their perception of ownership of the processes. Climate Field Schools (CFS) and Farmers Field Schools (FFS) are good examples of methodologies that target these mechanisms.

**Ecosystem perspective.** Most climate change projects in the agricultural sector follow an ecosystem-based approach to address human-environment interactions at a landscape level rather than only at the farm level. However, landscape planning over the long term requires a clear and common vision for future land uses, which is not always present. One approach to implementing this vision is through the coordination of locally led initiatives that consider the site-specific context. A pre-project analysis that consults key actors and integrates the relevant sectors can clarify this context and identify underlying problems. Such an analysis should also evaluate existing policies and interventions outside the project to avoid overlaps and enable coordination and complementarity with other initiatives.

**Iterative planning.** Successful project implementation is dependent on well prepared and realistic time plans that allow sufficient attention to participatory processes and synchronization with relevant external events and processes, such as the agricultural calendar. As circumstances evolve during the implementation process, the performance of activities needs to be evaluated and continuously adapted.



Lessons learned from completed project phases can then be integrated into subsequent phases. Further, to improve the sustainability of outcomes and increase the resilience of livelihoods and food production systems, long-term planning must complement the short-term need for demonstrable results. For example, emergency projects that support the recovery of agricultural systems after perturbations often have a very short planning horizon. Local capacity development is a necessary investment in order to address recurrent disasters and prolong the positive results of otherwise short-term projects.

## Data and technology needs

**Baseline data.** Climatic as well as land and forest baseline data are needed to assess climate change impacts and choose appropriate tools for adaptation and mitigation. The provision of household level data, biological field data collection, geospatial information from remote sensing and maps, and robust projections of climate change impacts is crucial to guide policies and planning for policy-makers and local communities alike. Biophysical, social and economic data need to be linked to enable assessments of vulnerability to climatic hazards.

**Information management expertise.** Implementing strong monitoring systems and generating and updating the information needed for climate change activities require certain institutional capacity within agricultural ministries and research and extension institutions. In many places, this capacity still needs to be strengthened, but where it has been put in place, experiences have shown that it has encouraged transparency of initiatives, helped fine-tune implementation and targeting, and generated better understanding of technologies and farming practices.

**Implementing good practices.** A key principle for upscaling climate-smart agricultural practices is local adaptation – recognizing that no technology or practice will be universally successful, and that solutions must be tailored to local conditions. Solutions that simultaneously address both the long-term need for climate change adaptation and the immediate needs for food and livelihood security are more likely to yield positive results. In the local process of identification, prioritization and selection of good practices, effective mechanisms for stakeholder engagement are especially important.

**Risk management.** Communities in disaster-prone countries are often well experienced in dealing with climatically induced hazards, but the expected increase in the frequency and magnitude of extreme climate-related events may exceed their coping capacity. In order to adopt adaptation measures effectively, communities need information to assess current vulnerabilities and future climate risks. Risk management and early warning systems are key in reducing the impacts of climate-related disasters. Indigenous early warning systems, farming practices and coping mechanisms used by local people are important factors that should be scientifically documented, analyzed and considered for replication. By integrating local and scientific knowledge, through collaboration of academic and development actors, projects have been successful in strengthening the knowledge of farmers with science-based support. To close the loop, lessons learned through these projects should be continuously re-evaluated by farmers and implementing partners to enable future improvements.

**Agricultural planning.** Climate variability has always made agricultural planning difficult, but the effects of climate change are making it increasingly important to enhance disaster risk reduction in agriculture, through measures such as agricultural diversification, crop rotation and new technologies, and seed varieties and breeds. For example, planting short-cycle rice varieties has been found effective for ensuring a quick harvest after cyclones and floods. Homestead vegetable cultivation as a complementary activity can be an important contribution to reduce vulnerability through risk diversification. In addition, market access for promotion of local products and services is central for livelihood security. Alternative marketing tools such as direct sale chains, Web forums and trust-based networks may become increasingly important in some areas.

## Capacity development and multi-stakeholder processes

**Coordination and harmonization.** National and local governments must lead country actions on climate change, but coordination among all actors, including civil society and the private sector, and harmonization of project management cycles is essential for successful outcomes. Efficient project execution becomes difficult when government departments and collaborating agencies have different planning, budgeting and implementation schedules.

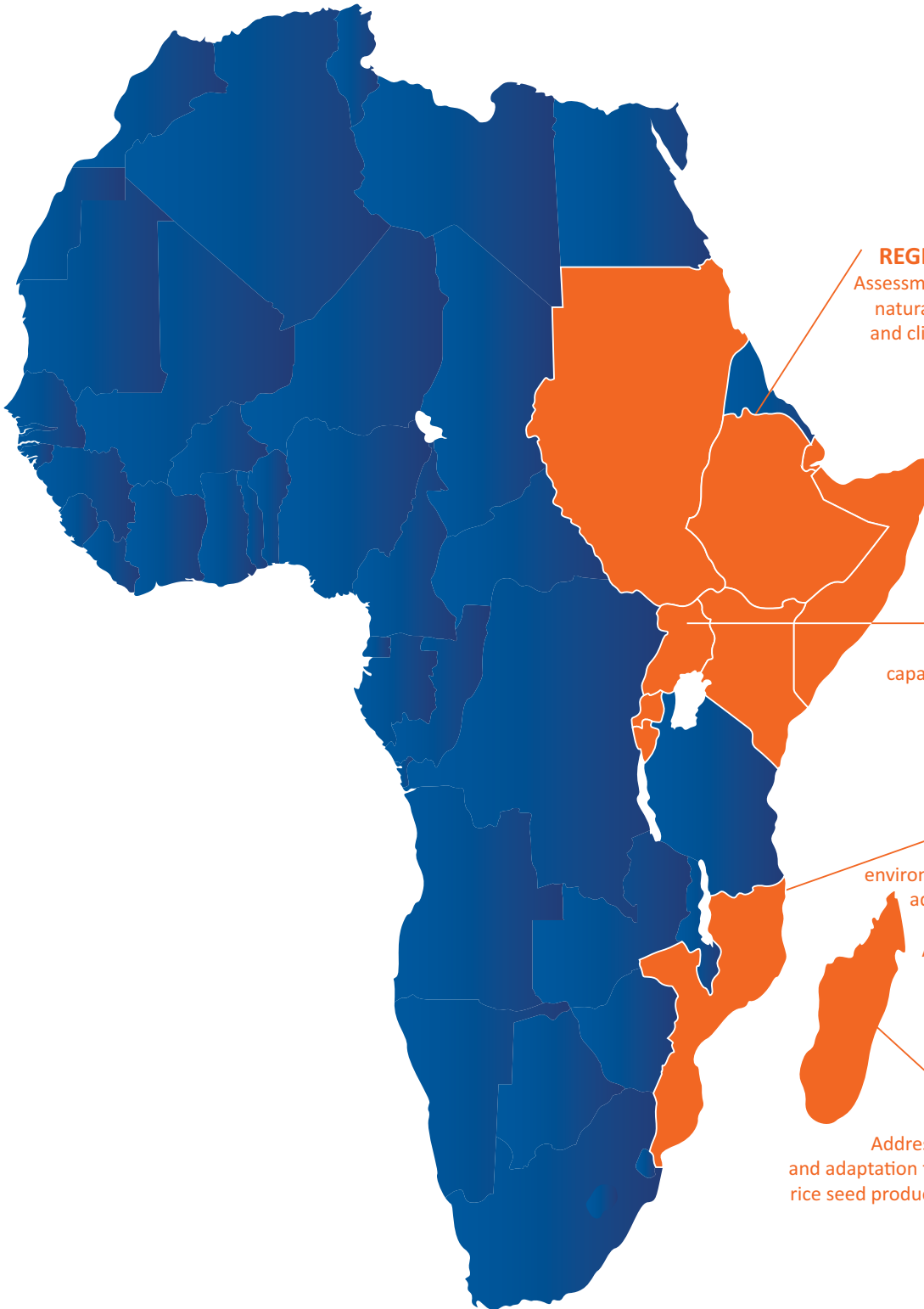
**Capacity development.** The means for capacity development are wide, ranging from formal classroom training to Farmer Field Schools, on-the-job training to action research and technical advice. An action-oriented approach can improve the successful implementation of recommendations and technical outputs from interventions. Most projects encourage the participation of community leaders and local authorities in decision-making and project implementation processes as a step towards empowering the *de facto* land managers. However, many relevant institutions still lack sufficient capacity to support multi-stakeholder processes. Besides technical capacities, there is thus a need to strengthen the functional capacities of national and local governments in policy support, knowledge management, outreach and partnering, along with implementation of climate change interventions.

**UN Collaboration.** Climate change is a crosscutting issue that cannot be addressed in isolation. FAO is engaged in various One UN initiatives related to climate change and cooperates with many partners, including sister agencies in the UN-REDD Programme, the World Meteorological Organization under the Global Framework for Climate Services and the Rome-based agencies, including IFAD and WFP. FAO is also further improving coherence of its various climate change interventions through the development of Umbrella Programmes for Climate Change Adaptation and Disaster Risk Management.

# Acronyms and abbreviations

<b>AECID</b>	<i>Agencia Española de Cooperación Internacional para Desarrollo</i>
<b>APFS</b>	Agro Pastoral Field School
<b>CBSUA</b>	Central Bicol State University of Agriculture
<b>CDM</b>	Clean Development Mechanism
<b>CDMP</b>	Comprehensive Disaster Management Programme
<b>CFS</b>	Climate Field School
<b>DA</b>	Department of Agriculture
<b>DAE</b>	Department of Agricultural Extension
<b>DOST</b>	Department of Science and Technology
<b>DRR</b>	Disaster risk reduction
<b>DVI</b>	Drought Vulnerability Index
<b>FAO</b>	Food and Agricultural Organization of the United Nations
<b>FFS</b>	Farmer Field School
<b>GCM</b>	Global climate models
<b>GHG</b>	Greenhouse gas
<b>GIS</b>	Geographical information system
<b>GoB</b>	Government of Bangladesh
<b>INBAR</b>	International Network for Bamboo and Rattan
<b>INETER</b>	Nicaraguan National Institute for Territorial Studies
<b>JP</b>	Joint Programme
<b>LACC</b>	Livelihood Adaptation to Climate Change project
<b>LWG</b>	Local working groups
<b>MARENA</b>	Nicaragua Ministry of Environment and Natural Resources
<b>MRV</b>	Measurement, reporting and verification
<b>NGO</b>	Non governmental organization
<b>QDS</b>	Quality declared seed

<b>PAGASA</b>	Philippine Atmospheric, Geophysical and Astronomical Services Administration
<b>PES</b>	Payment for Environmental Services
<b>PFM</b>	Participatory forest management
<b>PRECIS</b>	Providing Regional Climates for Impacts Studies
<b>RANET</b>	Radio and internet for the communication of hydro-meteorological information for rural development
<b>RCM</b>	Regional climate model
<b>RDD</b>	Regional drought decision
<b>REDD</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>REL</b>	Reference emission level
<b>RRI</b>	Rapid resource inventory
<b>SADC</b>	Southern African Development Community
<b>SLM</b>	Sustainable land management
<b>UN-HABITAT</b>	United Nations Human Settlements Programme
<b>UNCDF</b>	United Nations Capital Development Fund
<b>UNDAF</b>	United Nations Development Assistance Framework
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNFPA</b>	United Nations Population Fund
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>UNOCHA</b>	United Nations Office for the Coordination of Humanitarian Affairs
<b>VCM</b>	Voluntary carbon markets
<b>WFP</b>	United Nations World Food Programme



**REGIONAL EAST AFRICA**

Assessment of carbon stocks for natural resources governance and climate change mitigation

**UGANDA**

Towards developing a capacity-building framework for UN Joint Programme on climate change in Uganda: The role of FAO Uganda

**MOZAMBIQUE**

UN Joint Programme on environmental mainstreaming and adaptation to climate change

An Integrated Development Information System for Climate Change (CCIDIS)

**MADAGASCAR**

Addressing disaster risk reduction and adaptation through local and improved rice seed production in disaster prone areas

# AFRICA







# MADAGASCAR

## Addressing disaster risk reduction and adaptation through local and improved rice seed production in disaster prone areas

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In the Republic of Madagascar, where more than 70 percent of the population depends on agriculture, the availability and accessibility of good quality seeds is paramount in enhancing the resilience of food production systems to climate-related hazards and other shocks. Regular floods and droughts over the last 15 years have severely strained the supply of quality seeds in the country. Following such events were periods of acute food and seed insecurity when harvests were destroyed and planting for the following season not completed. During difficult years, farmers often resorted to eating their seeds. The limited seed production that exists has been of poor quality, which has led to low yields, even in years free from acute environmental stresses.

Thus, in November 2008, FAO and Care International implemented a short project in the northeastern region of Analanjirifo to build and strengthen the quality declared seed (QDS) production capacity of farmers who were previously highly vulnerable to such shocks. The project aimed to minimize disaster-related risks from floods and cyclones and dependence on direct external assistance. This case describes the experiences from Madagascar. The same activities were also implemented in Mozambique, Malawi and the Comoros.

### Summary

- As climate change has caused more extreme and unpredictable weather, agriculture planning has become more difficult
- Climate change adaptation, risk reduction, disaster risk management and the development sector need to be linked through an integrated approach of climate risk management
- Short-cycle seed varieties allow for harvesting and storage of production before the peak of the cyclone season or for a quick harvest following re-planting after cyclones and flooding
- Rice seed production at the local level and the establishment of strategic and cyclone-proof seed stocks can minimize losses during the cyclone season and greatly improve availability of and accessibility to quality seeds
- Making short-cycle seed available in vulnerable areas exposed to cyclic environmental stresses increases future resilience to hazard impacts



## Project background

Project title	Coordination and technical support to local production of improved rice seed in disaster prone areas affected by Cyclone Ivan
Project type	Office for Special Relief Operations (emergency project – disaster risk reduction)
Project code	OSRO/MAG/805/EC
Country, location	Madagascar
Duration of project	8 months, November 2008-June 2009
Web site	<a href="http://www.fao.org/emergencies">www.fao.org/emergencies</a>
Stakeholders/beneficiaries	<ul style="list-style-type: none"> <li>• 48 500 people in 8 000 households, each with an average of 6 family members.</li> <li>• 80 rice producers and 20 field technicians were trained in seed multiplication activities. Including the rice producers' families; beneficiaries of this training totalled 480 people.</li> </ul>
Implementing organization	FAO and CARE International
Project objectives	<p><b>Principal objective:</b></p> <ul style="list-style-type: none"> <li>• Improve food security of the most vulnerable farming families and strengthen the resilience of farmers to recurrent natural calamities in disaster prone areas.</li> </ul> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>• Improve food security of the population in the region of Analanjirofo through sound field coordination activities</li> <li>• Strengthen the local, informal seed production system and increase availability of improved rice seed</li> </ul>
Main activities	<ul style="list-style-type: none"> <li>• Identification of farmers for seed multiplication</li> <li>• Finalization of agreement with implementing partners (NGOs)</li> <li>• Local procurement and distribution of improved seeds for multiplication, small tools and inputs</li> <li>• Technical assistance to implementing partners and farmers participating in seed multiplication activities</li> <li>• Collection, treatment and packaging of the produced seeds</li> <li>• On-farm training for 80 rice producing farmers</li> <li>• Training for 20 NGOs and disaster risk reduction (DRR) field technicians</li> <li>• Distribution of produced seeds to vulnerable farmers through NGO partners and seed banks</li> </ul>
Hazards addressed	Extreme events: cyclones, floods

## Key messages

### 1. As climate change has caused more extreme and unpredictable weather, agriculture planning has become more difficult

Madagascar has seen an increase in precipitation intensity, a decrease in the number of rainy days and an increase in the length of dry spells. This is in accordance with IPCC predictions of more extreme events as a result of climate change. As a result of this, agricultural planning, including choosing the appropriate seed variety becomes more difficult. For example, the project activity of distributing flood-tolerant seed varieties to farmers as a disaster impact mitigation measure proved successful in Madagascar. However, in other programme countries where the same intervention was implemented the weather did not follow predicted patterns and farmers faced dry spells instead of the expected floods.

This outcome thus underlines the fact that there is no single magic bullet that will invariably reduce the risk of disaster, but that an approach with many different measures aimed at strengthening the resilience of affected farmers including, for example, identifying alternative livelihood possibilities, is more likely to be successful.

