



Global Climate Change: Can Agriculture Cope?

Executive Summary

A recent report of the United Nations Intergovernmental Panel on Climate Change (IPCC) states that the average temperature of the earth's surface should increase by about 3 degrees Centigrade, on average, over the next century, assuming greenhouse gas emissions continue to rise at current rates. The scientific evidence behind these projections, says Yvo de Boer, Executive Secretary of the UN's Framework Convention on Climate Change, leaves "no doubt as to the dangers mankind is facing."

One of the greatest of those dangers is the vulnerability of agriculture to climate change, especially in developing countries. The expected impacts — including more frequent and severe drought and flooding as well as shorter growing seasons — are of grave concern to the 15 international research Centers supported by the CGIAR.

Center scientists and their numerous national partners have generated a wealth of technologies, knowledge and methods, which can lessen the vulnerability of marginalized rural people and places to the impacts of climate change through more sustainable agricultural development. They have also identified promising approaches to tropical land management, which could mitigate future climate change through the capture of significant amounts of carbon and other greenhouse gases, while also contributing to poverty reduction.

Mapping the Menace of Global Climate Change

The impacts of global climate change on agriculture will vary over time and across locations, depending on different agroecologies, farming systems, production conditions and even particular plant species. Likewise, strategies and measures for coping with those impacts will need to be adjusted to the variable circumstances of rural people in diverse landscapes.

There is plenty of scope for developing broadly applicable solutions to the problems those people will face, including improved crop varieties and better natural resource management practices. But to make those measures as effective as possible, they must be targeted with a reasonable degree of precision to the places where they will be most needed and are most likely to work.

During recent years, CGIAR scientists have progressed significantly — with the aid of geographical information systems (GIS) and simulation models — in determining what

specific consequences rural people, especially the poor, can expect to face at specific locations as a result of climate change during the coming decades. In pioneering studies, for example, they have predicted negative effects on key staples, such as maize and wheat, in major production environments and across entire continents.

Adapting Agricultural Systems to Climate Change

The performance of crops, wild species, livestock and aquatic resources under stress depends both on their inherent genetic capacity and on the whole agroecosystems in which they are managed. For that reason, any serious effort to increase the resilience of developing country agriculture in the face of climate change must involve the adoption of stress tolerant crop varieties and animal breeds as well as more prudent management of crops, animals and the natural resources that sustain their production while providing other vital services for people and the environment.

Since stresses such as drought and heat have always posed a significant threat to crop production, CGIAR scientists began developing hardier varieties soon after the international agricultural research centers were created. "Climate-resilient" crop varieties resulting from this work have already reached farmers' fields, and more are in the making.

That research figures importantly in a major CGIAR research effort to improve the productivity of water in agriculture. Among the other products of this work are alternative irrigation systems that are suitable for small farmers, better practices for managing rainwater in dry areas and innovative approaches to collective management of natural resources in watersheds. Meanwhile, CGIAR soils research, which is closely related to the work on water, has given rise to crop and soil management practices that can help farmers adapt to harsh growing conditions, while contributing to lowering greenhouse gas emissions through, for example, reduced tillage and increased fertilizer-use efficiency.

To foster the changes in agricultural systems that are needed to make them more resilient is a complex challenge for developing countries, but they are making progress. Three conditions

must be met to heighten their chances of success: (1) strong market incentives, (2) able institutions and (3) supportive policies that foster positive change. CGIAR researchers are exploring a number of avenues with other international institutions and with partners in developing countries to meet those conditions.

Managing Tropical Lands to Mitigate Climate Change

Although they bear essentially no responsibility for having brought about global climate change, developing countries, nonetheless, recognize the need and opportunities for helping meet this threat.

Some of the most promising options open to them involve better approaches to the management of tropical lands. These include reduced deforestation, more sustainable forest management, agroforestry systems, production of biofuels and various innovations in agricultural systems. All of these measures could mitigate future climate change by permitting the capture of significant amounts of carbon and other greenhouse gases, while also contributing to poverty reduction. But there are numerous obstacles impeding widespread improvement in land use.

An invaluable opportunity to overcome those obstacles lies in current deliberations on post-Kyoto Protocol regulations for carbon trading. It is imperative that the governments and international agencies shaping the new regulations move land-use change from the margins to the center of carbon finance. Unless they seize this historic opportunity, the Millennium Development Goals will most likely remain an empty promise for many of the world's rural poor, particularly as they confront the menace of global climate change.

