Assessing climate risks and vulnerability

FAO Contribution to the synthesis publication under the

"Nairobi Work Programme (NWP) on impacts, vulnerability and adaptation to climate change"

What have we learned? A synthesis of emerging good practices, challenges and needs from the implementation of the Nairobi work programmed (2006 - 2009)

FAO contribution for the theme "Assessing climate risks and vulnerability"

Preamble

An assessment of vulnerability to climate change is a pre-requisite to sound adaptation actions. In order to assist Parties for adaptation planning in agriculture sector, agro-climatological methods for impact, vulnerability and adaptation assessments are being developed and applied in developing countries.

1. Outcomes and impacts of the actions

Based on the FAO crop forecasting methodology (AgroMetShell), a method to assess climate change impacts on crop yields was developed. The method was first applied to a World Bank-Government of Morocco comprehensive climate change study, of which FAO was responsible for assessment of crop production.

The methodology consists of developing a yield function which empirically links agricultural yields to the soil water balance. The technology trend (increase of yields achieved over time due to the use of improved varieties, mechanization, better management, use of inputs, etc) as well as the fertilizer effect of atmospheric CO_2 on the crops, were incorporated in the yield functions. Future yields are obtained by applying future climate conditions to the yield functions.

Climate change projections were downscaled to the level of six agro-ecological zones in Morocco, and agricultural yield projections were simulated for fifty rainfed and irrigated crops, for two greenhouse gas emission scenarios A2 and B2 and for four time horizons: 2000 (current period, covering 1979 to 2006), 2030 (from 2011 to 2040), 2050 (from 2041 to 2070) and 2080 (from 2071 to 2099).

Climate projections in Morocco show gradually increasing aridity because of reduced rainfall and higher temperatures. Increased aridity will have negative effects on agricultural yields, especially from 2030 onwards and rainfed crops (non-irrigated) will be particularly affected by climate change. Irrigated crop yields will continue to increase only if irrigation water continues to be available in sufficient

quantities, which is highly uncertain given climate change projection for the Mediterranean. Generally speaking, agricultural yields will remain more or less stable up to 2030, and then will drop rather quickly beyond the decade. It is found that when technology trend is taken into account, negative impacts of climate change can be, at least partly, offset.

As long as the same crops are cultivated in the future the methodology has the potential to assess impacts of climate change on crops well, particularly for the near future.

The results of this assessment provided valuable information for economic modelling and adaptation policy making, which were dealt with at later stages of the large comprehensive study.

The same methodology of climate change impact and vulnerability assessment is being transferred to the Ministry of Agriculture and Water Resources of the Government of Nigeria who requires assistance in the assessment of the possible impacts of climate change on agriculture. The scope is wider and includes enhanced capability for seasonal climate prediction and an application of a Farm Adaptive Dynamic Optimisation (FADO) methodology that identifies, analyze and prioritize climate-related risks and opportunities at farm level.

2. Good practices and lessons learned

The Morocco study provided an excellent learning opportunity for most participants (The Ministry of Agriculture, Rural Development and Fisheries (MPAM) the World Bank (WB), the National Institute for Agricultural Research (INRA), the National Meteorology Authority (DMN), and FAO. In the process, a number of Moroccan national researchers were trained on climate downscaling, crop forecasting, statistical analysis, etc. The methodology is a product of concerted efforts of all parties involved in the study.

The methodology and the outcome were published in a report (see FTP address at bottom of document) and there is a plan to release the software package.

3. Opportunities, challenges, needs

One of the challenges was to obtain historical data on climate and agricultural statistics. Quality, frequency, consistency and geographical coverage of datasets were often questionable, and much effort was expensed to fill the data gap. No assessment of climate risk is possible without good data and renewed attention to and investment in data collection and observation network are warranted.

Future improvements to the assessment approach include a more dynamic simulation of farming systems (such as several forms of spontaneous and controlled adaptation), the parallel modelling of crops and surface and groundwater availability, the dynamic downscaling of climate scenarios and a more explicit treatment of climate variability.

Adaptation measures to climate change is based on management of water, land and crops at the national, regional watershed and farm level, constrained by market, labour and political and socio-economic conditions. More work is required to develop methodologies that can be used to realistically simulate adaptation in agriculture sector.

The Morocco report can be downloaded at:
ftp://ext-ftp.fao.org/SD/Reserved/Agromet/WB_FAO_morocco_CC_yield_impact/report/

FAO Climate Change portal:
http://www.fao.org/climatechange/home/en/

Climate Impact on Agriculture:
http://www.fao.org/nr/climpag/index_en.asp