

Expert Meeting  
on  
Climate Change Adaptation and Mitigation  
FAO Headquarters, Rome, 5-7 March 2008

## Options for Decision Makers

---

### **Introduction**

Climate change will compound existing food insecurity and vulnerability patterns. Communities must prepare themselves for the possibility of food shortages and make appropriate use of resources to protect their livelihoods as well as lives and property. It is imperative to identify and institutionalize mechanisms that enable the most vulnerable to cope with climate change impacts. This requires collaborative thinking and response to the challenges generated by the interaction between food supply, climate change and sustainable development.

### **The climate adaptation context**

Vulnerability to food insecurity shocks has grown global. Global and local food security vulnerability patterns will be modified by climate change. Small-scale rainfed farming systems, pastoralist systems, inland and coastal fishing and aquaculture communities and forest-based systems are particularly vulnerable to climate change. Moreover, the urban poor, particularly in coastal cities and floodplain settlements, face increasing risks. It is urgent to build “resilient” communities living off agricultural, forestry and fisheries/aquaculture systems that have high capacity to adapt to stress and disturbances.

Attempts to improve resilience to future and uncertain impacts through anticipatory and planned adaptation and innovation will have both immediate and future costs – with trade-offs between optimizing current conditions and minimizing vulnerability to future shocks. For instance, diversifying agriculture may decrease profitability in the short term, but also reduce future vulnerability. Adaptation to climate change must also focus on prevention and removal of maladaptive practices that may do not succeed in reducing vulnerability but, instead, could increase it.

Technical adaptation measures range from temporal and spatial variations in production systems (e.g. adjusting planting or fishing dates, rotations, multiple cropping/species diversification, crop-livestock pisciculture systems, agroforestry) to confer better protection against temperature changes, changing rainfall variability and patterns, salinization through sea level rise, and pest attacks - to investing in soil, water and biodiversity conservation and development (e.g. building soil biomass, restoring degraded lands, rehabilitating rangelands, harvesting and recycling water, planting trees, developing adapted cultivars and breeds, protecting aquatic ecosystems) in order to maintain long-term productivity.

Adaptation measures also include establishing disaster risk management plans and risk transfer mechanisms, such as crop insurance and diversified livelihood systems. For example, integrated aquaculture-agriculture systems will allow activities to shift in response to changes in the suitability of land and availability of water to produce food. In cases where benefits of diversification are limited, such as those that affect all aspects of the food production systems,

social safety nets are required. An important caveat is that there are limits to adaptation. Due to changing climate, the frequency of floods and droughts may increase so much that agriculture, fisheries and forestry are no longer sustainable. Diversification to other economic activities and relocation will need to be considered under such conditions.

### **Mitigation: new options for carbon sequestration in agriculture and forestry**

Agriculture and land-use change such as deforestation contributes to, respectively, 13 and 17 percent of total anthropogenic greenhouse gas (GHG) emissions. While carbon dioxide emissions from agriculture are small, the sector accounts for about 60 percent of all nitrous oxide (N<sub>2</sub>O, mainly from fertiliser use) and about 50 percent of methane (CH<sub>4</sub>, emitted, mainly from natural and cultivated wetlands and enteric fermentation). The GHG impact through radiative forcing of N<sub>2</sub>O is 300 times that of CO<sub>2</sub>. Methane and nitrous oxide emissions are projected to further increase by 35 to 60 percent by 2030, driven by growing nitrogen fertilizer use and increased livestock production in response to growing food demand.

Mitigation of climate change is a global responsibility. Agriculture, forestry, fisheries/aquaculture provide, in principle, a significant potential for GHG mitigation. The IPCC estimates that the global technical mitigation potential for agriculture (excluding forestry) will be between 5 500 and 6 000 Mt CO<sub>2</sub>-equivalent per year by 2030, 89 percent of which are assumed to be from carbon sequestration in soils.