## **2. Climate change adaptation, risk reduction, disaster risk management and the development sector need to be linked through an integrated approach of climate risk management**

As shown in the example above where a dry spell occurred when a flood was expected, climate change adaptation work needs to be integrated with disaster risk management strategies that deal with climate variability from seasonal to inter-annual time scales. While impact assessments of climate change over decades or even centuries can be useful in identifying particularly vulnerable areas and populations in the long term, lack of capability to make seasonal climate forecasts make disaster reduction actions difficult. Measures to reduce vulnerability and strengthen resilience are crucial contributions to fighting poverty.

## **3. Short-cycle seed varieties allow for harvesting and storage of production before the peak of the cyclone season or a quick harvest from re-planting after cyclones and flooding**

The project activity of planting an improved flood-tolerant, short-cycle rice seed variety (X265) was successful, resulting in a faster harvest and good yields during a time of great food shortage. The impact of cyclones and floods, which are recurrent on the eastern Madagascar coast between December and March, could thus be mitigated. For example, thanks to X265's flood tolerance, when Cyclone Jade struck the project area in 2009, there was still an acceptable harvest from the seed production fields where, otherwise, the entire harvest would have been destroyed.

## **4. Rice seed production at the local level and the establishment of strategic and cyclone-proof seed stocks can minimize losses during the cyclone season and greatly improve availability of and accessibility to quality seeds**

Before the project, the physical assets of the farmers in the project had been completely depleted after a cyclone hit their village. Stored seed was swept away along with houses, and field crops were destroyed by strong winds and floods that followed the cyclone. Seed production systems and cyclone proof storage had not been implemented before in these areas but corresponded to a recognized urgent need. The project's installation of cyclone-proof seed storage meant that seed was immediately available for planting after the cyclone.

Good quality seeds are not nationally available in sufficient quantity in Madagascar. After recurrent natural disasters, it is not possible to find good seeds in the local market. Experience has shown that seed importation from abroad or other regions is not a viable solution because of the length of time needed before the seed can reach beneficiaries, transportation issues, the difficulty of guaranteeing quality and of course the high costs.

Increased local availability of adapted and short-cycle seeds represents the best solution to mitigate the impact of calamities, not only reducing the risk of losing a season's production in the event of a disaster, but also improving sustainable access to quality and adapted seeds.

## **5. Making short-cycle seed available in vulnerable areas exposed to cyclic environmental stresses increases future resilience to hazard impacts**

As the project demonstrated, introducing or strengthening the production and availability of specific, well-adapted seeds (particularly short-cycle and flood-tolerant varieties) in the field was appropriate in vulnerable regions of Madagascar. Although some production losses were noted, they were much lower than for other varieties of seeds and the beneficiaries were eager to continue the programme activities after the project ended. This rapid response project gave not only valuable short-term results, it strengthened technical capacities of farmers and agents from partner NGOs and the Ministry of Agriculture (technicians from the Regional offices for rural development and from the seed official control services), thus promoting longer term sustainability.

By increasing availability of quality seeds to improve the resilience of local farmers against climate-related disasters, the project contributed to food self-sufficiency and, in turn, reduced the need for direct food aid. It also strengthened coping mechanisms of the targeted vulnerable population who now can sell the seeds they produce. Furthermore, the most successful among them pave the way for small-scale informal production of quality seed and their wider availability on decentralized markets which could significantly contribute to increase and stabilize agricultural production in disaster-prone areas of Madagascar, thus linking emergency and rehabilitation with development in the field.

The population expressed strong enthusiasm for seed production and, when given the opportunity of training, a greater number of seed farmers and technicians participated than originally planned. Some beneficiaries, who were renting land and thus were very vulnerable, now plan to continue this income-generating activity in order to purchase small land plots in the near future.

## Outlook

- Production, treatment and packaging are important components of seed production activities. Although this project helped establish a basis for rehabilitating the local seed production sector in the targeted areas, a single campaign is not sufficient to enable all those in need to master seed multiplication.
- It is recommended that similar campaigns are carried out, not only in terms of extension activities on seed production standards and techniques, but also to kick-start a crucial rehabilitation of the seed sector in Madagascar, built on improved and adapted seeds.
- As the areas of the project are confronted with recurrent cyclone damage, the installation of seed banks would facilitate a quicker response. Considering the risk of more severe cyclones in the future, interventions are also needed to coordinate the distribution of seeds to threatened households. This will be further elaborated by FAO in coming projects.



# MOZAMBIQUE

## UN Joint Programme on Environmental Mainstreaming and Adaptation to Climate Change

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Mozambique's rural poor are particularly vulnerable to threats to natural resources due to extreme weather events such as floods or droughts. In the Gaza Province, which has an average annual rainfall of only 350 mm, lack of sufficient water for people, agriculture and livestock is the biggest constraint to development. There also are indications that rainfall distribution is becoming more erratic and the dry season longer and hotter under the influence of climate change.<sup>1</sup>

The UN Joint Programme on Environmental Mainstreaming and Adaptation to Climate Change is a three year initiative funded by the Spanish government through the MDG Achievement Fund. It is implemented by six UN agencies in cooperation with six Mozambique government institutions was established to help Mozambique integrate climate change into national policy and to provide field-level activities that provide farmers support in adapting to the effects of climate change.

### Summary

- Water conservation and training in improved water management is fundamental to sustainable livelihood diversification and adaptation to climate change in semi-arid or arid zones
- The coping strategies of rural communities in the face of climate change depend largely on the exploitation of the natural resource base which is not being sustainably managed. Interventions are essential to reverse this situation
- To the extent possible, harmonization of planned activities between government partners and the Joint Programme is important for the sustainability of interventions
- The participation of beneficiaries in programme design is crucial for a sense of ownership at the community level
- A holistic approach is necessary to address climate change on the country level

<sup>1</sup> INGC. 2009. Synthesis report. INGC Climate Change Report: Study on the impact of climate change on disaster risk in Mozambique. [van Logchem B and Brito R (ed.)]. INGC, Mozambique.

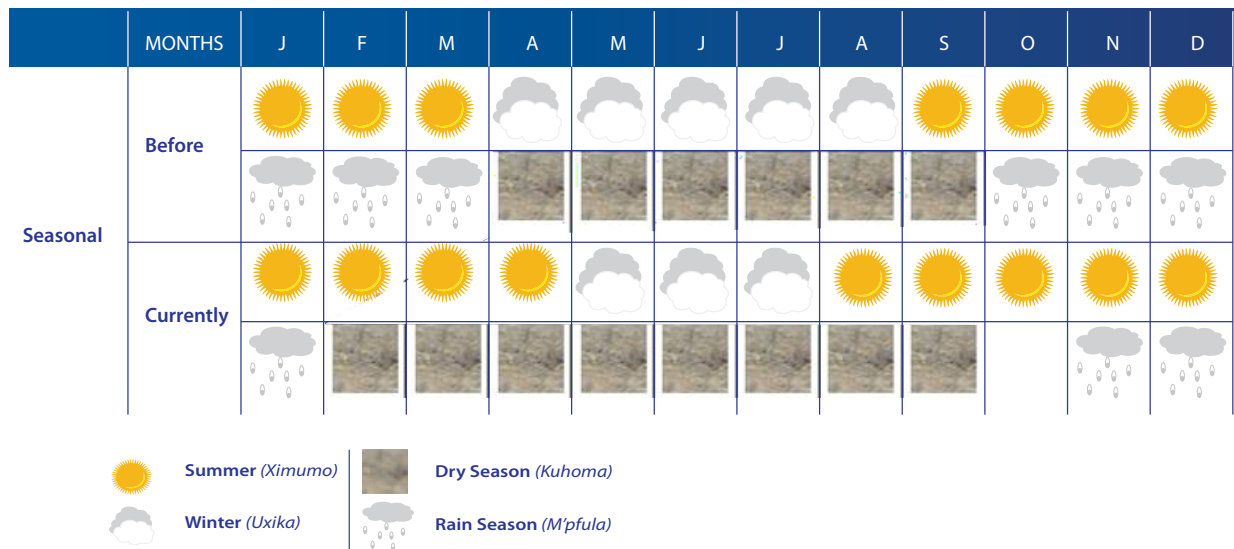
## Project background

Programme title	UN Joint Programme on Environmental Mainstreaming and Adaptation to Climate change
Programme type	UN Joint Programme under Spanish MDG-Fund
Programme code	UNJP/MOZ/085/SPA
Duration of programme	3 years (2008-2011)
Country, location	Mozambique, mainly Gaza Province.
Stakeholders	Staff of national, provincial and district level government partner institutions, rural communities, civil society groups (NGOs).
Beneficiaries	1000 families, mainly residents of 10 villages in Chicualacuala district of Gaza Province, are direct beneficiaries, with at least the same number of indirect beneficiaries, e.g. those who buy the products produced on the farms of the beneficiaries.
Implementing organizations	FAO, UNDP, UNEP, UNIDO, WFP and UN-HABITAT, in collaboration with Mozambique government institutions: Ministry for Coordination of Environmental Affairs, Ministry of Agriculture, National Institute for Disaster Management, National Meteorological Institute, Ministry of Public Works and Ministry of Energy.
Programme objectives	<p><b>Mainstreaming environment and climate change:</b></p> <ul style="list-style-type: none"> <li>Integrate environment and climate change considerations into government plans, policies and strategies at national, provincial and district levels.</li> </ul> <p><b>Adaptation to climate change:</b></p> <ul style="list-style-type: none"> <li>Improve the resilience of rural communities to climate change by improving and strengthening management of the natural resource base and diversifying livelihoods.</li> </ul>
Main activities	<p><b>Capacity development:</b></p> <ul style="list-style-type: none"> <li>Training and support to the government to integrate climate change into policies and plans</li> <li>Promotion of greater knowledge and understanding of environmental and climate change issues at the local level</li> <li>Exchange visits and field days to explore and promote best practices</li> </ul> <p><b>Natural resource management:</b></p> <ul style="list-style-type: none"> <li>Water resource conservation, development and management</li> <li>Improved livestock management, treatment and slaughter facilities</li> <li>Development and implementation of a climate proofing strategy at district level</li> <li>Promotion of renewable energies</li> </ul> <p><b>Information systems:</b></p> <ul style="list-style-type: none"> <li>Risk mapping and improvement of early warning systems</li> <li>Rehabilitation of the district level meteorological network</li> <li>Extension of radio and internet for the communication of hydro-meteorological information for rural development (RANET) at the district level</li> </ul>
Hazards addressed	<ul style="list-style-type: none"> <li>Extreme events: prolonged droughts</li> <li>Gradual change: more erratic rainfall, increasing temperatures</li> </ul>

## Key messages

### 1. Water conservation and training in improved water management is fundamental to sustainable livelihood diversification and adaptation to climate change in semi-arid or arid zones

With an average annual rainfall of 350 mm, shortage of water for people, agriculture and livestock is the biggest constraint to development in the programme area. The distribution of rainfall is becoming more erratic under the influence of climate change and the dry season is becoming longer and hotter. The calendar in Figure 1 shows how rural communities perceive these changes over the past few decades.



**Figure 1.** Seasonal weather calendar compiled by farmers in the Chicualacuala district, showing the perception of weather changes over the past few decades.

One of the Joint Programme's major undertakings to help rural communities respond to this phenomenon has been opening boreholes (around 100 meters deep) equipped with solar pumps. Other initiatives include expanding irrigated areas close to the Limpopo River, installing rainwater harvesting tank-and-gutter systems in houses, schools and other government buildings, enlarging existing water catchment structures (ponds and dams) and promoting runoff and erosion control measures (building gabions and planting vetiver grass). Training of rural communities in the maintenance and use of installed technology will be fundamental to long-term sustainability. After the two irrigation schemes were expanded with the assistance of the Joint Programme, over 60 tonnes of vegetables were produced, compared to no production the year before. These vegetables were consumed locally or sold in various district-level markets, increasing income for farmers and providing fresh produce in an area where vegetables (especially greens) were not widely available. Results from the first two years of the programme have been encouraging and community involvement and enthusiasm for these interventions is strong.

## 2. The coping strategies of rural communities in the face of climate change depend largely on the exploitation of the natural resource base which is not being sustainably managed. Interventions are essential to reverse this situation

A range of activities implemented by the Joint Programme were designed to address various problems in the management of natural resources in Chicualacuala, where the livelihood and coping strategies of rural communities depend largely on the exploitation of land and water resources.

In response to prolonged droughts, where dryland farming does not guarantee food security, rural communities are turning increasingly to the forest as a source of food and income. When a study conducted by the Joint Programme found that extraction of charcoal and building materials from forests exceeded sustainable limits, it supported three communities in designing and implementing a pilot community-based forest management plan covering 47 000 ha of forest land. In addition, forestry management associations have been created and members trained. All steps in this process are fully participatory – nothing is done without full community agreement. The Joint Programme also promotes biogas production and energy-conserving stoves to reduce forest pressure caused by need for fuelwood.

Livestock keeping – mainly cattle, goats and chickens – provides insurance against crop failure in Chicualacuala. However, animal and pasture management is poor and overgrazing is a problem near water

points, while the stocking rate is still well below carrying capacity in the district. The Joint Programme assists livestock keepers in improving the way they manage their animals and use pastures. It is hoped that the opening of ponds and boreholes will reduce pressure on overgrazed areas. Livestock treatment facilities have been built and community members trained and equipped as animal health workers. The incidence of tick-borne diseases has been reduced as a result of regular spraying of cattle. The Joint Programme also has trained community members to vaccinate village chickens against Newcastle disease. Women, who have responsibility for keeping chickens, have increased family income with this activity which, in turn, increases their ability to cope with climate-related shocks.

Soils in the district are generally quite fertile and produce good yields when rainfall is favourable. However, monocropping of cereals or intercropping with pumpkins, melons, beans, groundnuts, etc., and the practice of leaving soil uncovered in the long dry season between crops has weakened soil structure and reduced fertility, leaving the land exposed to the erosive actions of the elements. Although the Joint Programme promotes conservation agriculture and agro-forestry as remedial actions, advising farmers not to plough and to maintain surface cover is met with resistance in these open grazing systems where farmers do not normally fence their agricultural fields. Promotion of mulching and the use of animal manure in agriculture (not traditional practices) are more successful and farmers adopt these interventions more readily.

To help overcome marketing difficulties for farm products where road access is poor and distances long, the Joint Programme promotes simple agro-processing techniques, such as sun drying vegetables and making jam and peanut butter.

### **3. To the extent possible, harmonization of planned activities between government partners and the Joint Programme is important for the sustainability of interventions**

The Joint Programme and its government partners had different planning, budgeting and implementation cycles which made implementation of a truly joint initiative and exploitation of synergies difficult. Ensuring harmonization in planning and activity implementation is complicated due to donor funding cycles. Experiences have however shown that where this is possible, it leads to a greater sense of government ownership of the intervention.

### **4. The participation of the target group in programme design is crucial for a sense of ownership at the community level**

Although the Joint Programme was planned in collaboration by the participating UN agencies and government representatives, the target group, particularly rural communities in Chicualacuala district, was not much involved in the design of the programme. As a result of this, although the majority of the Joint Programme's field activities are in line with farmer priorities, some of the communities do not feel ownership of the interventions which may threaten the sustainability of the results. Instilling a sense of ownership requires constant sensitization of communities on the part of Joint Programme staff, assisted by community leaders.

### **5. A holistic approach is necessary to address climate change on the country level**

A strategy designed to help communities adapt to the effects of climate change cannot comprise only physical interventions to improve natural resources management. A holistic approach is necessary which combines such activities with technical training, organizational capacity building (e.g. farmer associations), awareness raising of climate change impacts and the necessity to adapt to them, improving market access for farmers, etc.

At the planning level, the Joint Programme assists the government in mainstreaming environment and climate change considerations into development plans and strategies. The support is designed to increase resilience of the country to climate change through risk mapping and the digitalization of topographical

maps, expanded radio and Internet coverage, support in territorial planning, rehabilitation of the district meteorological station, improvement in early warning systems, development of an integrated water management strategy, sensitization of rural communities about the risks associated with climate change and education campaigns in schools.

## Outlook

Based on lessons learned from its first two years of activities, the Joint Programme has identified three important areas on which to focus for the future:

- improve market access for agro-livestock producers and put greater emphasis on agro-processing;
- enhance community organization for sustainable management of natural resources;
- develop appropriate strategies to improve and sustain food security in areas affected by climate change.







