iisd International Institute for Sustainable Development / Institut international du développement durable

IISD REPORT

IISD Food Security and Climate Change Initiative

Integrating Mitigation and Adaptation in the Agriculture Sector

Hilary Hove

November 2011

www.iisd.org

International Institute for Sustainable Development

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC), and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations and the private sector.

Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Web site: www.iisd.org

IISD Food Security and Climate Change Initiative
Integrating Mitigation and Adaptation in the Agriculture Sector

November 2011

Written by Hilary Hove

Preface

A critical challenge facing the world is how to feed an expected population of around 9 billion by 2050, while simultaneously reducing greenhouse gas (GHG) emissions and adapting to climate change.

The agricultural sector plays a critical role in food security, poverty reduction and economic growth—especially in developing countries, where agriculture is fundamental to sustainable development. Agricultural systems are very sensitive to changes in climatic conditions and will have to adapt if they are to ensure provision of adequate food for an increasing population. The sector is a large emitter of GHGs, responsible for around 14 per cent of global emissions, and has significant potential to sequester atmospheric carbon dioxide and reduce GHG emissions. In this respect, actions in the agricultural sector within the international climate change regime potentially can strengthen adaptive capacity and reduce GHG emissions while improving food security and enhancing rural livelihoods.

With the support of Canada's International Development Research Centre, the International Institute for Sustainable Development (IISD) launched the Food Security and Climate Change Initiative to help promote the triple dividend within the context of the United Nations Framework Convention on Climate Change (UNFCCC). IISD's research, policy and practice aims to inform the inclusion of agriculture in a future international climate change agreement in a way that encourages the triple dividend.

The series of policy reports focus on the following themes:

Agriculture and the UNFCCC Negotiations

- *Agriculture in an International Climate Change Agreement*
- *Agriculture and Climate Change: Post-Durban Issues for Negotiators*

Achieving the Triple Dividend: Perspectives on linking adaptation and mitigation in practice

- *Encouraging a Triple Dividend: Increased Food Security, Improved Adaptive Capacity and Reduced Emissions*
- *Integrating Mitigation and Adaptation in the Agricultural Sector*

Critical Issues for Agriculture Moving Forward

- *Addressing Financing for Agriculture: Ensuring a Triple Dividend for Smallholders*
- *Agriculture and Trade*

The papers are written by a team of researchers from IISD's Climate Change and Energy team. We extend thanks to our Expert Advisory Group—comprised of Mohammed Asaduzzaman, Marcelo Theoto Rocha, Brian Mantlana, Isabel Proulx, Alexandra Conliffe and Marie Boehm—whose input and direction improved the papers. The opinions and ideas expressed in these papers are those of the authors alone and do not necessarily reflect the views of those consulted.

.

Table of Contents

1.0 Introduction

Policy discussions at the national and international level have traditionally treated climate change mitigation and adaptation as parallel yet separate issues, with respective policy prescriptions rarely recognizing the synergies and complementarities that may occur through a more unified approach to these two issues. Increasingly, this false dichotomy is being highlighted as a missed opportunity. An integrated approach to climate change that can advance both mitigation and adaptation objectives is particularly applicable in land-use sectors, including agriculture. Many agricultural management practices that contribute to the achievement of adaptation goals—and thus to improving agricultural production potential—are also those that support mitigation co-benefits. A shift from a focus on low-carbon agricultural production systems on the one hand, and climate resilient development on the other, to a more integrated discussion of climate change is increasingly encouraged in the agriculture sector.

Emerging evidence indicates that these linkages are not simply conceptual, but are also being recognized by policy-makers and policy influencers. Under the UNFCCC, the draft text on sectoral approaches to agriculture acknowledges the need to address both mitigation and adaptation. The Declaration of the World Summit on Food Security (held in Rome in November 2009) acknowledges the inextricable links between mitigation, adaptation and food security.[1] The African Ministerial Conference on Climate-Smart Agriculture held in September 2011 produced the Johannesburg Communiqué, which calls upon COP 17 to establish a programme of work on agriculture that covers adaptation and mitigation.[2] The Food and Agriculture Organization (FAO, 2010, p. ii) uses the term climate-smart agriculture, referring to "agriculture that sustainably increases productivity, is resilience (adaptation) reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals."

National governments have an interest in ensuring that their agricultural production sectors are resilient to the impacts of climate change. While this is the case across the world, adaptation is a particular concern in developing countries where capacity to adapt is weak, the sector is dominated by smallholder farmers and rain-fed agriculture, and where the agriculture sector directly supports the livelihoods and national food consumption of the majority of the population. While the primary interest of farmers lies in ensuring productivity and livelihood gains through appropriate adaptation measures, many practices that generate livelihood benefits also contribute to mitigation.

This paper explores the synergies between mitigation and adaptation in agricultural production systems, attempting to demonstrate that the agricultural sector offers an opportunity to further mitigation and adaptation objectives through a more holistic, integrated response to climate change. First, the paper will highlight agricultural management practices that have been shown to contribute to both mitigation and adaptation benefits. The paper will then explore the barriers and gaps that prevent this integrated approach from being adopted at the international and national levels and, ultimately, at the local level. Finally, it will identify policy options at the national and international levels that may assist in overcoming these barriers, and provide guidance as to how the UNFCCC may play a catalytic role in encouraging the transition to agricultural approaches that address both mitigation and adaptation.

