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Agriculture, Agro-biodiversity and Climate Change

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The agricultural sector is one of the largest contributors to greenhouse gas emissions, second only to the energy sector.[1] Conversely, climate change affects agriculture throughout the world. According to the fourth assessment report of the Inter-governmental Panel on Climate Change, crop yield losses as a result of climate change will be more severe in the tropics than in temperate regions. Estimates indicate that between 75 million and 250 million people in Africa will be affected by water shortages caused by climate change.[2] As in any situation of economic imbalance, the poor will be the most affected – losing livelihood opportunities and access to food and water. Many mitigation and adaptation measures are beyond the reach of countries with severe resource constraints.

Adapting to climate change

Adaptation to climate change should be considered from a contingency planning process perspective. Many least developed countries have had the opportunity to develop National Adaptation Plans of Action in the context of the United Nations Framework Convention on Climate Change but implementation of those programmes and strategic links to resourcing actions are often lacking. Adaptation in the agricultural sector can be seen in terms of both short-term and long-term actions. The provision of crop and livestock insurance, social safety nets, new irrigation schemes and local management strategies, as well as research and development of stress resistant crop varieties form the core of short-term responses. Long-term responses include re-designing irrigation systems, developing land management systems and raising finances to sustain adoption of those systems.[3]

The Canadian agricultural sector has identified 96 distinct adaptation measures in agriculture including altering the topography of land; changing farming systems; using different crop varieties; making governmental and institutional changes and researching new technologies to take up the challenges posed to agriculture by climate change.

Agriculture and mitigation

Livestock and crops emit carbon dioxide, methane and nitrous oxide making agriculture a major source of greenhouse gases. Some 80 per cent of these emissions come from developing countries. Agriculture is also a major cause of deforestation according to reports of the United Nations Framework Convention on Climate Change. Nitrous oxide emissions from soils, because of the use of fertilizers and manures and methane from livestock production account for a third of non-carbon dioxide emissions. Land use change, compounded by agriculture, also reduces carbon sequestration.[4]

Challenges

In light of the foregoing, the agricultural sector faces multiple challenges. While intensification and diversification of agriculture is key to securing food for local people, in the absence of clear understanding of their impacts on agriculture, they can be problematic. Though measures to reduce the use of fertilizers, to increase organic inputs and to deploy new varieties of crops are suggested as better agronomic practices, more clarity is required regarding their impacts on climate. For example, the selection of rice varieties that include wetland rice in sub-Saharan Africa can reduce deforestation as well as management costs and emissions.[5]

Agriculture could also benefit from emerging areas of climate change action. For example, it could profit from the benefits of land uses that sequester carbon, from the emerging markets for trading carbon emissions. Such activities offer higher returns than those arising from forest conversion to agricultural land. Post-2012 discussions under the Kyoto Protocol to the United Nations Framework Convention on Climate Change might consider exploring credits for the sequestration of carbon in soils through conservation tillage in agriculture as well as agroforestry in agricultural landscapes.[6]

Livestock improvements brought about by more research on ruminant animals, storage and capture technologies for manure and conversion of emissions into biogas are additional contributions that agriculture can make towards mitigating climate change.[7]

National agricultural priority setting should consider climate change responses. While the biophysical impacts of climate change on agriculture and vice versa are better understood, the social and economic impacts have not been researched adequately in many developing countries. With increasing trade distortions and the changing prioritization of agriculture in developed countries, developing countries affected by climate change should focus on developing suitable national, regional and global measures that will provide a safety net in the short term, should productivity fail owing to climate variability and change.

Institutional and human resource capacities supported by sustained funding options in the form of direct or indirect investments into adaptation to climate change in agriculture are essential. Mainstreaming climate change issues into national economic and development plans is critical to enabling countries tackle the impacts of climate change on agriculture and reducing the negative effects of agricultural practices on climate change.

1 World Development Report, 2008. World Bank, Washington, United States of America.
2 Adaptation to climate change in agriculture, forestry and fisheries: perspective, framework and priorities. 2007. FAO, Rome
3 FAO, 2005 Background document for thirty first session of the Committee on World Food Security. FAO, Rome.
4 World Development Report, 2008. World Bank, Washington, United States of America.
5 Fisher and others 2002. Research Report 02, IIAPA, Austria.
6 Adaptation and Mitigation of Climate Change in Agriculture, Policy brief, World Development Report, 2008.
7 Livestock's long shadow. 2006, FAO, Rome.