# MOZAMBIQUE II

## Incorporating climate change in development planning – an integrated information system

### Author

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The *Climate Change Integrated Development Information System* (CCIDIS) is a methodology designed to make climate change information available in an accessible format in order to inform development planning. The methodology combines field data from land use and land cover surveys with data derived from satellite imagery. The development of the methodology was the combined output of two related projects developed by the Government of Mozambique with technical assistance from FAO, International Network for Bamboo and Rattan (INBAR) and the company RMSI.

The methodology used Rapid Resource Inventories (RRIs) to collect field data and high resolution satellite imagery to survey a project area and develop a model of potential climate change impacts that can be used by farmers and planners. The methodology is cost effective and provides substantially improved data in comparison to expensive, extrapolated and error-prone traditional forest and other resource inventories. A Geographical Information System (GIS) was used to integrate the data and create simple maps which could be understood by farmers as well as policy-makers.

### Summary

- Innovative approaches may be required to obtain the site-specific data needed to understand local climate change impacts
- Complex technical information on climate change, processed in one integrated information system and presented in a user-friendly way, can inform development planning both by farmers and policy-makers
- High resolution satellite imagery is essential for accurate carbon estimates. Medium resolution satellite imagery combined with field-level inventories can be used to establish national baselines.

## Project background

Project title	<ul style="list-style-type: none"> <li>• Support for Community Forestry and Wildlife Management (Phase II)</li> <li>• Improving Food Security in Vulnerable SADC Countries</li> </ul>
Project type	Government Project; Office for Special Relief Operations (emergency project)
Project code	<ul style="list-style-type: none"> <li>• 656/IUCN/CEF/2004 – Government project for bamboo flowering</li> <li>• OSRO/RAF/403/SAF - FAO technical assistance and high resolution satellite imageries</li> </ul>
Duration of project	2004 – 2005 (12 months)
Country, location	Mozambique, Sofala province, Nhamatanda District
Stakeholders	<ul style="list-style-type: none"> <li>• Government of Mozambique</li> <li>• Nhamatanda district administration</li> <li>• Catholic University of Mozambique (custodians of the database)</li> </ul>
Beneficiaries	<ul style="list-style-type: none"> <li>• Community forestry groups of Mucombezi village (beneficiaries of stock assessment information - baselines),</li> <li>• Catholic University of Mozambique (beneficiaries in terms of gaining the methodology)</li> </ul>
Implementing organization	Government of Mozambique with technical assistance from FAO, International Network for Bamboo and Rattan (INBAR) and RMSI.
Project objectives	<ul style="list-style-type: none"> <li>• Combine satellite imagery with on-the-ground surveys to provide integrated information to district administration on agriculture, forestry, fisheries, land use and land cover that can be used support effective decentralized development planning and budgeting to achieve food security.</li> <li>• Create data that can be used for assessing forest stocks and carbon sequestration and emission levels.</li> </ul>
Main activities	<ul style="list-style-type: none"> <li>• Compilation and analysis of existing information on resource inventories, satellite images and socio-economic data</li> <li>• Participatory RRI to collect field data</li> <li>• Data analysis of satellite images and data integration in a GIS</li> <li>• Verification and validation of integrated data</li> </ul>

## Key messages

### 1. Innovative approaches may be required to obtain the site-specific data needed to understand local climate change impacts

Climate change is a cross-cutting issue that impacts a wide range of ecosystems, landscapes and species. Impacts are site specific and have the most severe effects on the livelihoods of the poorest. In the project, site-specific data were needed to increase understanding of local climate change impacts and facilitate planning of local adaptation and mitigation actions. However, efforts to extract such data were constrained by the fact that the government departments used different information-gathering standards or formats. This led to difficulties in compiling and integrating the data needed for developing an overview of local climate change impacts and preparedness planning.

To overcome this, the project first extracted relevant information and statistics from provincial or national-level reports on sectors such as forestry, livestock, agriculture, meteorology, natural resources, soil and water and on socio-economic conditions, and then converted them into unified formats. Gaps in the information were filled using regional or global information, or with new data generated through remote sensing satellite images.

## 2. Complex technical information on climate change, processed in one integrated information system and presented in a user-friendly way, can inform development planning both by farmers and policy-makers

Limited funds forced the project to combine resources from different projects and integrate remote sensing to reduce costs from the traditional labour-intensive inventory approach to collecting forest and natural resource data.

The study collected field data on timber, biomass, agriculture, weather, soil, water, infrastructure, habitats, etc. The field data was integrated with remote sensing data into maps with a GIS system. Using satellite images, variables that were studied in the field were classified and geo-referenced from field GPS data. These predetermined variables also helped to stratify large key species such as bamboo, and to group various mixed *miambo* woodlands. Satellite images were also used to calculate forest stocks and class densities, giving an estimate of wood stocks per pixel. These estimates proved beneficial for forest concession management and licensing, and for assessing carbon sequestration and emissions. Heuristics and weightage analysis was employed to model various risks and development potentials in agriculture, forestry, fisheries and marketing.

The resulting data could be visually displayed as user-friendly GIS map layers that were easily merged in various combinations to produce maps according to different needs. These maps could be used by illiterate farmers with little guidance to give them information on climatic factors such as temperature and rainfall that impact their livelihoods.

In addition, the site specific information system on climate change proved very useful to a wide range of stakeholders in Mozambique, especially the district authorities who were in desperate need of integrated information to support decentralization of governance. GIS tools helped them in overlaying multiple map layers of various types of information in a simplified way to derive site-specific maps of agriculture, forestry, natural resources, disaster risks, disaster management options, infrastructure, residence patterns, marketing clusters, etc. With this information, they could plan or prioritize development actions for individual villages. This enabled district authorities to understand the climate impact scenarios concerning floods, droughts and fires, and plan accordingly.

Importantly, making this type of official documentation on natural resources accessible can facilitate and encourage transparent decision-making and, thereby, goals of good governance and democracy in developing countries.

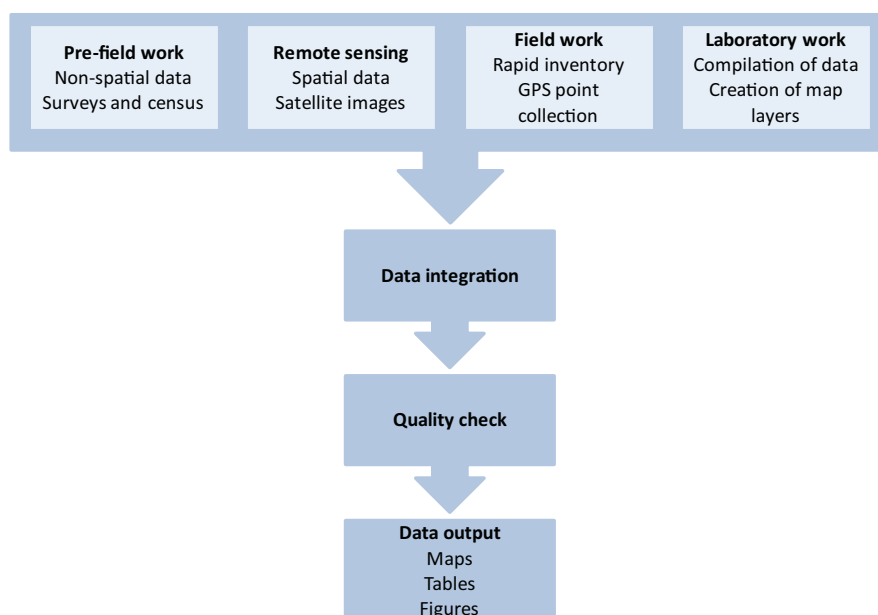


Figure 2: Methodological framework

### **3. High resolution satellite imagery is essential for accurate carbon estimates. Medium resolution satellite imagery combined with field level inventories can be used to establish national baselines.**

Carbon finance was an attractive entry point to convince the government to invest in sustainable forest management. To obtain the needed above-ground biomass carbon estimates, the project tested a combination of medium resolution (30 meters) Landsat 7 images and high resolution (5.8 meters) LISS 4 images to map the entire district, using higher resolution in key areas. High resolution satellite images were used for mapping major forest types and estimating carbon stocks. This system can function as a potential tool for voluntary carbon accounting systems. Medium resolution satellite images, combined with RRI, were useful for district-level analysis and could be used when establishing national reference emission levels (RELs), as well as measurement, reporting and verification (MRV) systems.

It was concluded that medium resolution satellite imageries integrated with RRI are valid for district and national level analysis that can be used in establishing national RELs and MRVs, according to the IPCC Tier-1 carbon estimates. High resolution imagery is useful in near accurate carbon calculations corresponding to IPCC's Tier-2 for single species and grouped species. While high resolution imagery is expensive and covers smaller areas in comparison to medium resolution imagery, it is good for meeting higher data requirements for voluntary carbon markets.

The combination of medium and high resolution imagery with RRI has been shown to be a cost-effective and reliable way to develop climate change integrated methodologies for a national system and enables a move away from expensive traditional inventory methodologies.

## **Outlook**

While the methodology that emerged from these projects provided the type of information that farmers and district managers need to increase their understanding of future climate change scenarios and adjust their planning, there remain questions concerning:

- whether this methodology can be scaled up to a national level;
- further understanding of the full potential of this data and its weakness;
- how weak national capacities can be overcome in order to promote and implement advanced and state-of-the-art technologies.



# UGANDA

## Towards developing a capacity-development framework for UN Joint Programme on climate change in Uganda: the role of FAO Uganda

### Author

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Uganda is one of the countries in Africa that is heavily affected by climate variability and change in the form of extreme weather events such as droughts, floods and landslides. The magnitude, frequency and severity of these hazards have increased over the past decades, seriously eroding the productive assets and traditional coping capacities of the rural poor.

The UN Joint Programme on Climate Change in Uganda, which began in 2010 and will extend to 2014, seeks to strengthen the capacity of Uganda to adapt to a changing climate while mitigating future climate change. The geographic areas of intervention were chosen based on evidence of climate change impact in Uganda as well as considerations of the UN's comparative advantage in these areas, namely, the dry land areas of Karamoja and the Moroto River Basin in the north, the Rwenzori Mountains in the west and Mount Elgon in the east.

### Summary

- Future interventions to address climate change in Uganda must move beyond short-term, project-based focus
- A more comprehensive, multi-stakeholder approach is needed to deal with climate change, disaster risks, natural resource degradation and food insecurity in an integrated and long-term manner
- A sound framework must be developed for systematically strengthening capacities at all levels

## Project background

Programme title	UN Joint Programme on Climate Change in Uganda
Programme type	UN Joint Programme
Duration of project	4 years, 2010–2014
Country, locations	Uganda
Stakeholders/ beneficiaries	District local government and communities in the dryland ecosystem of Karamoja, the Moroto River Basin which covers parts of Acholi, Lango and Teso, and the Mount Elgon and Rwenzori Mountains ecosystems
Implementing organization	FAO, WFP, UNDP, UNEP, UNFPA, UNESCO, UN HABITAT, UNCDF, UNOCHA Ugandan Ministry of Water and Environment
Programme objectives	To strengthen the capacity of government, civil society institutions and vulnerable communities to deal with climate change mitigation and adaptation, disaster preparedness and response.
Main activities	<ul style="list-style-type: none"><li>• Policy, planning, financing and advocacy</li><li>• Research, learning and documentation of best practices</li><li>• District and community level capacity building</li><li>• Field application of climate change adaptation and mitigation measures</li></ul>
Hazards addressed	<ul style="list-style-type: none"><li>• Extreme events: droughts, floods, landslides</li><li>• Gradual changes: shifts in seasons, and rainfall and temperature patterns</li></ul>

## Key messages

### 1. Future interventions to address climate change in Uganda must move beyond short-term, project-based focus

FAO efforts to address the impact of climate change in Uganda began in 1999 with a series of interventions that included improving watershed-based land and natural resource management (1999–2004), and decreasing the vulnerability of pastoralists by enhancing the response capacity to drought-related animal production and health stresses (2006–2008). A related regional initiative, the ongoing Regional Drought Decision Project (RDD), operates in Ethiopia and Kenya as well as Uganda to pave the way for longer term development actions by reducing vulnerability and strengthening capacity to respond to recurrent droughts and other climatic hazards.

Between 1999 and 2009, FAO projects have addressed climate change indirectly by establishing about 2 300 Farmer Field Schools (FFS) that have benefitted 414 000 individuals, many of them in drought- and flood-affected areas of the country. FAO also has conducted training on riverbed water harvesting technologies such as sub-surface dams for 22 technical staff of local government and development partners in Karamoja, and trained 23 Agro Pastoral Field School (APFS) facilitators in the technologies to facilitate their adoption at grassroots level in all districts of Karamoja.

While individual climate interventions are laudable and serve specific purposes, they must be planned and implemented in a systematic, coordinated and integrated manner if they are to address the complexities of climate change issues in Uganda on a long-term basis.

### 2. A new, more comprehensive, multi-stakeholder approach is needed to deal with climate change, disaster risks, natural resource degradation and food insecurity in an integrated and long-term manner

The UN Joint Programme on Climate Change in Uganda seeks to strengthen the capacity of government, civil society institutions and vulnerable communities in Uganda in areas of climate change mitigation and adaptation, and disaster preparedness and response. The project recognizes the need for a multi-stakeholder approach with a clearly defined capacity-development framework and defined roles for

participants. This approach ensures a common agenda, collective learning, transparency, commitment of resources and active participation of various stakeholders and institutions.

The Joint Programme uses an ecosystem approach to address adaptation and mitigation issues. Proposed interventions are guided by the United Nations Development Assistance Framework (UNDAF) for Uganda and the climate change objective in Uganda's National Development Plan to "develop national capacity in the country in support of social welfare and national development in general."

Drawing from lessons of past experiences that showed the need for a systematic and integrated approach, the following components have been recommended for incorporation into the Joint Programme's strategy.

- Develop and apply a capacity development framework on climate change adaptation and mitigation that includes a participatory, stakeholder-based and systematic field application.
- Promote community-based adaptation and mitigation measures using a participatory integrated watershed management approach that includes: community-based early warning systems, soil and land management, water resources development through small-scale irrigation and water harvesting schemes, conservation agriculture, rural energy management focusing on energy-saving stoves and biogas, conflict management, livestock and pasture management, forest management and afforestation, health and nutrition, livelihood enterprise development and biodiversity conservation and use.
- Adapt FFS and APFS approaches to transfer and scale-up farmers' knowledge, skills and capacity on climate change adaptation and disaster risk management in agriculture.
- Form community-based climate change adaptation networks consisting of the FFS, community groups and watershed associations in the target watersheds. FAO currently has FFS networks in several parts of Uganda.
- Promote village savings and loan associations, and put financial and credit incentives in place that support climate change adaptation and mitigation practices and can strengthen community capacity to manage resources and livelihood diversification.

Although it is still under formulation, early lessons have shown that a multi-stakeholder approach, anchored on a clearly defined capacity development framework with clearly defined roles is essential for tackling climate change issues on a long-term basis and for the UN organizations to deliver united results.

### **3. A sound framework must be developed for systematically strengthening capacities at all levels**

In the formulation phase of the programme, a stakeholder-centred capacity development framework including several training packages was proposed to enable individuals, groups, organizations and local institutions to strengthen their ability to respond systematically to challenges of climate change (Table 1). Based on principles of partnership and learning, it recognizes the need for the current UN strategy in Uganda to build on past experiences of climate change-related interventions.

In June 2010, an initial joint scoping mission was conducted in the targeted ecosystems of Moroto River Basin in Karamoja subregion, and Mt Elgon in Eastern Uganda to:

- consult with district and local government officials on the programme design and the implementation strategy, as well as stimulate buy-in, and
- explore with stakeholders how district and community intervention training packages might vary in different ecosystem contexts, identify specific trainings needs of target groups and discuss how best to monitor and evaluate programme activities.