*Global Soil Carbon Sequestration Initiative.* IPCC estimates that the reduction of agricultural GHG mitigation options are cost-competitive with non-agricultural options for achieving long-term climate objectives. Soil carbon sequestration could in fact take effect very quickly and is very cost-effective in agriculture. A win-win approach could be achieved by paying farmers for carbon sequestration (building soil organic matter) which sets up a scenario where: CO<sub>2</sub> is removed from the atmosphere (mitigation); higher organic matter levels in soil increase agroecosystem resilience (adaptation); and improved soil fertility leads to better yields (production and income generation). However, sequestration of CO<sub>2</sub> in soils is not included in the Clean Development Mechanism (CDM) agreed to in Kyoto. The scope of the successor of the CDM could be enhanced with a view to increase carbon sinks in soil and in above- and below-ground biomass, and thus contribute to removing methodological barriers to operationalising soil carbon sequestration under the Post-2012 climate change regime. FAO should play a leading role in this process, including through the establishment of a Global Soil Carbon Sequestration Initiative entrusted with the promotion of agricultural technologies that restore carbon pools and soil quality (e.g. organic agriculture, conservation agriculture) and to create tools to measure, monitor and verify soil carbon pools and fluxes of greenhouse gas emissions (namely nitrous oxide) from agricultural soils, including croplands and pastures.

*Reducing Emissions from Deforestation and forest Degradation in developing countries (REDD).* Since the Eleventh Session of its Conference of Parties (COP) in November 2005, UNFCCC has been exploring the possibility of developing an instrument under the Convention to provide financial incentives for Reducing Emissions from Deforestation and forest Degradation in developing countries (REDD). As the UN agency with the mandate for forestry and a comprehensive programme covering all aspects of forestry as well as agriculture, FAO can play a leading role in: providing technical information and support for the development of methodological and policy options for REDD; strengthening capacity for countries undertaking REDD programmes, including developing systems for monitoring changes in forest carbon; and addressing underlying causes of deforestation and forest

degradation rooted in both the agriculture and forest sectors. In addition, FAO can launch a comprehensive REDD support effort for developing countries.

#### The knowledge base

*Strengthening IPCC and UNFCCC on agriculture and food-related issues.* IPCC could improve its assessments on the impacts of climate change on food security. The establishment of a Global Food Security Observing System (GFSOS) is seen as an extension of FAO's Global Information and Early Warning System. It is also a technically feasible option to set up permanent monitoring of the effects of current and future climate on food security. Global studies must be complemented by comprehensive national assessments of climate change impacts on agriculture and food security. Local impacts are badly needed to support national and subnational decision-making. While existing studies mainly focus on the effect of down-scaled climate change scenarios on major crops and aquatic species, future studies should look at a wider range of crops and also take into account local farming dynamics and resource base, food marketing chains and delivery systems, the greater international connectedness, food prices, the implications of agricultural policy and possible development pathways. In some regions, such as large parts of Africa, such studies are hampered by highly uncertain trends in rainfall, the insufficient resolution of climate models and the lack of climate observation data.

*Improving data collection and impact assessment capacity.* Improving data collection and sharing results at national, regional and international levels will improve local weather forecasts, seasonal climate forecasts, risk and impact assessments. It can also increase the detail of climate impact assessments to a scale that is meaningful for optimizing adaptation and mitigation measures, and operating nearly real-time early warning and hotspots warning systems for food security, agriculture, forestry and fisheries. This refers particularly to the 10 to 15 years time horizon over which the reliability of impact projections is probably acceptable and the planning of responses is probably realistic. Better data will improve access to international funding mechanisms. National extension and agronomic research services have an increased role to play in data collection, analysis and use for decision-making and decentralized service delivery to farmers. There is also a need to include social science research to boost understanding on how people adopt and implement adaptation and mitigation options.

*Agroecological research.* Research will provide the backbone for adaptation and mitigation methodologies. However, research for a rapidly changing situation is different from research for stable ecological conditions. Traditional knowledge and local biodiversity are a suitable entry points, but likely to be insufficient in a rapidly changing situation. In addition, methodologies, crops and crop varieties need to be developed for future conditions as their applicability cannot be assessed at the location where they may be used in future. This requires strong national and international agricultural, forestry and fisheries research and provides an important role to the Consultative Group on International Agricultural Research (CGIAR) Centres. Research results need to be public in an enabling environment in which methods, germplasm, crop varieties and animal breeds are accessible for use and introduction in adaptation programmes.

#### **Climate-related capacities in agriculture, forestry and fisheries**

Country capacity to assess and apply adaptation and mitigation measures in agriculture, forestry and fisheries is weak at two levels: national institutional frameworks; and adaptive capacity of local populations to climate change and variability. To implement national climate

change and food security policies, there is need for in-depth knowledge of appropriate methods and tools as well as awareness of available funding mechanisms, such as the carbon market and adaptation funds established under the IPCC.

