

Workshop
on
Climate Change and Biodiversity for Food and Agriculture
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Options for Decision Makers

Developing the knowledge basis to monitor biodiversity trends and associated risks

Analyzing whether climate change may constitute a threat for biodiversity in the future requires understanding the extent and distribution of biodiversity for food and agriculture, and its vulnerability and adaptation patterns. Matching this information with that available from climate change models will be a basic requirement to inform conservation and adaptation strategies. Lack of characterization and evaluation of genetic resources for food and agriculture will be an obstacle in developing adaptation mechanisms to climate change. Evaluation is currently an important bottleneck across all types of genetic resources. Improving information systems for genetic resources and the dissemination of relevant information to users will be an important priority for the future.

Suggestions for future action:

- Improve biodiversity national inventories to include relevant spatial information assessing threats caused by climate change to species, populations or genotypes of relevance to food and agriculture.
- Improve knowledge on the genetic processes, such as geneflow, introgression, local populations and extinctions, that allow or undermine species adaptation to climate change of relevant biodiversity for food and agriculture.
- Undertake predictive modelling of future distribution of genetic resources for food and agriculture under different climate change scenarios to inform national strategies.
- Develop biodiversity monitoring plans to analyze changes in delivery of ecosystem services due to climate change in specific farming systems, to inform place-based adaptation strategies.
- Strengthen characterization and evaluation of genetic resources for food and agriculture as a fundamental basis to enable sustainable use.
- Develop or strengthen information systems on genetic resources, including early warning systems.

Inter-sectorial cooperation and integrated planning

Biodiversity for food and agriculture and climate change have rarely been discussed in the same context. Previous global assessments on climate change have dealt with possible impacts on food security and on biodiversity, but, so far, there has been no comprehensive analysis at the global level of the threats posed by climate change to the biodiversity most important to food security and on the crucial role biodiversity for food and agriculture can play to respond to climate change. On the other hand, previous global assessments of the status and trends of biodiversity for food and agriculture had limited focus on climate change. Given its potential to contribute to coping with climate change, the sustainable management of biodiversity for food and agriculture should be made a basic component of adaptation strategies.

Suggestions for future action:

- Improve cooperation between the United Nations Framework Convention on Climate Change and relevant biodiversity forums, such as the Commission on Genetic Resources for Food and Agriculture, the International Treaty on Plant Genetic Resources for Food and Agriculture and the Convention on Biological Diversity.
- Integrate climate change dimensions into future global assessments on biodiversity for food and agriculture, so that the findings can inform future climate change assessments by incorporating agricultural biodiversity perspectives.
- Develop integrated strategies to tackle climate change adaptation and mitigation, food security and rural development, and the sustainable management of biodiversity. In doing so, identify opportunities to deliver these triple dividends, but also the trade-offs and conflicts and ways to resolve them.

Building adaptive capacity through biodiversity management in farming systems

Improving our understanding of the ecosystem services provided by agricultural biodiversity and of how these may be affected by climate change will be a key element in the development of place-based sustainable agricultural responses to climate change. Responses will need to be dynamic given the complex changes occurring at different scales, as explained above. Smallholder and subsistence farmers or pastoralists are likely to suffer complex, localized impacts of climate change. These vulnerable communities are among those most dependent on biodiversity and on the provision of ecosystem services to guarantee their livelihoods and well-being. Farmers and local and indigenous communities adapt to change continuously, and agricultural biodiversity, especially crop and livestock diversity, has traditionally formed an important element of farmer risk management strategies. Strengthening farmer adaptation strategies, their ecological knowledge and local institutions will enable development of more effective adaptation strategies to climate change. It will also allow farmers and rural communities to play a role in climate change discussions and policy. Developing local response strategies will depend on the complementary knowledge of farmers and researchers.

Suggestions for future action:

- Identify which agro-ecosystems, components or properties of agricultural biodiversity are most or least sensitive to climatic variability.
- Downscale climate change data to allow informed decisions on biodiversity planning by farmers and rural communities.
- Put in place long-term monitoring of functional agricultural biodiversity in production systems and identify key biodiversity indicators to facilitate such monitoring.

- Promote local institutions to manage agricultural biodiversity and strengthen community capacity to access genetic resources and associated information to cope with climate change.
- Strengthen the dissemination of knowledge, appropriate technologies and tools to improve management practices related to agricultural biodiversity and ecosystem services.

Developing climate-change informed plans and policies for genetic resources for food and agriculture

Very few national and international programmes on genetic resources for food and agriculture factor climate change into their conservation and sustainable use strategies. Lack of information is currently an obstacle, but available data suggest that there are serious challenges to confront, as climate change is likely to cause a significant and irreversible loss of the genetic diversity that is critical for the sustainability of the food and agriculture sector.

Both *ex situ* and *in situ* conservation will need further support to guarantee the availability of genetic diversity needed for future generations to adapt to climate change. *In situ* and on-farm conservation measures will need to guarantee the dynamic evolution of genetic diversity to changing conditions. However, there will be regions and species for which the rate of change caused by climate change may be greater than the natural capacity of certain species and populations to adapt or move, and human intervention will be needed to prevent accelerated genetic erosion, in particular through *ex situ* conservation. However, *ex situ* conservation should be considered a complementary strategy to *in situ* conservation, and not substitute for it. The challenge is how to develop an overall integrated approach to conservation and use which will be cost-effective and, at the same time, safeguard as much diversity for the future as possible throughout climate change.

The sustainable use of genetic resources for food and agriculture is the foundation for many of the climate-change adaptation strategies required in food and agriculture. Farmers and rural communities will require genotypes adapted to multiple new stresses, from drought to new pests and diseases. On-farm management of genetic diversity has traditionally allowed farmers to cope with adversity. Breeding is a long-term process, so preparing to adapt to climate change requires planning. Given that climate change will increase the frequency of extreme climate events, measures should be taken to rehabilitate agricultural systems with locally adapted genotypes after disasters.

With climate change, countries will increasingly depend on genetic resources from other countries and regions to adapt their food and agriculture. Loss of genetic diversity at a given place may have negative effects globally as well as locally, as important traits for climate change adaptation may be lost forever. Interdependence between countries with regard to genetic resources for food and agriculture will increase, as will the need to improve the exchange mechanisms for this critical resource. In developing countries, lack of human and financial resources will impede response to climate change through the conservation and sustainable use of genetic resources for food and agriculture. International cooperation, therefore, will be a key element of a long-term strategy to confront climate change in this field.

Suggestions for future action:

- Analyze the effects of climate change, in particular in centres of origin and diversification of genetic resources of relevance to food and agriculture, to inform national conservation strategies.

- Improve monitoring methods of genetic resources being managed *in situ*, to increase understanding of threats and vulnerability due to climate change.
- Promote the collection and *ex situ* conservation of genetic resources for food and agriculture most threatened by climate change, and most potentially useful in adaptation.
- Develop robust programmes and strategies for sustainable use of genetic resources for food and agriculture, so that breeders, farmers and rural communities can have available a wide range of genetic diversity to adapt to climate change.
- Support farmers to continue developing locally adapted genotypes through on-farm management.
- Improve rehabilitation strategies after climate-change related disasters to ensure that locally adapted genotypes are re-introduced.
- Integrate climate change dimensions into the relevant international policies and programmes for the conservation and sustainable use of genetic resources for food and agriculture, and the fair and equitable sharing of the benefits arising out of their use.
- Strengthen international cooperation to build capacities in developing countries to conserve and sustainably use genetic resources for food and agriculture to respond to climate change.