**Table 1.** Proposed training packages for district and community level for UN Joint Programme on climate change

ASPECTS	District Level	Community Level
Focus/ key content areas	<ul style="list-style-type: none"> <li>How to plan, implement, monitor and evaluate climate change adaptation and mitigation programmes and projects.</li> </ul> <p><b>Related trainings and modules</b></p> <ul style="list-style-type: none"> <li>Sensitization on climate change to raise awareness</li> <li>Disaster risk management, disaster risk reduction</li> <li>Early warning system and contingency planning</li> <li>Participatory action research</li> <li>Community-based Integrated watershed management</li> <li>Sector-specific training on climate change. i.e. food security, health, biodiversity, population, cities</li> <li>Convergence of climate change adaptation and disaster risk reduction</li> <li>Integration of climate change and disaster risk reduction into district and urban development planning</li> </ul>	<ul style="list-style-type: none"> <li>How to plan, implement, monitor and evaluate climate change adaptation and mitigation assets.</li> </ul> <p><b>Related training topics</b></p> <ul style="list-style-type: none"> <li>Community level sensitization on climate change</li> <li>Community-based adaptation to climate change and integrated watershed management</li> <li>Community-managed disaster risk reduction and early warning system</li> </ul>
Who to train	<ul style="list-style-type: none"> <li>Government staff from units at various local institutional levels</li> </ul>	<ul style="list-style-type: none"> <li>Farmer and livelihood groups</li> <li>Farmer networks</li> <li>Community-based organizations including youth groups</li> </ul>
Training approach	<ul style="list-style-type: none"> <li>Training of Trainers (TOT)</li> </ul>	<ul style="list-style-type: none"> <li>Farmer Field School and</li> <li>Agro-Pastoral Field School approaches</li> </ul>
Expected outputs	<ul style="list-style-type: none"> <li>Train or orient 80% of relevant district officials in climate change adaptation and mitigation</li> <li>Develop district climate change adaptation and mitigation plans</li> <li>Establish and activate district early warning system</li> <li>Develop contingency plans to address climate change related hazards</li> <li>Establish district climate change adaptation, monitoring and evaluation system</li> </ul>	<ul style="list-style-type: none"> <li>Train or orient 80% of targeted community groups in climate change adaptation and mitigation</li> <li>Develop community-level climate adaptation plans</li> <li>Develop community-based early warning systems and contingency plans to address climate change-related hazards</li> </ul>

## Outlook

The UN Joint Programme on Climate Change in Uganda is still in the early phase of building partnerships among UN partner agencies and identifying local stakeholders. An in-depth capacity and training needs assessment will help to further improve the design, implementation and evaluation of a full training programme and other capacity development activities.

The remaining challenge is to harmonize the overall implementation strategies of the Joint Programme. For this reason, three thematic task forces have been formed along with the lead UN agencies to coordinate and provide the needed content and process work plans. FAO leads the development and implementation of the district and community training task force.



# REGIONAL EAST AFRICA

## Assessment of carbon stocks for natural resources governance and climate change mitigation

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The African continent is affected by severe land degradation and soil carbon losses, as well as losses of around 4 million hectares of forest each year. Despite this, only 2 percent of voluntary carbon markets payments are made in Africa.<sup>2</sup>

Since access to geospatial data is fundamental for natural resource management and modelling of environmental trends, this project was undertaken to gather available data for the development of an East African regional geospatial database. The targeted data included natural resources such as land use, water resources, forests, rangelands, crops and agro-ecological zoning at subregional, national and local scales, as well as information on carbon stocks and climate change issues.

### Summary

- The development of interdisciplinary geospatial databases is important for determining carbon stock baselines and informing political climate change discussions in East Africa
- During the development of a geospatial database, the interlinkages among natural resource components, climate variability and scale pose challenges for the accuracy of the model
- Building institutional capacities for collection and analysis of climatic and land and forest baseline data at country and regional levels is a prerequisite to set up a transparent carbon monitoring system
- The ways carbon credit may benefit and encourage communities to adopt sustainable land and forest management practices need to be assessed

<sup>2</sup> Food and Agriculture Organization of the United Nations. 2009. State of the World's Forests, Rome, Italy

## Project background

Project title	Development of a land and natural resources database at sub-regional and regional scales
Project type	Regular programme
Project code	SFE-MDT and RAF Regular Budget
Duration of project	From November 2009 and ongoing
Country, location	Ethiopia with Regional Office for Africa (RAF) and Sub-regional Office for Eastern Africa (SFE)
Stakeholders/beneficiaries	Donors and partners, policy makers, NGOs
Implementing organization	FAO SFE multidisciplinary team
Project objectives	Assessment of carbon stocks for planning mitigation and adaptation actions in relation to climate change
Main activities	<ul style="list-style-type: none"><li>• Data collection and analysis</li><li>• GIS database development</li><li>• Modelling and scenario building</li><li>• Carbon stock estimates and economic valuation</li><li>• Assessment of benefit impacts on communities in relation to climate change</li></ul>

## Key messages

### 1. The development of interdisciplinary geospatial databases is important for determining carbon stock baselines and informing political climate change discussions in East Africa

The first major step in designing the Eastern African geo-database was to organize storage, processing and analysis of information needed for different datasets on natural resources, such as land use, water, forests, rangelands, crops and agro-ecological zoning. This broad input has enabled the database to provide accurate baseline data related to carbon stocks which consider various components of land use and farming systems.

Provision of hard data, maps and robust projections of climate change impacts (positive and negative) is essential for strong buy-in from policy-makers and local communities in climate change interventions. Linking biophysical data to social and economic valuation makes it more attractive to these stakeholders.

To understand and respond appropriately to climate change challenges, specialized institutions in various disciplines related to soils, forests, water and crop production need to work together with specialists on community-based approaches.

### 2. During the development of a geospatial database, the interlinkages among natural resource components, climate variability and scale pose challenges for the accuracy of the model

Combining remote sensing and a ground survey with stakeholder's participation seems to be the most adequate method for estimating land-use changes, defining forest types and assessing the level of environmental degradation in relation to climate evolution. The major challenges involve identification of the relevant scale to measure fluxes and stocks of carbon at the local level and determining how this interacts with regional, national and even international environments.

On top of that, not recognizing the interrelationship among land, water, forests and rangelands as components of the environment and their functioning at spatial and temporal scales in seasonal climatic variation could jeopardize the level of accuracy of existing models on carbon stocks calculation and projection.

Another challenge is to determine the minimum scale or area required at which an impact can be measured with respect to carbon sequestration that results in economic and environmental benefits for communities and even for countries.

### 3. Building institutional capacities for collection and analysis of climatic and land and forest baseline data at country and regional levels is a prerequisite to set up a transparent carbon monitoring system

Addressing weak national and regional institutional and technical capacities that hinder the development of necessary reference levels and systematic monitoring systems is an enormous challenge. For instance, in order for mechanisms such as REDD+ to become operational, procedures and tools must be developed to assess historic and future emissions levels, and pilot mechanisms must be tested for setting up a transparent emissions monitoring system at a reasonable cost.

Therefore, the project reviewed, at various scales, the appropriate institutional frameworks and operational methods to develop credible carbon emissions scenarios and monitoring systems which could be used in the dialogue with countries in the Eastern Africa subregion.

#### Box 1: Baseline development for the mountain forest in the Kafa Zone of Southern Ethiopia

A study of the mountain forest type of Kafa Zone in southern Ethiopia was undertaken to demonstrate opportunities to link REDD with Participatory Forest Management (PFM) interventions, using data gathered during the lifetime of the FAO Kafa Sustainable Land Management (SLM) project (2006–2008). The objective was to show the necessity of developing consistent baselines at the early stage of implementation and to promote upscaling of PFM as a means to access REDD funds.

Using low estimates, the potential capital of forest land in the Kafa Zone was evaluated at 2.84 million carbon credits. This indicates that reducing deforestation by 75 percent over ten years could generate USD 34 million.

Judging from the Kafa SLM project experience, the success of REDD implementation will depend on trust and participation of local communities throughout the entire process. PFM seems to be one of the most adequate management unit approaches to fulfil REDD requirements and ensure that local communities can benefit from it.

### 4. The ways carbon credit may benefit and encourage communities to adopt sustainable land and forest management practices need to be assessed

The economic and socio-cultural opportunities for community-based REDD activities need to be explored and the transparent mechanisms for benefit sharing evaluated. It will be important to estimate, and later to monitor, potential impacts of the benefits generated from carbon credits on community SLM practices, taking into account external influences.

To have substantial impact on the environment and improve the livelihoods of many communities, the strategy seems to be towards establishing a coherent corridor of PFMs covering large areas to limit so called “leakages”. Such a strategy will contribute to sustaining forest-based livelihoods and protecting valuable ecosystems, such as wild coffee forests, and preventing potential conflicts with adjacent communities. The FAO Kafa project (see Box 1) supported the implementation of a corridor of 11 PFMs covering around 10 000 ha based on a watershed management approach.

This approach to protecting and managing natural resources sustainably needs to include consideration of current trends such as:

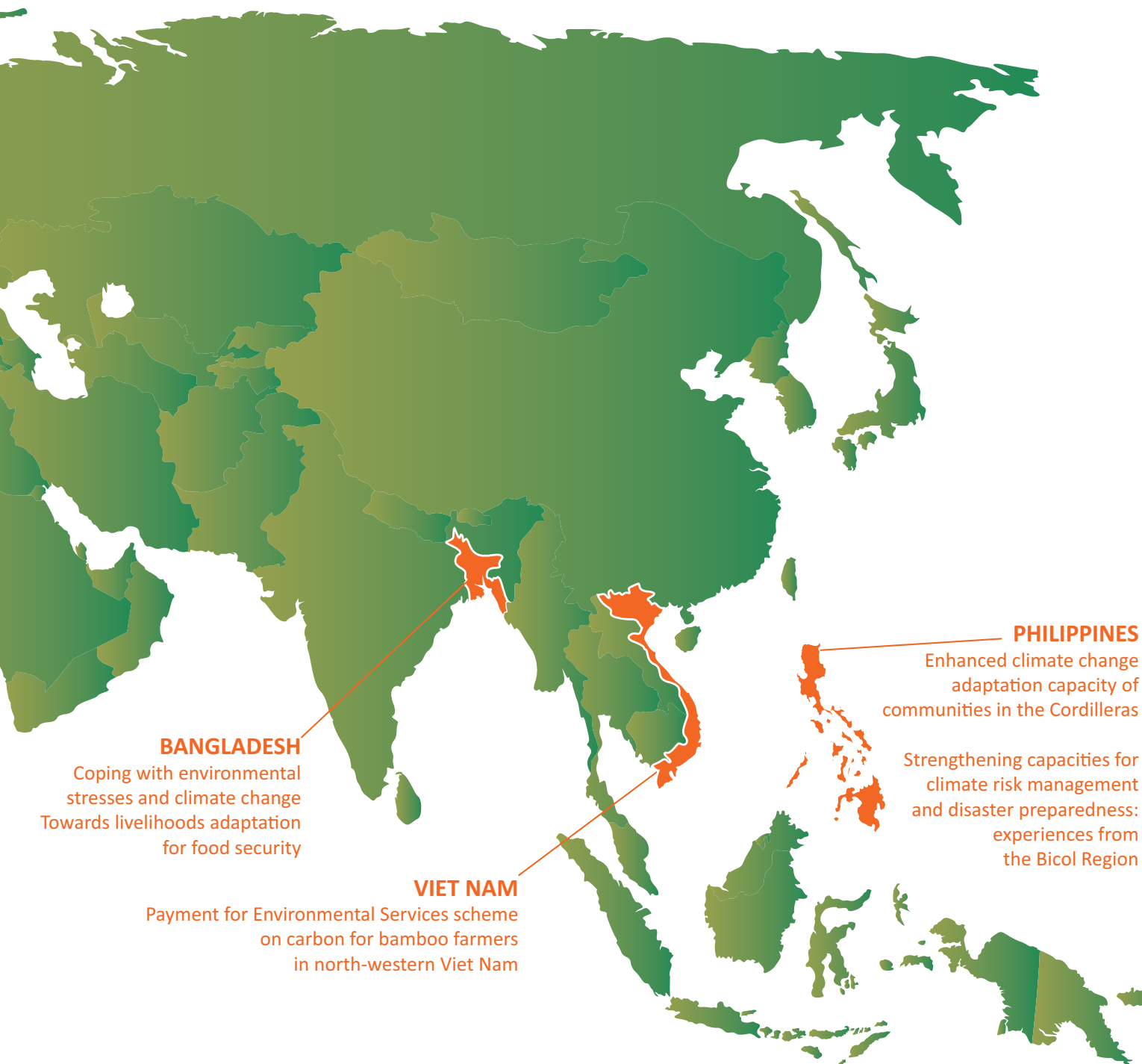
- the growing investor interest in obtaining land for large-scale production, for instance of coffee and tea;
- the risk of fragmentation of unique natural ecosystems;
- the urgent need to develop a coherent management strategy for the entire area.

In this context, PFM and REDD have potential to make important contributions to watershed management and highlight the need to develop a coherent natural resources management strategy including land tenure aspects.

## Outlook

Some future issues for this ongoing project are listed below.

- Development of an accurate baseline database
- Assessment of how benefits from carbon credits and community based mechanisms for coping with climate change can interact and mutually reinforce one another.
- Advancement of advocacy tools to support policy makers in developing appropriate policies
- Move from generalities to more focused and contextual technical tools and best practices



**BANGLADESH**

Coping with environmental stresses and climate change  
Towards livelihoods adaptation for food security

**VIET NAM**

Payment for Environmental Services scheme on carbon for bamboo farmers in north-western Viet Nam

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Enhanced climate change adaptation capacity of communities in the Cordilleras

Strengthening capacities for climate risk management and disaster preparedness: experiences from the Bicol Region

# ASIA







# BANGLADESH

## Coping with environmental stresses and climate change: towards livelihoods adaptation for food security

### Author

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Bangladesh is a low-lying country, highly vulnerable to impacts of climate change and variability, such as drought, floods, river bank erosion and sea level rise. In the context of climate change, farmers face the risk of changes in rainfall patterns and increasing soil and water salinity. Agricultural land in the country is already decreasing by an estimated 1 percent per year, but this is expected to accelerate due to climate change and other environmental stresses.

The Livelihood Adaptation to Climate Change (LACC) project started its activities in the drought-prone areas of northwestern Bangladesh, and then later expanded to the saline coastal areas. Through a “learning by doing approach” and a seasonal fine-tuning of the agricultural packages prepared to increase farmers’ resilience to climate change, the project accumulated a solid understanding of the topic and strengthened capacities of different stakeholders. It maintained a socio-economic focus on environmental stresses that are likely to worsen due to the impact of climate change and their potential effect on rural dwellers and their livelihoods.

### Summary

- Adaptation is a social learning process which needs to be based on the existing local knowledge and on applied scientific research
- Adaptation to climate change is location specific – there is no “one-size-fits-all” solution. Need-driven climate change adaptation technologies have proven to be more easily accepted by the beneficiaries
- An inclusive and participatory mechanism for technology validation, selection and dissemination helps to improve knowledge, skills and attitudes of partner institutions
- Diversification – within and beyond agriculture – is crucial for risk reduction and successful adaptation to climate change
- A solid monitoring and evaluation system helps in fine tuning implementation and targeting, and generates a better understanding of the climate change adaptation technologies
- Environmentally sustainable technologies can have higher costs but also higher poverty reduction potential



## Project background

Project title	Livelihood adaptation to climate change (LACC)
Project type	Component of Comprehensive Disaster Management Programme (CDMP) of the Government of Bangladesh (GoB) and UNDP
Project code	LACC – BGD/01/004/01/99
Duration of project	4 years, 2006-2010
Country, location	Bangladesh – drought and saline prone areas
Web site	<a href="http://www.fao.org/climatechange/laccproject">http://www.fao.org/climatechange/laccproject</a>
Stakeholders	Bangladesh Ministry of Agriculture, Department of Agricultural Extension (DAE), research institutes, NGOs.
Beneficiaries	Dynamic and poor small and medium scale farmers
Implementing organization	FAO and Bangladesh Department of Agricultural Extension
Project objectives	<ul style="list-style-type: none"> <li>To increase livelihood adaptation to climate change in the agricultural sector which encompasses crop, livestock, fisheries, and forestry.</li> <li>To ensure sustainability of the institutional mechanisms to identify and promote suitable and context-specific livelihood adaptation options.</li> </ul>
Main activities	<ul style="list-style-type: none"> <li>Awareness campaigns and social mobilization, targeting a wide range of stakeholders on causes and local impacts of climate change on agriculture.</li> <li>Establishment and institutionalization of seasonal processes of validation of options for climate change adaptation, developed in consultation with local communities, local experts and research community.</li> <li>Field testing of validated climate change adaptation options for rural livelihoods in the agricultural sectors, and assessing the social, economic, agronomic and environmental aspects of the performance.</li> </ul>
Hazards addressed	<ul style="list-style-type: none"> <li>Extreme events: droughts, floods</li> <li>Gradual changes: sea level rise, salinity</li> </ul>

## Key messages

### 1. Adaptation is a social learning process which needs to be based on existing local knowledge and on applied scientific research

Community empowerment and efforts to develop strategies for increasing climate change resilience are facilitated when key messages that increase awareness of farmers are delivered clearly and through participatory learning processes. The LACC project reached around 12 500 farmers through farmer field days, individual demonstrations and joint learning sessions, with messages on the impacts of climate change and the potential for agriculture to adapt and be part of the solution. The project also piloted successful Climate Field Schools (CFS) with regular sessions for more than 18 months to around 100 selected beneficiaries in drought-prone and saline-prone areas.