*Capacity strengthening.* The capacity to identify, collect and share data, use information and methods and build knowledge relevant for climate change adaptation, mitigation and food security is critical because of rapidly changing climatic, environmental and socio-economic conditions. Extension services and mechanisms have been weakened greatly over the last two decades. Extension will need to be strengthened substantially in order to address adaptation and mitigation if it will have to provide an efficient interface between policy-makers and the farming community. Recognizing that climate change will alter many existing equilibriums, socio-economic dynamics must be considered, and the role of all the partners may need to be re-examined or redefined.

#### **Capacities weaknesses in adaptation development in the food sectors**

- vulnerability of infrastructure (e.g. irrigation, means to cope with flood, seawater incursion protection), non-structural measures (e.g. legislation, insurance and capacities to integrate adaptation into development planning at all levels), transportation, food storage and distribution systems to climate vagaries;
- lack of crop varieties, animal and aquatic species breeds, trees and forests adapted to climate change;
- lack of climate-related knowledge in research and extension;
- lack of standard tools to assess main vulnerability patterns that can be tailored to national circumstances;
- lack of monitoring and forecasting of variable food availability;
- insufficient knowledge of rural development and of the roles of markets, trade, migration, refugees, urbanization and their linkage to climate change and food security;
- lack of understanding of social dimensions of vulnerability and resilience, such as how climate change will require shifts in use of, and access to, natural resources (land, water), credit and education;
- insufficient institutional capacities and integration.

*Regional cooperation.* Neighbouring countries often share similar problems and solutions. Countries can pool their resources to inventorize and share traditional and innovative solutions. They can also take advantage of developing regionalized markets in order to reduce greenhouse gas emissions and transport costs and increase benefits and rural incomes.

#### **Policy development**

*Integrated climate change strategies.* Climate change strategies and action plans must account for all sectors' specificities. Since food security, sustainable development, and climate change adaptation and mitigation are strongly linked, policies need to be integrated across levels (from people to institutions and ministries) and across sectors. This will avoid later contradictions between local actions and higher decision-making, and ensure that national policies use the benefits associated with the international mechanisms to improve the livelihoods of people. Awareness raising, permanent monitoring of changing vulnerabilities and capacity building are essential components of national climate change strategies.

*Increasing resilience of food production systems.* Many countries would benefit from identifying and promoting positive incentives to practices, production systems, and land/aquatic resource-use policies and tenure systems that increase resilience of food production systems. Countries should facilitate the design of new policy tools that consider climate change but also build on already available tools such as early warning systems and disaster risk management. In parallel, negative incentives that encourage harmful practices

and production systems and unsustainable land/aquatic resource-use should be identified and removed. Policies to encourage appropriate investments and technology transfer into rural areas should be directed towards reducing long-term negative effects of short-term climate variability on food security. Examples include crop insurance, policy, legislation and non-structural measures that target vulnerable people.

*Land and aquatic resource use planning.* Investments in forest conservation and sound forest management, tree planting, sustainable fisheries and aquaculture development, and improved soil and water management for climate change mitigation and adaptation require addressing tenure constraints and incentives, and managing pressure and conflicts over resources. It is paramount to secure land and resources rights of groups and individuals, facilitate community involvement and establish solid, robust institutions for governance and conflict resolution. Land, water and aquatic resource-use planning and policy measures are particularly essential to: avoid perverse incentives which lead to detrimental land conversion, such as from forest to agriculture; identify measures to reduce pressure on natural resources and promote sustainable land-use systems; avoid encroachment of agriculture and disruption of mobile dryland pastoral systems that are adapted to droughts and irregular rainfall; and manage the consequences of massive migration and refugees.

### **Financial instruments**

*More active participation in the international climate change discussions.* Climate variability and change are dominant factors driving food production availability and stability. They also affect, at least indirectly, food accessibility and utilization. Measures aiming at improving food security directly contribute to sustainable development. On the other hand, measures for adapting to climate change or reducing emissions can contribute to food security. The Post-2012 climate change regime that is currently being prepared offers an important window of opportunity to developing countries. Many countries would benefit if the international carbon-related funding mechanisms paid more attention to food security, agriculture and livestock, soil, fishery and rangeland activities, along the lines of REDD (Reducing Emissions from Deforestation and forest Degradation).