Agriculture has always been inherently vulnerable to climate-related stresses and therefore farmers have had to adapt continuously. Awareness campaigns have proven effective in passing on simple lessons about climate change and its impacts on agriculture, but if campaigns focus on climate change as the cause of stresses without recognizing natural climate variability, there is likely to be confusion or even frustration. This is especially important when farmers realize that they are likely to suffer the most from the dynamics of climate change although they make only minor contributions to GHG emissions. The project's field experience indicated that such learning sessions risked contributing to an excessive demand for external assistance which, in the worst case, could also create dependence on external technologies, limiting the farmers' motivations to improve their existing skills and capacities to build resilience to climate change.

## **2. Climate Field Schools (CFS) and Farmers Field Schools (FFS): Collective learning has a higher potential for outreach than an individual approach**

Climate Field Schools based on the FFS model were piloted by the project to disseminate knowledge about climate change, its causes, potential impact on livelihoods and local coping strategies. With curricula adapted to address local conditions such as specific climate change-related knowledge and skills, CFSs can help farmers adapt, develop better climate-resilient integrated farming systems and improve their ability to cope with disasters and other environmental challenges. Recognizing that building on existing knowledge has proven more effective, FAO has started a revision of the FFS curricula in collaboration with DANIDA and the government of Bangladesh to focus on building climate change-resilient communities through a new and broader range of topics and methods that integrate agricultural, fisheries and livestock subsectors.

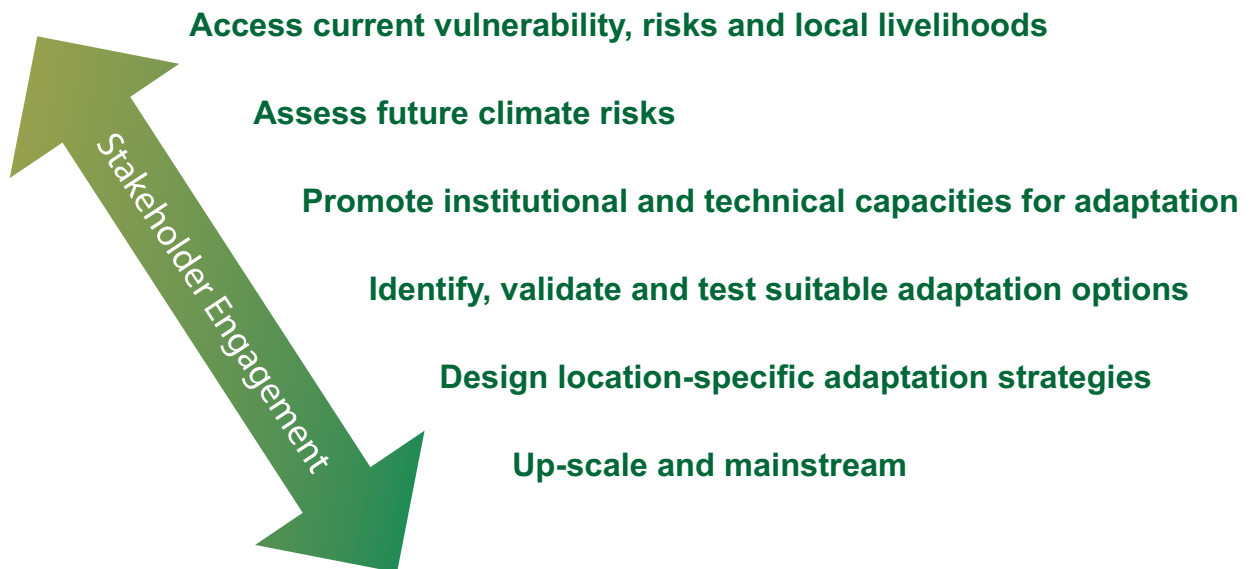
## **3. Adaptation to climate change is location specific – there is no “one-size-fits-all” solution. Need-driven climate change adaptation technologies have proven more acceptable to beneficiaries**

Farmers are generally open to investing in options that address their immediate needs. Thus, climate change adaptation efforts must be context specific and bear in mind that for farmers who have poverty and food security as their main concerns, their priority will be to improve crop production and livelihoods. Farmers express preference for options that address both their general vulnerability and their climate change-related vulnerability – in other words, reduction of both poverty and environmental stresses.

Piloting adaptation strategies is necessary to generate knowledge on how to address seasonal environmental perturbations that farmers perceive to be much more dangerous than medium- or long-term impacts of climate change. Vulnerable farmers have scarce resources and are therefore risk averse. Without adequate information, they are inclined to prioritize solutions to environmental stresses that address immediate problems, such as low rainfall, and may disregard a longer term perspective. Therefore, it is crucial that farmers have information they need to take informed decisions about their investments.

## **4. An inclusive and participatory mechanism for technology validation, selection and dissemination helps to improve knowledge, skills and attitudes of partner institutions**

The participatory process of validating the adaptation options implemented by the project was a successful case of farmers collaborating with institutions. Farmers and local institutions and research institutes suggested options, which were then validated at *upazila* and national levels by the *Upazila* (subdistrict) and National Technical Implementation Working Groups (UTIWG and NTIWG). In order to root the mechanisms in existing institutions, the project maintained a fruitful collaboration with the Union Disaster Management Committees, already operational and an institutional model of which Bangladesh has substantial experience. This participatory mechanism formed a key part of the overall project approach (Figure 2).



**Figure 3: Strong stakeholder engagement in all project activities was a key principle in the LACC project approach.**

### **5. Diversification – within and beyond agriculture – is crucial for risk reduction and successful adaptation to climate change**

To reduce farmer vulnerability to climate-related stresses, which are likely to be exacerbated by climate change, the project found that there was a need to combine adaptation options rather than focusing on single actions. This was also in line with the objective of agricultural diversification. For example, in Bangladesh, homestead vegetable gardening contributes significantly to food security. Vegetables can be grown even on very small portions of land, by landless farmers (including in urban slums), making it a good complementary option to reduce vulnerability through risk diversification. However, gardening requires stability in social factors such as the ability of farmers to preserve seeds for the following season or to generate savings to buy seeds, and in biophysical variables, mainly water availability. Even the most drought-resistant vegetables are often difficult to grow in rainfed systems during the dry season.

### **6. A solid monitoring and evaluation system helps fine-tune implementation and targeting, and generates a better understanding of the climate change adaptation technologies**

The project set up a monitoring system to evaluate how the implemented adaptation strategies performed against ideal requirements. The monitoring system was continuously adapted to evolving circumstances during the course of the implementation process.

The climate change adaptation strategies were analyzed against the following criteria:

- suitability to the agro-ecological context and local growing season;
- capacity to have a positive impact on the socio-economic environment – and contribute to reducing general social vulnerability;
- capacity to increase the resilience of the farmers and the capacity to cope with unfavourable environmental stresses and risks of climate change impacts – and decrease climate change-related vulnerability;
- capacity to mitigate climate change – by reducing or maintaining current levels of GHG emissions and/or sequestering carbon in soils or biomass.

## 7. Environmentally sustainable technologies can have higher costs but also higher poverty reduction potential

A climate change adaptation option needs to be suitable to the agro-ecological context but also to farmers' needs. The project found a much higher chance of options being replicated by the farmers with their own resources when the potential for short- or medium-term gains was clear, such as in these examples of "win-win" options:

- utilizing improved cooking stoves allows households to reduce the fuel required to cook by up to 50 percent;
- installing biogas plants improves the quality of cooking, saves fuel wood and does not reduce the quantity of organic fertilizers from manure;
- planting fruit trees at the side of the road increases the income of the community and contributes to carbon stock.

### Outlook

Some main considerations can be drawn from the experience.

- The project successfully strengthened local knowledge through linkages with scientific institutions, thereby contributing to bridging the gap between the needs of the farmers and research. In order to complete the circle – and further strengthen the capacities of farmers – the lessons learned through the piloting process should be returned to the farmers. This also would allow better tailoring of technologies to farmers' needs.
- More effective means of knowledge transfer from the project to implementing partners (the extension agents) should be put in place in future initiatives.
- The project developed a solid validation mechanism to promote adaptation options among rural dwellers, and built a base through which to transfer knowledge and skills to the partner institutions and to stimulate a continuation of the activities beyond the life of the project. The inclusive and participatory structure is a model that can be adapted to other contexts.





# PHILIPPINES

## Enhanced climate change adaptation capacity of communities in the Cordilleras

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Climate change projections for the Philippines include increasing mean temperatures, with wet seasons getting wetter and dry seasons getting drier. Agriculture, forestry and other land-use sectors in the fragile mountain and lowland ecosystems of the Philippines Cordillera Region are very vulnerable to climate change. Thus, identification, documentation and dissemination of good practices for adaptation to climate change in two Cordillera provinces – Ifugao and Benguet – have been the focus of the project “Enhanced Climate Change Adaptation Capacity of Communities in Contiguous Fragile Ecosystems in the Cordilleras”. The project is a subcomponent of the programme: “Strengthening the Philippines’ Institutional Capacity to Adapt to Climate Change (SPICACC)”, which is a joint undertaking of the UN, Spain and the Philippines.

The expected outputs of the subcomponent include improved climate change adaptation strategies in the Cordilleras and a tested approach replicable for the whole country. At the heart of the component is the principle of bridging local and scientific knowledge through pilot demonstrations in communities.

Ifugao and Benguet were chosen as pilot sites primarily for their wealth of indigenous practices, but also because of the disaster risks in the area, the commitment of local government actors, presence of state universities and colleges capable of conducting studies, and of organizations to contribute to the project.

### Summary

- Effective mechanisms for stakeholder collaboration were crucial for successful programme implementation
- Participatory project site identification strengthens the sense of local ownership, but the approach has limitations
- Climate change adaptation can build on local best practices
- National climate change scenarios need to be translated for local application in the agricultural sector and linked to local observed impacts

## Project background

Project title	<ul style="list-style-type: none"> <li>Strengthening the Philippines' Institutional Capacity to Adapt to Climate Change (SPICACC): Outcome 3.1: Enhanced Climate Change Adaptation Capacity of Communities in Contiguous Fragile Ecosystems in the Cordilleras Project</li> </ul>
Project type	Subcomponent of a UN Joint Programme under the Spanish MDG-Fund.
Project code	UNJP/PHI/054/SPA
Duration of project	3 years, 2009-2012
Country, location	Philippines
Web site	<a href="http://www.e-extension.gov.ph/climatechange">www.e-extension.gov.ph/climatechange</a>
Stakeholders	<ul style="list-style-type: none"> <li>Local government units of Benguet and Ifugao Provinces, Cordillera Administrative Region (provincial, municipality and barangay level)</li> </ul>
Beneficiaries	Local communities, in particular agricultural producers in the project area, benefitting from field demonstrations, awareness raising and capacity development activities.
Implementing organization	In the larger JP, implementing actors are nine agencies from the Government of the Philippines and six UN Agencies. The subcomponent is implemented by the Philippine Department of Agriculture, assisted by FAO.
Project objectives	<ul style="list-style-type: none"> <li>Develop intersectoral, rights-based and gender-adapted adaptation approaches including "no regret" measures in contiguous mountain forest and lowland agriculture ecosystems.</li> <li>Test innovative adaptation measures and technologies for agriculture, water and watershed management including biodiversity conservation</li> </ul>
Main activities	<ul style="list-style-type: none"> <li>Assess vulnerability and adaptive capacity in the Cordilleras in terms of agriculture, water resources and forestry and biodiversity resources.</li> <li>Develop community-based climate variability and vulnerability assessment tools.</li> <li>Local consultation among farmers and other major stakeholders to identify and prioritize "no regrets" adaptation options.</li> <li>Field-test and document climate change adaptations measures including indigenous and good practices, and "no regret" options.</li> </ul>
Hazards addressed	<ul style="list-style-type: none"> <li>Extreme events: droughts, floods and typhoons.</li> <li>Gradual changes: shifts in seasons, distribution of pests and diseases.</li> </ul>

## Key messages

### 1. Effective mechanisms for stakeholder collaboration were crucial for successful programme implementation

In this UN Joint Programme, responsibilities are divided among nine agencies of the Government of the Philippines and six UN agencies. This large number of implementing actors and interventions – scaling from national to community level – required the establishment of effective mechanisms for stakeholder collaboration. Means to foster linkages among the project components and subcomponents that were successful in the programme included rotating the location of the Interagency Programme Management Committee meetings and setting up a joint knowledge management strategy.

However, even within the subcomponent implemented by the Department of Agriculture and FAO, an effective mechanism for stakeholder engagement had to be developed. A National Project Steering Committee oversees the project and Project Component Management Teams run implementation at national and regional levels, with technical advice of several national FAO consultants. Further, memoranda of understanding were signed with provincial local government units and the eight municipal local government units at the pilot sites to create local working groups (LWGs) at the municipal level. They have played a central role in local identification, validation and implementation of adaptation options for each season. To bring in innovative technologies, various research institutes and state universities

have also been engaged through a regional working group and letters of agreement. A fulltime project coordinator facilitates communication between all stakeholders and ensure timely delivery. The project activities so far have shown that this setup is effective.

## **2. Participatory project site identification strengthens the sense of local ownership, but the approach has limitations**

Regional and provincial project areas were identified in the planning phase. Selection of specific municipalities and the village-level (*barangay*) administrative units for establishment of field demonstrations was handled by local government units (LGUs), assisted by the Department of Agriculture. At the municipal level, a workshop was held to set criteria for site selection and rank municipalities accordingly. Criteria included: (i) vulnerability (biophysical and socio-economic), (ii) commitment level of local collaborators, (iii) representation of fragile ecosystems (high, middle, low elevation), (iv) occurrence of indigenous and innovative adaptation practices, and (v) accessibility and visibility for field demonstrations. The workshop identified three municipalities in each of the two provinces, representing high, medium and low elevation. While this process allowed early engagement and strong ownership of local stakeholders, it also meant there was potential for frustration of non-selected municipalities and for interference due to political interests of local politicians and project leaders. *Barangay*-level sites were selected by the LGUs based on a similar set of criteria. At the local level, particular priority was given to areas with existing farmer organizations. The project did not, however, look into planned interventions of other projects in the area. As a result, three project sites overlapped with those of an IFAD community-based project. The IFAD-project was not focusing on climate change but had a similar approach which could confuse farmers and risk exhausting time resources of local stakeholders.

## **3. Climate change adaptation can build on local best practices**

To document local solutions for survival in different seasons, a series of workshops was carried out. The workshops found that community members had observed unusual changes in weather patterns and climate-related impacts that were greatly affecting their livelihood activities and natural resources (Table 2). Workshop results also showed that villagers had indigenous management systems or farming practices that they used under erratic conditions or abnormal situations which are not necessarily linked to climate change but nevertheless may function as adaptive measures. However, the existing local solutions may be insufficient in some regards and more innovative options needed, which would require strong engagement of research actors for integration of local and scientific knowledge.

## **4. National climate change scenarios need to be translated for local application in the agricultural sector and linked to local observed impacts**

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) developed national climate change scenarios using the PRECIS climate modelling system which generates high-resolution climate change information and is freely available to groups in developing countries. Its projections for mean temperature indicate a likely increase of 0.9–1.1°C by 2020 and 1.7–2.2°C by 2050, with wet seasons expected to get wetter and dry seasons drier. Scientists associated with the project translated the seasonal climate changes into crop yield probabilities and determined an optimal cropping calendar and commodity mix of crops, livestock, fish, etc., at the household level under different seasonal climate scenarios. In addition, the project provided a simple climate risk and vulnerability assessment tool for the LGUs.



**Table 2:** Farmers observations of climate change impacts

Phenomena	Locally observed impacts of climate change on farming
Drought	<ul style="list-style-type: none"> <li>• Prolonged dry season starting earlier, springs and rivers being dry</li> <li>• Scarcity of water supply for irrigation</li> <li>• Decreased quality of fruits and vegetables (abnormal sizes, unpalatable)</li> <li>• Short panicle on crops (rice, tiger grass), stunted crops and animals, poor yields (corn, vegetables, rice)</li> <li>• Low/medium elevation: No planting due to drought, cracking of rice paddies</li> <li>• Medium elevation: Drought increases earthworm populations through better aerated soils contributing to erosion of terraces wall and irrigation system</li> <li>• High elevation: Life span of plants becoming shorter</li> </ul>
Changes in rainfall	<ul style="list-style-type: none"> <li>• Irregular rainfall – best planting season of crops such as pineapple uncertain</li> <li>• Late start of rainy season – short season affects planting time and leads to low yields</li> <li>• More heavy rainfall and deforestation – leads to floods, erosion, landslides and field siltation</li> </ul>
Typhoons and floods	<ul style="list-style-type: none"> <li>• Three successive years of strong typhoons</li> <li>• Typhoon duration increased from 1–2-day to 3–7 days. and typhoon season expanded to include December and January, causing increased water contamination, destruction of cash crops and inaccessible roads, and more flooding and soil erosion during wet season</li> <li>• Local people are no longer able to predict typhoons. At high elevations typhoons were traditionally predicted through the appearance of rainbows, or of “killing nasack” birds, usually the last week of October, or when crabs were observed at the foot of the mountain trail, but this is no longer sufficient.</li> </ul>
Changes in temperature	<ul style="list-style-type: none"> <li>• More temperature fluctuation</li> <li>• Higher temperature than previous years, even extreme heat in mornings, causing:</li> <li>• changes in flowering, e.g. fruit trees flowering in early January instead of May/June at low elevations, sunflowers that bloomed in the summer are disappearing at medium elevations</li> <li>• new insect pests and diseases, e.g. banana pest (low elevations), poultry disease (medium elevations), brown and green grasshoppers in rice fields (high elevations)</li> <li>• changes in habitat, e.g. lowland fruit trees such as mango now grow and bear fruit in the highlands; animals from low lying areas can now adapt in the highlands (e.g. cobra snakes); sayote and tomatoes bear fruit in highlands due to warmer weather and arrival of non-highland insect species</li> <li>• increased health problems, skin diseases for humans and animals, resulting in reduced labour availability</li> <li>• Lower temperature than previous years, frost in new locations, at new times and more irregularly (medium/high elevations)</li> </ul>

## Outlook

Monitoring and evaluation on the effectiveness of the implemented adaptation options will continue to be a key activity. While the first set of field demonstrations mainly focused on “no-regret” options, the 2010/11 dry seasons and the next cycles will include more innovative options. They will build on improved information on vulnerabilities generated by the project and expected local impacts of climate change.



# PHILIPPINES II

## Strengthening capacities for climate risk management and disaster preparedness: experiences from the Bicol Region

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The Bicol Region of the Philippines is vulnerable to numerous natural disasters, from typhoons that hit up to 20 times a year to volcanic activity. Flooding and landslides are common. The Albay provincial government has been pro-active in promoting climate change adaptation not just in the province but in the whole country.

The project “Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines (Bicol Region)” works with national and local governments to improve their ability to manage climate risks and promote preparedness. This includes validating and documenting indigenous farming practices and coping mechanisms in order to determine if they are replicable and, if so, presenting them in other areas as good practice options.

### Summary

- Indigenous early warning systems, farming practices and coping mechanisms used by farmers and fishers must be scientifically documented and evaluated, to be considered for replication
- Agricultural technologies and sound policy directions, when adapted to current social and environmental contexts, are equally important responses to climate change
- Identification, prioritization and selection of good practices for implementation should always include involvement of concerned stakeholders to give them accountability and sense of ownership of the climate change adaptation and mitigation efforts
- Communities must be aware of their current vulnerabilities and future climate risks to instigate adaptation and risk mitigation measures effectively

## Project background

Project title	Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines (Bicol Region)
Project type	Technical Cooperation Project
Project code	(TCP/PHI/3203)
Duration of project	2 years, 2009 - 2010
Country, location	Bicol Region, Philippines
Web site	<a href="http://www.da.bicol.gov.ph/">http://www.da.bicol.gov.ph/</a> ; <a href="http://www.fao.org/climatechange/ph/bicol/">http://www.fao.org/climatechange/ph/bicol/</a>
Stakeholders/beneficiaries	270 farmers and fisherfolk from three provinces, three municipalities and nine villages ( <i>barangays</i> )
Implementing organizations	FAO; Philippine Department of Agriculture in collaboration with Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Bicol University and Central Bicol State University of Agriculture (CBSUA)
Project objectives	<ul style="list-style-type: none"> <li>• Enhance the institutional and technical capacities within the Department of Agriculture (DA), PAGASA of the Department of Science and Technology (DOST), and of local institutions to improve their management of climate related risks and promote local level preparedness against recurrent natural hazards such as typhoons, floods and drought.</li> <li>• Improve the livelihood resilience and food security of farmers and fisher folk who are highly vulnerable to frequent extreme climatic events by keeping them involved in the planning process and informed of the risks that may occur.</li> </ul>
Main activities	<ul style="list-style-type: none"> <li>• Workshops and planning meetings for identification and implementation of good practice options</li> <li>• Participatory selection of priority <i>barangays</i> and beneficiaries</li> <li>• Situational assessment</li> <li>• Documentation of good practice options for enhanced disaster risk reduction and climate change adaptation</li> <li>• Capacity building of project implementers, project beneficiaries and other stakeholders</li> <li>• Project implementation, monitoring and evaluation</li> </ul>
Hazards addressed	Extreme events: typhoons, floods, droughts

## Key messages

### 1. Indigenous early warning systems, farming practices and coping mechanisms used by farmers and fishers must be scientifically documented and evaluated to be considered for replication

In the validation and documentation of good practice options conducted in the three provinces of the Bicol region, it was observed that farmers have their own strategies and approaches for dealing with extreme climate events such as droughts and typhoons. In Catanduanes Province, there were several early warning systems that had been documented by a previous FAO and AECID project that could potentially be replicated, but require thorough evaluation to determine their reliability. For example, during typhoons, the indigenous Aetas use temporary shelters or *kurobs*, made of wood and leaves where they can live and store their food, livestock and poultry. This adaptation practice could be modified and replicated using available construction materials in other communities with high vulnerability to typhoons.

Similarly, the El Niño phenomenon that cyclically affects the agriculture sector in the Philippines has prompted some farmers in Buhi, Camarines Sur, to *ratoon*, meaning they let existing rice plants produce grains again instead of replanting, despite an expected decrease in yield. They consider it too risky to plough and replant because of the threat of water stress associated with El Niño. Replanting would offer a chance for higher yields but with the risk of nearly complete crop failure.

## **2. Agricultural technologies and sound policy directions, when adapted to current social and environmental contexts, are equally important responses to climate change**

For adapting agriculture to climate change, the implementation of climate-smart technologies is a key activity. However, this should be set in the current social and environmental contexts in congruence with sound policy directions. These factors, often dealt with separately, are equally important components that should be integrated across sectors to improve adaptive responses of local communities.

Current efforts to mainstream climate change adaptation and mitigation in the programmes and projects of the Department of Agriculture among others, are highly dependent on the cooperation and support of local government units that carry out the direct implementation. Likewise, the full collaboration and involvement of local leaders are necessary to realize policy objectives in terms of promoting technologies that will combat the adverse effects of extreme weather events. Local leaders have the responsibility to enact regulations and be proactive in the preparation of climate-proofed programmes and projects. They will only be able to fulfill this function if they are advised about potential actions they can take in policy and development planning and are properly informed of associated risks.

The Albay provincial government has been pro-active, promoting climate change adaptation, not just in the province but in the whole country. Key achievements include the Albay Declaration on Climate Change Adaptation, which resolved to mainstream climate change into local and national development policies. It has the following major resolutions: (a) prioritize climate change adaptation in local and national policies; promote “climate-proofing” development; (b) advocate the creation of oversight bodies in the government; (c) mainstream climate change through local and regional partnerships for sustainable development; (d) support information, education, and communication, and research and development; (e) source out funds for activities and programmes that will directly benefit local communities; and (f) promote environmentally sustainable practices. Further, Albay is the only province in Bicol that has an operational management office to coordinate the various stakeholders towards promoting efficient intervention on disaster preparedness and emergency response. This set-up has made it easier for the different collaborating institutions implementing the project to build cooperation and participation with local stakeholders.

## **3. Identification, prioritization and selection of good practices for implementation should always involve concerned stakeholders to give them accountability as well as a sense of ownership of the climate-adaptation and mitigation efforts**

Being presented with good practices options can be very helpful for farmers and fisherfolk whose livelihoods are being threatened in the context of climate change. Under the project, they have been given practical choices for their consideration. The involvement of all stakeholders in the selection and identification of technology options, specifically for potential implementers of the technologies, has been important. Their participation in the planning and validation processes has enabled them to understand the technology fully as well as to develop a sense of ownership, which makes technology transfer easier.

The project implementers determined that it was important to note the differing perceptions of farmers regarding the options identified. They then used the documented perceptions in the prioritization and selection process. Although this process was very tedious, in the end the output (a priority list of interventions), reflected the perspectives of stakeholders as well as local suitability of technologies in terms of adaptation and risk mitigation objectives. Thereby, a sound justification of the decisions had been obtained. The involvement of stakeholders also showed that farmers’ attitudes play an important role in the success of technology pilot farms. Although the “attitude” factor is usually not covered in the selection criteria, it can mean success or failure in the implementation of the project. Moreover, adoption costs and other social implications that must be borne by the target beneficiaries were assessed through dialogues and consultations with stakeholders. These activities helped the implementers in selecting farmers for pilots and for clarification of the role of the stakeholders involved in the project.

#### 4. Communities must be aware of their current vulnerabilities and future climate risks to instigate adaptation and mitigation measures effectively

Bicolano farmers and fisherfolk have traditionally had to be resilient to climate hazards, as the region is frequented by about 20 typhoons a year and also faces the El Niño and La Niña phenomena. Although their inherent resilience has led them to adopt pragmatic and practical adaptation approaches, the current threat posed by climate change means that vulnerable farming communities will face an increase in the incidence of extreme climate-related events. Their involvement in awareness campaigns and planning stages of project implementation has given them a realistic view of their situation, including an introduction to current climate models of potential hazard frequencies, vulnerability, risks and threats to their livelihoods. They have also been given a choice of adaptation options.

At the same time, seminars and workshops have provided project implementers with the knowledge and skills to recognize and appreciate the capacity of participants (e.g. farmers and *barangay* officials) to analyze the hazards affecting their locality. This capacity has been strengthened by providing tools in community-based disaster risk management and vulnerability assessment. The project approach has ensured that the beneficiaries have participated actively in providing suggestions and recommendations on planning for adaptation measures as well as in validating the findings of researchers and consultants.

#### Outlook

With the project underway and the above efforts and initiatives recognized by local and national stakeholders, the next steps are to determine:

- what needs to be done in order to refine and effectively apply, mainstream and document the activities;
- how to replicate the activities deemed to have potential for broad application, so they can serve as the bases of subsequent efforts in the disaster risk management programmes in other concerned provinces, municipalities and *barangays* in the Bicol Region.



# VIET NAM

## Payment for Environmental Services scheme on carbon for bamboo farmers in northwestern Viet Nam

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Bamboo plants have a high ability to sequester carbon rapidly in both above-ground biomass and extensive root systems. Therefore, the possibility of commercializing carbon offset credits from bamboo forests is promising. This was well demonstrated by an FAO-supported fact-finding mission and preliminary calculations carried out in July 2009. The findings were supported by scientific research results from China, distributed by the International Network for Bamboo and Rattan (INBAR).

In the context of climate change mitigation, Viet Nam may soon follow the example of Cambodia and the Philippines and change its forest definition to include bamboo and palms. Once this national decision has been communicated to the UNFCCC (CDM Executive Board), CDM afforestation and reforestation projects become technically possible. At field level, the FAO office in Cambodia is supporting Cambodia in accessing carbon markets through a Community Forestry Project, which develops methodologies for setting baselines and monitoring systems for carbon in bamboo forests and, at a later stage, to sell the carbon offset credits to markets. Outcomes of these efforts may be also applicable for Viet Nam.

### Summary

- For bamboo carbon projects to be financially viable, additional financing is required and minimum planting scales need to be adhered to
- Integrated bamboo carbon projects can offer multiple benefits in terms of carbon sequestration, carbon credit generation, provision of food security, manufactured products and green electricity
- For bamboo planting activities to be eligible for carbon finance, diligent planning is required by the government
- Local schemes for payments for environmental services (PES) can be useful financial instruments to support bamboo carbon projects and distribute funds to beneficiaries

## Project background

Project title	Establishing a Payment for Environmental Services scheme on carbon for bamboo farmers in north-western Viet Nam
Project type	Feasibility study
Project code	N.A.
Duration of project	3 months in 2009, followed by a programming mission and project submission in 2010 as part of a regional Bamboo Carbon Programme
Country, location	Viet Nam, north-western provinces
Stakeholders/beneficiaries	Smallholders with bamboo activities, NGOs, carbon trade developers, Government of Viet Nam
Implementing organization	FAO with local partners
Project objectives	Define the feasibility and a viable structure of a pilot bamboo carbon project in Viet Nam for submission to donors
Main activities	<ul style="list-style-type: none"><li>• Assessment of bamboo-based activities qualifying for carbon markets.</li><li>• Ground truthing and calculation on the potential of bamboo carbon for generating farm-based income.</li><li>• Conceptualizing of Bamboo Carbon Project models in the CDM, VCM and REDD+ frameworks.</li><li>• Design a Payment for Environmental Services (PES) scheme to operate the carbon project in communities.</li></ul>

## Key messages

### 1. For bamboo carbon projects to be financially viable, additional financing is required and minimum planting scales need to be adhered to

Carbon trade requires an initial investment of USD 150 000–250 000 per project, an amount that is rather independent of the size of the activity. That cost can be lowered if a competent local project developer is engaged. Bamboo planting cost is high, and the anticipated carbon income will not be sufficient to compensate farmers fully. Financing for actual establishment of plantations will always need to draw on other sources, unrelated to carbon. Bridge funding from the government, donors or private sources will be required to start up. Assuming that the planting costs can be covered by grants or pre-project financing, a minimum planting scale of 4 000 ha/yr of bamboo would provide an opportunity to generate revenue at a significant scale from the sale of carbon credits. However, this threshold could be lowered by including other activities acceptable in the voluntary carbon markets (VCM).

### 2. Integrated bamboo carbon projects can offer multiple benefits in terms of carbon sequestration, carbon credit generation, provision of food, manufactured products and green electricity

Afforestation or reforestation activities can be carried out in combination with multipurpose use of existing bamboo culms. This is to avoid carbon emissions when bamboo culms begin to decay after eight years. Around 3 200 culms can be harvested per hectare each year, depending on the species. This harvesting stimulates the natural regeneration of bamboo through new root expansion and shooting, whereby total productivity is improved. In the voluntary carbon markets, carbon stored in finished bamboo products intended for long-term use, likewise in harvested wood products, can generate carbon credits. In addition, waste from processing and harvesting dead culms can be utilized in generating green electricity. Replacing electricity from fossil fuels with bamboo biomass-based electricity is yet another source of carbon offset credits. Having an integrated bamboo carbon approach across the supply chain improves food security and the economic viability of the project.

### **3. For bamboo planting activities to be eligible for carbon finance , diligent planning is required by the government.**

Sufficient planting scale and fulfilled additionality requirements for carbon finance eligibility are currently only achieved in new or on-going government-funded programmes. Old government planting programmes cannot be easily retrofitted into carbon projects. Only newly designed programmes with distinct funding sources would pass an additionality test and be eligible for carbon finance. The total area of degraded and other forest lands suitable for bamboo planting ranges from 11 000 ha in Quan Hoa district and up to 90 000 ha in Thanh Hoa province. Their replanting is a stated objective. The applicable government funding programmes for planting were not, however, performing up to their goals in the area. If large-scale bamboo planting initiatives are promoted for carbon finance by the Vietnamese government, carbon finance will need to be integrated from the beginning into the planning process, significant efforts taken to identify eligible lands and the required technical and organizational infrastructure set up.

### **4. Local schemes for payments for environmental services (PES) can be useful financial instruments to support bamboo carbon projects and distribute funds to beneficiaries**

Local schemes for Payments for Environmental Services (PES) can be institutional models to support bamboo carbon projects and distribute funds to beneficiaries. A PES scheme would provide a robust system for accruing carbon income from afforestation, reforestation or other activities on bamboo, and distribute it fairly to alleviate poverty among participating farmers.

Beneficiary commitment will depend on the inputs versus rewards, and on opportunity costs. In order to make this work, institutions including a PES local entity, model contracts, a registry and a fund are needed. These structures can then administer carbon credit transactions, payouts to farmers, and liability issues between farmers.

## **Outlook**

The project has been amalgamated into a regional South-East Asian Bamboo Carbon programme proposal submitted to a donor at the end of 2010. The fact that Cambodia and the Philippines have already included bamboo in their forest definitions makes them logical participants in the programme, which Viet Nam would join in due course.

In short, the regional programme adopts a supply chain approach in generating measurable climate change benefits from bamboo. It would develop green bamboo supply chain incubators to enhance the economic and environmental benefits by locking carbon into bamboo products and neutralizing emissions, and to demonstrate bamboo's climate benefits through reforestation. Bamboo processing waste and biomass incineration through improved gasifier technology would be demonstrated in order to switch local electricity generation from fossil fuels to biomass.

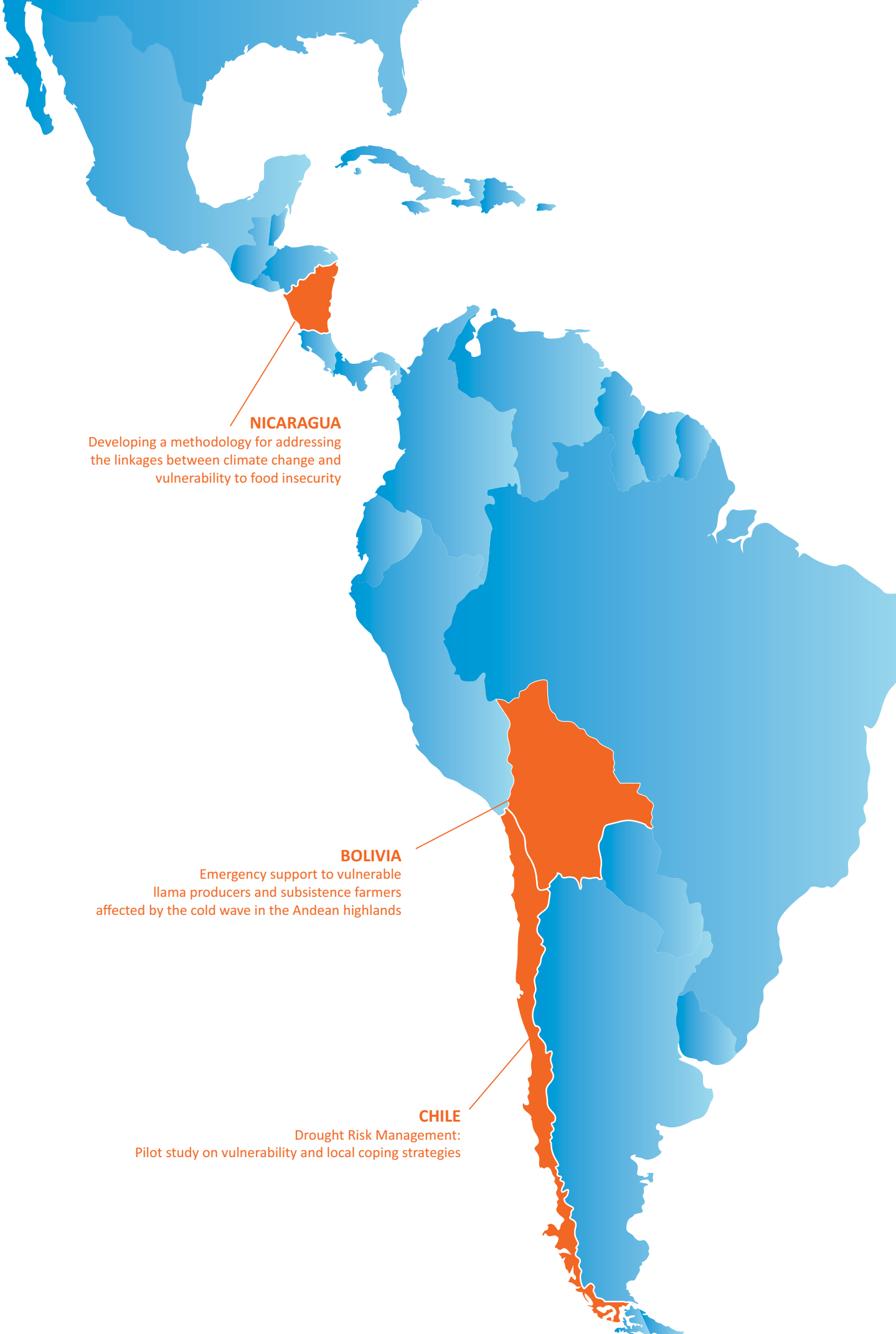
Although there are existing CDM, VCM and REDD+ methodologies that cater to the programme activities, some of them do not fully address the particular conditions around bamboo production. A proven methodology will be developed and adopted to establish reference emission levels (RELS) and "Bamboo Inventory and Carbon Accounting Methodology" for monitoring, reporting and verification (MRV) purposes.

The Programme will work through four main components.

- Resource base quantification and carbon accounting methodologies
- Establishment of bamboo enterprise incubators and new value chains
- Strategies for bamboo biodiversity conservation in plantations
- Payment for Environmental Services schemes from bamboo activities

Accessing carbon markets from activities along the bamboo supply chains would set an important precedent as countries are considering their strategies on CDM, VCM, and REDD+. FAO is supporting countries in establishing MRV systems through UN-REDD as a preparation for REDD+ implementation. The regional programme is strategically positioned to demonstrate the benefits of bamboo integration in climate change mitigation work and produce valuable experiences to inform international policy processes.





**NICARAGUA**

Developing a methodology for addressing the linkages between climate change and vulnerability to food insecurity

**BOLIVIA**

Emergency support to vulnerable llama producers and subsistence farmers affected by the cold wave in the Andean highlands

**CHILE**

Drought Risk Management: Pilot study on vulnerability and local coping strategies

# LATIN AMERICA







# BOLIVIA

## Emergency support to vulnerable llama producers and subsistence farmers affected by the cold wave in the Andean highlands

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In the winter of 2008, a combination of erratic climatic patterns coupled with plant and animal pests and diseases led to significant damages to food crops and natural pastures in the Andean uplands of Bolivia. As a result, livelihoods of the most vulnerable population, both livestock (llama) breeders and small farmers living above 3 500 m above sea level were severely affected.

FAO emergency support recognized the importance of ensuring that any emergency response activities have sustainable results. Interventions therefore included training livestock owners on how to maintain their herds in optimal health, activities for optimal sowing and cultivation, and training on appropriate harvest techniques before the occurrence of the first frost and drought. The project also specifically extended its timeline to cover the agricultural seasonal calendar, and introduced solutions for adapting to climate change that combined technological activities with traditional local knowledge. Ten graduate university students provided support with research on how to mitigate the negative effects of the cold wave on agricultural systems at high altitude conditions. The result was both social and economic success, with the project achieving prospectively sustainable results and implementing principles to guide future activities.

### Summary

- Emergency projects must have a longer time horizon to promote resilience against future disasters
- An integrated pre-project analysis and participatory process is essential to allow successful interventions
- Risk management and early warning systems are key service mechanisms to reduce disasters
- Local authorities have to lead preventive actions

## Project background

Project title	Emergency support to vulnerable llama producers, and subsistence farmers affected by the cold wave in the Andean highlands of Bolivia
Project type	Office for Special Relief Operations (emergency project)
Project code	OSRO/BOL/803/EC
Duration of project	1 year, 2008-2009
Country, location	Bolivia, High Mountain Andean Region
Web site	www.fao.org.bo
Stakeholders	Implementing partners and local authorities
Beneficiaries	9 100 families in subsistence farming and llama breeding communities, located at least 3 500 m above sea level. All were within the lowest Human Development Index quintile, characterized by high prevalence of infant malnutrition and poverty.
Implementing organization	FAO Bolivia
Project objective	<ul style="list-style-type: none"><li>• Improve the livelihoods of llama breeders and subsistence farmers in the Andean highlands of Bolivia.</li><li>• Increase resilience to recurrent cold waves, which may be worsened by climate change.</li></ul>
Main activities	<p><b>Livestock:</b></p> <ul style="list-style-type: none"><li>• 4 755 llama breeder families benefited from the project activities through corral constructions, production of dry hay forage, improved llama nutrition, forage seed distribution, deworming programmes and training in livestock management techniques</li></ul> <p><b>Agriculture:</b></p> <ul style="list-style-type: none"><li>• 4 435 subsistence farmers benefited from agricultural activities, including improved production and seed distribution of potato, quinoa, barley, triticale and oat. Organic fertilizers were produced through locally built bio-digesters</li></ul>
Hazards addressed	Extreme events: cold waves

## Key messages

### 1. Emergency projects must have a longer time horizon to promote resilience against future disasters

Emergency projects, including those focusing on recovery of agricultural production, traditionally have very short time perspectives. In some cases, they do not even cover the whole agricultural calendar. This diminishes the potential for sustainable results and judicious use of the knowledge obtained in the project, such as determining how to build from what is learned during the emergency response and apply it to other situations. For emergency projects to be successful in supporting beneficiaries to face recurrent types of damages caused by climate change, they have to strengthen local capacities and plan for interventions to have sustainable outcomes.

The project, addressing cold waves in the fragile ecosystem of the Andean highlands of Bolivia, was planned keeping this in mind, and therefore focused on ensuring sustainability. It introduced special agreements with local municipalities and other social organizations for maintenance of equipment. For farmers, the project created rotating funds for providing seeds – a kind of seed bank – administered by farmers' associations and technical staff of the municipalities. For llama breeders, it introduced three livestock management activities: de-worming, supplying mineral salts and the implementation of maternity corrals which greatly decreased incidence of animal disease, leading to animal mortality rate decreasing from 42 percent to 5.5 percent in almost 15 000 female llamas included in this project. This is a good example of integration of shorter and longer term assistance, helping farmers survive an emergency at the same time as building resilience to future shocks and increasing understanding of future development needs.

## 2. An integrated pre-project analysis and participative process is essential to allow successful interventions

A thorough pre-project analysis is an essential foundation for successful interventions. A unified strategy to define underlying problems and evaluate emergency damages in several sectors, including health, transport, housing and agriculture, is needed to inform formulation of the project proposal and planning of interventions. A participatory process that includes all key actors during the formulation of the project is also necessary for the success of interventions, but it must be conducted appropriately. During the implementation of project activities, the project gave particular importance to capacity building via the work of community promoters, ensuring that communities were receptive to messages in order to ensure sustainability of the project's assistance to agricultural practices.

## 3. Risk management and early warning systems are key service mechanisms to reduce disasters

Instead of waiting for the consequences of a disaster that could be avoided or mitigated, risk management focuses on preventive measures. To manage the recurrence of natural disasters generated by climate change, especially in the highlands where most subsistence farmers live, early warning systems are important components in disaster risk management and risk reduction strategies in vulnerable communities. Implementing early warning systems that include the participation of women and men of all ages in the affected community can be appropriate for harnessing the capacities of the population. Other risk management activities included the creation of seed banks, as mentioned above, and building capacity of local actors to manage disaster impacts. The strategy should be to link emergency support for subsistence households to strategic frameworks in order to ensure sustainable results and replicability of successful interventions.

## 4. Local authorities have to lead preventive actions

Sound disaster management involves preventive actions to avoid loss of life and agricultural production and unnecessary economic expenses in the process. National and municipal governments must take responsibility for implementing such actions, with enhanced resilience to disasters and damage prevention being central objectives. A culture of prevention must be fortified in the population. It is important that the National System of Civil Defence implements and enforces a policy of disaster risk reduction to mitigate disaster-related impacts on the most vulnerable population groups.

For project activities, demonstrated interest in the project and active participation in the processes of local authorities and communal leaders increase the chances of wider community participation. Their engagement is therefore a valuable step in achieving sustainability of implemented activities. The project informed the national and local authorities about the need for de-worming and for providing vitamins to breeders to avoid losses during critical periods of the year. As a result, municipalities started to incorporate such activities into their budgets, thereby improving the sustainability of project interventions.

## Outlook

Emergency interventions naturally require some activities, for example relating to sowing or rain-fed irrigation, to be executed as quickly as possible to concur with key natural events. If the administrative support to projects is not opportune and efficient, project results may suffer and timely project impact evaluations be overlooked. Some issues have arisen from the project that may be useful to consider in future initiatives.

- How emergency actions can be designed to incorporate lessons on sustainability and development from similar emergency cases
- Social and economic considerations that must be taken into account to make interventions in a community that has been affected by a climate related disaster

- How administrative support can be improved for staff in charge of project implementation
- How to avoid the delegation of all responsibility by the national government to the collaborating institution and executor of the project
- Whether risk management can be included in all development projects
- How climate change adaptation relates to overall sustainability in disaster afflicted communities



# CHILE

## Drought Risk Management: Pilot study on vulnerability and local coping strategies

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Drought is the major natural hazard of concern for the agricultural sector in Chile. Climate change scenarios predict an increase of extreme climate events, including droughts. In 2007 and 2008, during the worst drought in Chile of the last 50 years, FAO and the Chilean Ministry of Agriculture joined efforts to carry-out a pilot study for a social and production vulnerability assessment, in order to develop local public policy for disaster risk reduction and climate change adaptation.

Two case studies were undertaken in drought-prone areas with rainfed agriculture in Combarbalá of the Norte Chico and Secano O'Higgins in the Central Valley of Chile. Combarbalá is a semi-arid zone, with rainfall concentrated in three winter months (150 and 300 mm per year), Secano O'Higgins receives more than twice as much rain (400 to 600 mm per year). The main production system in Combarbalá is goat rearing. The limited cultivated land available is mainly devoted to fruit production and grasslands. Secano O'Higgins has more extensive agriculture, with forage, cereals, fruit and vineyards, as well as cattle and sheep production.

Drought impacts and coping strategies were measured. The results indicated that vulnerability of rural livelihoods were correlated to factors that included sources of income, age of farmers, distance from urban areas, natural resource depletion and lack of social networks. The risk reduction measures implemented by farmers proved to be significantly different between the two studied areas, being both ineffective and reactive. The results of this study have supported the design of the National System for Agroclimatic risk management in Chile.

### Summary

- Limited local coping strategies are weakening the resilience of communities to natural hazards
- Socio-economic information is crucial for assessing vulnerability to droughts and other climatic hazards
- The drought impact survey is useful for quantifying economic impacts and drought exposure risk, and for supporting decision-making processes
- Local knowledge is essential for identifying vulnerability factors to climatic hazards and to implement disaster risk reduction
- Training of local agriculture producers in interpretation of agro-climatic information and climate change adaptation practices is essential



## Project background

Project title	Drought Risk Management: Pilot study on vulnerability and local coping strategies
Project type	FAO Technical Cooperation Project
Project code	TCP/CHI/3102 baby 2
Duration of project	1 year, 2008-2009
Country, location	Chile – Combarbalá and Secano O'Higgins regions
Web site	<a href="http://www.fao.cl/pubs/pdf/climachl.pdf">http://www.fao.cl/pubs/pdf/climachl.pdf</a>
Stakeholders/beneficiaries	Local farmers associations, public services and research institutions.
Implementing organization	FAO, Chilean Ministry of Agriculture
Project objectives	<ul style="list-style-type: none"><li>• Promote integration of agro-climatic risk management in rural development.</li><li>• Characterize the vulnerability context in terms of environmental, social and agricultural production factors, including local coping strategies used by farmers.</li><li>• Develop evaluation criteria and a methodology to estimate drought impacts.</li></ul>
Main activities	<ul style="list-style-type: none"><li>• Development of a cartographic vulnerability assessment methodology and an agricultural dependence index, focus groups and a survey.</li><li>• Completion of two analyses: drought impact evaluation and vulnerability and coping strategies.</li></ul>
Hazards addressed	Extreme events: droughts

## Key messages

### 1. Limited local coping strategies are weakening the resilience of communities to natural hazards

The two analyses produced by the study – on drought impacts, and vulnerability and coping strategies – were based on research, personal interviews with key actors, focus groups with 180 local people, and a 70-question survey presented to 278 people in the two areas of the study. The results showed similarities in the coping strategies employed by farmers in both study areas. Long-term measures taken to reduce vulnerability included community training via radio and peer-to-peer support, and diversification of production alternatives into areas such as handicrafts and tourism.

In both cases, adaptation measures were limited, and the local coping strategies turned out to be insufficient when analyzed within the context of factors such as migration, environmental depletion and limited production alternatives. This has led to high dependency on public assistance, such as drought relief, which has practically become a regular annual feature instead of an exceptional emergency measure. Surprisingly, agricultural insurance was rarely mentioned as a coping strategy.

### 2. Socio-economic information is crucial to assess vulnerability to droughts and other climatic hazards

The study designed a drought vulnerability index (DVI) from which a vulnerability map was drawn for initial analysis. The drought vulnerability index had several sub-indexes such as: i) aridity, ii) soil water retention, iii) irrigation security, iv) crop diversity, v) farmers' ability to adopt new technologies, vi) basic needs deficits and vii) social vulnerability linked to agricultural revenues (agricultural dependence index). The map identified where the most vulnerable groups were located (usually the most isolated areas) and thus presented an overview of the geographical distribution of vulnerability.

The results indicated that rural livelihood vulnerability was related to factors such as income sources, age of the farmer and distance to urban areas, but also levels of environmental depletion and lack of social networks. The risk reduction measures implemented by farmers proved to be significantly different between the two study areas, although both cases were insufficient and highly dependent on public aid.

This study also found that factors of social vulnerability (aged population with low incomes, fragile local economies and at-risk livelihoods) were more strongly correlated to the negative impacts of drought than other vulnerability factors such as environmental depletion or limited production systems.

### **3. The drought impact survey is useful for quantifying economic impacts and drought exposure risk, and to support decision-making processes**

Proper application of a drought impact survey can give a good diagnosis of the level of economic losses associated with a drought event. Currently, there is no evaluation on the effectiveness of the disaster reduction measures (e.g. early warning alerts, water reuse, changes in the crop calendar), but the results of this survey could be used to build a baseline to assess the effectiveness of these preparedness measures for future drought events.

The survey found that income is an important variable to determine risk-proneness to droughts. Families of producers with limited economic resources were most harmed by negative impacts on water availability, livestock numbers and agricultural productivity. Thus, the higher the economic capital, the better farmers are equipped to confront extreme climatic events.

### **4. The participation of local stakeholders in drought risk management is essential to identify vulnerability factors and implement disaster risk reduction measures**

When defining the risks of droughts and other climatic impacts, the participation of local stakeholders and the consideration of their site specific knowledge is very helpful. The most valuable findings of the study with respect to vulnerability factors came from the communities, either via the survey or in focal group discussions. For instance, the farmers most affected by droughts, those from the most isolated communities, were identified in focal group discussions. The discussions also pinpointed gaps and areas of improvement for governmental interventions.

During drought events, facilitating organizations serve a vital function, linking community and government institutions at communal and regional levels. Community members should be provided with appropriate information and be part of consultation and decision-making processes.

### **5. Training of local agriculture producers in interpretation of agro-climatic information and climate change adaptation practices is essential**

Training on climatic information, irrigation and crop techniques adjusted to drought conditions (e.g. maintenance irrigation, crop reduction, and water-saving techniques), especially through peer-to-peer sessions, is in high demand among farmers. Training in techniques to improve water management efficiency in agriculture, including treatment and safe re-use of waste water for irrigation, is particularly crucial in rainfed areas due to depletion of water resources and saturation of the water market. In an effort to increase stability and resilience of communities, FAO is collaborating with the Chilean Government to design and implement a National System of Agro-climatic Risk Management. Partially based on the results of this study, it will consider actions for each state of the disaster risk management cycle and take into account the different vulnerability factors of regional and local stakeholders throughout the heterogeneous Chilean territory.

## **Outlook**

FAO is currently collaborating with the Chilean Government to design and implement a National System of Agro-climatic Risk Management, partially based on the results of the presented study. The system considers actions to be developed in each stage of the DRM cycle. It also takes into account different hazards throughout the heterogeneous Chilean territory, different vulnerability factors and regional and local stakeholders. For future action the following activities need to be considered.

- Improve drought risk management, which will require: integrating vulnerability into public policy and local development planning; developing a multidisciplinary and inter-agency drought management

task force; improving climatic information provision and interpretation and providing training to the farmers in disaster risk reduction practices; promoting strategic alliances among the scientific world, public institutions, and local organizations; and opening access to information on projects and studies to locals.

- Ensure institutional stability and long-term creation of resilience of communities and productive systems.
- Establish or enhance communication networks among government, local farmers and private actors, in order to develop information products for disaster risk management, based on local needs.
- Develop and validate a methodology to measure the effectiveness of disaster risk reduction practices in order for the practices to be given priority in policy recommendations. Due to the need for climate change projections, the analysis should include the economic benefits and long-term effectiveness of the measures.



# NICARAGUA

## Developing a methodology for addressing the linkages between climate change and vulnerability to food insecurity

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Agriculture, forestry and fisheries are all influenced by changes in climate. In Nicaragua, 80 percent of the rural population depends on these economic sectors as the primary source of subsistence. Relatively small changes in temperature and precipitation are already leading to significant changes in agricultural production and, as a result, in the farming incomes and consumption of rural people. In order to prevent groups of rural families from becoming food insecure in the decades to come, it is essential to reduce their vulnerability to climate change through targeted policy interventions.

The study, "Impact of climate change on food security at the household level in Nicaragua", currently in its second phase, aims at testing a methodology to address linkages between climate change and vulnerability to food insecurity through identification of vulnerable household groups and provision of policy recommendations aimed at strengthening adaptive capacity of these most vulnerable households. Local and national policies on land and water management, resource use and access, livelihood strategies, crop development, risk management and trade can all strongly influence climate change adaptation mechanisms and strengthen household food security.

The following case study features an approach for improving the design and targeting of the policy and institutional frameworks and engaging policy communities to better address household food security concerns in a changing climate.

### Summary

- The methodological framework: How regional climate models and national household living standards data can be merged to inform policy advice for improved food security
- The vulnerable can be profiled by combining downscaled climate data with a household-level analysis of vulnerability to food insecurity
- Identification and characterization of vulnerable households allows for improved policy design and targeting

## Project background

Project title	Impact of climate change on food security at the household level in Nicaragua
Project type	FAO Multi Donor Partnership Programme (FMPP) component
Project code	FMPP/GLO/001/MUL
Duration of project	Sept 2009 – April 2010 (under FMPP), desk work in step two of the methodology is ongoing
Country, location	Nicaragua
Stakeholders	Local and regional governments, the Nicaraguan National Institute for Territorial Studies (INETER), international organizations and NGOs involved in climate change adaptation.
Beneficiaries	Rural households in Nicaragua found to be among the most vulnerable to food insecurity as a result of climate change.
Implementing organization	FAO, Nicaragua Ministry of Environment and Natural Resources (MARENA)
Project objectives	Improve design and targeting of policy responses to better address the impacts of climate change on household food security
Main activities	The project developed a methodology to address linkages between climate change and food security of farmers at the household level, through three main steps: <ul style="list-style-type: none"> <li>• downscaling of global climate models to the local level (50x50 km) to estimate local impacts of climate change to the 2030 time horizon,</li> <li>• an analysis of changes in vulnerability to food insecurity under climate change based on national household living standards data,</li> <li>• an analysis of related policy implications and identification of policy instruments to increase the capacity of households to cope with impacts of climate change on food security.</li> </ul>
Hazards addressed	Gradual changes: temperature and rainfall

## Key messages

### 1. The methodological framework: How regional climate models and national household living standards data can be merged to inform policy advice for improved food security

Several studies have been conducted to analyze the biophysical impact of climate change on agricultural production and productivity in Nicaragua, thus primarily addressing food availability. However, food security has several dimensions (Box 2) and the methodology employed in this project went beyond availability of food and focused on access to food.

This methodology, currently undergoing development and testing through a pilot study in Nicaragua aims to contribute to a broader and more comprehensive research framework by providing an assessment of the impact of climate change on the economic access to food, thus linking climate change to household food security.

While Global Climate Models (GCMs) are needed to understand and predict large-scale changes in climate, they do not include local climate forcings, such as from mountains and inland water basins, and are hence not yet capable of providing the high resolution information that is needed for adaptation planning. Therefore, in the first step of the methodology, global scale predictions of GCMs are connected to regional dynamics through a Regional Climate Model (RCM) to generate regional forecasts.

#### Box 2. The four dimensions of food security

**Food availability:** The availability of sufficient quantities of food of appropriate quality

**Food access:** Access by individuals to adequate food resources

**Utilization:** Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being

**Stability:** The access to adequate food at all times, even in the face of sudden shocks or cyclical events

In the second step, climate change scenarios downscaled to the local level for the whole country are integrated with data from a quantitative analysis of climate change effect on farmer livelihoods, based on rural national household datasets. The analytical model used, developed by the FAO Agricultural Economics Division (ESA), characterizes vulnerability and identifies indicators associated with the highest levels of vulnerability to food insecurity, resulting in a detailed profiling of vulnerable household groups.

The third step involves using the results of the vulnerability analysis to assess how policies affect these vulnerable groups and subsequently provide recommendations for improvements in the design and targeting of policy responses to impacts of climate change on household food security. This phase includes identifying what instruments should be promoted to support households in increasing their coping capacity in terms of withstanding the effects of climate variability on food security and further adapt to climate change. An analysis was also made of what policies, institutions and multi-level arrangements are needed to support vulnerable households.

This methodology (Figure 3) aims to engage policy-makers in better addressing food security concerns in a changing climate, by bringing the global and seemingly illusive climate change issue down to the local level, identifying direct impacts on rural households' food access.

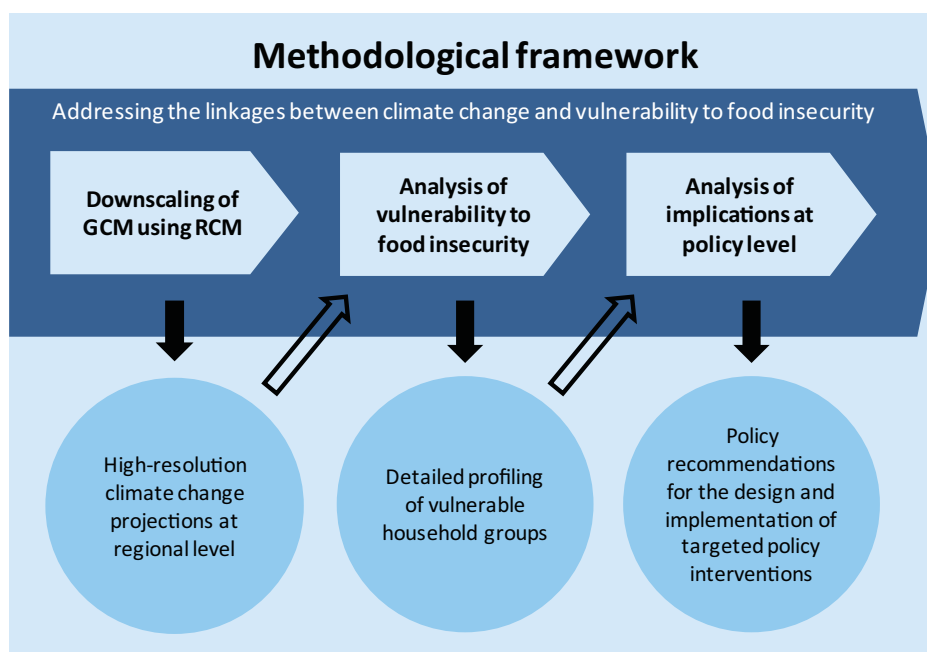


Figure 4: Methodological framework

## 2. The vulnerable can be profiled by combining downscaled climate data with a household level analysis of vulnerability to food insecurity

Global climate models and scenarios dominate the climate change debate. Analyzing the impact of climate change on household food security required downscaling climate change projections to the local level. The modeling work was carried out at regional level in order to lead to more effective dissemination of scientific expertise and to tap into valuable local knowledge. This included checking the validity of the model against observations in the region.

Two different high-resolution climate change scenarios were generated using the regional climate model Providing Regional Climates for Impacts Studies (PRECIS). The outputs were time series projections of temperature and precipitation to the 2030 horizon with a 50x50 km resolution, corresponding to about 50 coordinates of the PRECIS grid covering the whole country.

The downscaled climate data obtained through the PRECIS model were matched to geographical information on administrative locations (*municipios*) from national household datasets. These were based on surveys from the *Encuesta Nacional de Hogares sobre Medición de Nivel de Vida 2001*, and covered 1 242 Nicaraguan households operating farmland. These constituted the database on which the model of vulnerability to food insecurity was applied.

In this approach, climate change is included in the vulnerability model as the projected impacts that temperature and precipitation changes have on income-generating capacity and food consumption. Vulnerability indicators such as asset holdings, access to means of transportation, credit, access to irrigation, health care and social infrastructure are derived from the estimates of household expenditure on food. Food expenditure is a measure of affordability, which is a key element for economic access to food.

Using dynamics of household assets, demographic characteristics and downscaled climate data as inputs, the model was run to determine the probability of households losing access to sufficient food in the future. The model allows estimating how current levels of vulnerability are expected to evolve with climate change (the non-vulnerable today could be vulnerable tomorrow, and vice-versa), how vulnerability is and is likely to be distributed as a result of changes in climate, and what the agricultural and non-agricultural variables associated with the highest degrees of vulnerability are. Although this vulnerability analysis is still in the process of being finalized, preliminary results indicate that the share of households vulnerable to climate change is likely to rise significantly.

### **3. Identification and characterization of vulnerable households allows for improved policy design and targeting**

The profiles of the most vulnerable households were defined by categorizing households. This information can serve as the basis for identifying and formulating recommendations for better design and targeting of policy measures that address the livelihood impacts of climate change.

The model allows testing a number of policy interventions and can identify leverage points in the country's institutional and policy environment for strengthening household resilience. To complement national policies, specific measures and technologies for promotion of local adaptation processes will be required. Increasing the productivity and value of farm production through improved technologies and market linkages as well as diversification of agricultural and non-farm income sources are some of the strategies that may prove effective to improve availability and access to food.

The third step of the methodology, yet to be executed in the Nicaragua pilot project, involves the identification of instruments that can be used to increase households' ability to cope with impacts of climate change on food security, in addition to policies, institutions and multi-level governance arrangements needed to support vulnerable households. The analysis focuses on the current policy and institutional context and will be conducted through a series of in-country consultations held with government stakeholders at various levels, climate change experts and representatives of the donor community. The purpose of these sessions is to fine-tune the policy simulations in the model to the country context. The simulations will identify policy recommendations that according to the data used in the study will address the impacts of climate change on household food security. The recommendations will consider short and long-term perspectives, as well as the need for coordination across institutional levels (local, national or regional) in formulating and implementing the policies.

## **Outlook**


The methodology described above is tested for the first time through the pilot project in Nicaragua. Lessons learned from the experiences will serve to evaluate and improve the methodology. The next step could then be to make plans for replication of the study in countries and areas of different climatic and socio-economic conditions, as well as different institutional and policy contexts. The methodology could further serve as the basis for more extensive policy assistance to member countries by FAO on climate change and household food security.

# OUTLOOK

The collection of case studies in this publication reflects the need for mechanisms to document and apply lessons learned from past experiences. As shown, each project has generated knowledge which needs to be made available to farmers, governance institutions and future projects. Capacities should be built to make sure relevant institutions continue to espouse the lessons learned from project results. FAO is putting in place various new mechanisms to improve the ways lessons learned from its interventions are captured and disseminated, such as through mandatory documentation of lessons learned in regular project reporting, establishing regularly occurring events for knowledge sharing, improving best practice platforms, and supporting the establishment and maintenance of communities of practice among colleagues working on the same issues.







Our knowledge of the processes and impacts of climate change is evolving fast. The agriculture, forestry and fisheries sectors are highly affected by climate change, yet at the same time contribute to the problem by emitting significant volumes of greenhouse gases. The future of food security therefore depends on strong action in these sectors to both mitigate and adapt to climate change. Effective mechanisms for assimilating, consolidating and applying experiences from field projects, scientific research and the knowledge and practices of local people will be central to such action.

The FAO Climate Change Days workshop was held at FAO headquarters in Rome 21–23 June 2010. It brought together around 100 professionals from the FAO's regional, subregional, country and headquarters offices in a number of sessions relating to FAO's climate change work. The participants discussed a multitude of issues concerning climate change project implementation. This publication was inspired by the workshop and is an effort to encourage knowledge sharing and uptake of lessons learned from field project experiences.