[1] The Declaration can be found here: http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf.
[2] The Johannesburg Communiqué can be found here: http://www.nda.agric.za/index2011ClimateChange.htm.

2.0 An Integrated Approach to Mitigation and Adaptation

At the theoretical level, mitigation and adaptation are closely linked, in that they each represent measures to reduce the risks of negative climate impacts. But the purpose of mitigation is to reduce the climate change effect, while adaptation aims at reducing vulnerability (Swart & Raes, 2007). The spatial and temporal scales they address create different implementation incentives—the benefits derived from mitigation more directly accrue at the global scale and over the longer term, while adaptation generates greater local benefits and aims to address both current and future impacts (Swart & Raes, 2007).

Adaptation is important in the agricultural sector, where climate change presents considerable challenges. Although anticipated impacts vary by region, the Intergovernmental Panel on Climate Change (IPCC) indicates that, globally, agriculture will be affected by long-term trends in average temperatures, precipitation, and wind patterns, as well as by increasing climate variability including an increased risk of extreme weather events such as droughts and floods (Smith et al., 2007). These changes create new local conditions for agricultural production. This is a particular concern for developing countries for which the impacts of climate change on agriculture are anticipated to affect production and where capacity to adapt is the weakest. It is estimated that in sub-Saharan Africa and Asia—regions where food security is an ongoing challenge[3]—56 per cent and 21 per cent of agriculture crops, respectively, may be impacted by climate change by mid-century (Ramirez et al., 2011). This vulnerability is compounded by the fact that the majority of farmers in developing countries are smallholders, with an estimated 85 per cent farming on less than 2 hectares and generating up to 80 per cent of the developing world's food production (McTaggart, 2010; Hoffman, 2011). In addition, the majority of agriculture in these areas is rain-fed, further exacerbating vulnerability to the impacts of climate change. In Sub-Saharan Africa, approximately only 4 per cent of agricultural land is under irrigation, with 39 per cent and 29 per cent in South Asia and East Asia respectively (World Bank, 2007).

The agricultural sector also contributes significantly to climate change, meaning that mitigation of emissions is also important. The agriculture sector is directly responsible for approximately 14 per cent of global GHG emissions and indirectly contributes to emissions through changes in land use, especially deforestation for agricultural expansion, which accounts for an additional 17 per cent of total GHG emissions (FAO, 2011). Emissions from the agricultural sector include emissions from soils, enteric fermentation, biomass burning, rice production, and manure management (Smith et al., 2007). The IPCC reports that developing countries represent approximately 70 per cent of the technical agricultural mitigation potential and notes that the materialization of the full mitigation potential is a complex issue.

Although the challenges are considerable, in many cases the measures that will assist farmers in mitigating climate change are also those that provide resilience benefits. This synergetic relationship primarily stems from the fact that increasing the carbon content of soil—estimated to comprise 89 per cent of global mitigation potential of the agriculture sector (Smith et al., 2007)—also enhances soil quality and productivity, particularly in many developing countries where soil degradation and erosion is an issue (Bryan et al., 2011). Agriculture can also be made both more resilient and GHG-efficient by reducing methane emissions from rice production and livestock, diminishing nitrous oxide emissions from chemical fertilizer and other inputs, and by preserving and enhancing the functioning of ecosystem services (Hoffman, 2011).

[3] Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). According to the FAO, even if the Millennium Development Goal of halving the number of people who suffer from hunger by 2015 were achieved, around 600 million people in developing countries would still suffer from food insecurity (FAO, 2011).

Further research is needed to reveal the specific mix of synergetic mitigation and adaptation policies for specific landscapes, countries, and regions; however, a growing body of literature has pointed to general principles of agricultural management that have a high likelihood of delivering both mitigation and adaptation co-benefits, regardless of their specific locational application. These are presented in the following broad categories: cropland management; soil and water management; management of livestock or grazing land; and restoration of degraded lands (ADB, 2009; FAO, 2009b; FAO, 2009c; Smith et al., 2007):

Cropland management

Many climate-smart agricultural practices that address both mitigation and adaptation concerns fall under the broad category of cropland management. These approaches broadly refer to actions that improve carbon sequestration within the soil, minimize tillage, and increase careful management of wastes, thereby reducing atmospheric carbon dioxide while enhancing soil quality. Healthier soils play a positive role in agricultural productivity while also providing resilience benefits such as improving water retention and decreasing runoff. Specific cropland management actions include the following:

- *Improved crop varieties or types:* Switching to crop varieties that are well adapted to changing climate conditions—including early maturing and drought-resistant varieties—can improve soil carbon sequestration while also improving resilience to changing weather patterns. Although the practical considerations of such actions must be considered, including the emerging trend of the seed industry to consolidate its products, thus narrowing seed options and causing farmers to lose access to important varieties.

- *Reduced or zero tillage:* Disturbance of agricultural lands causes soil carbon losses and decreases soil fertility, while also disrupting the soil's ability to retain water. Reduced or zero tillage practices can sequester carbon and improve the health and productivity of their soils, but increased soil carbon sequestration often results in increased nitrous oxide emissions, which somewhat negates the expected mitigation benefits. Research is needed to compare soil respiration rates, and the interaction of carbon and nitrous oxide in reduced/zero tillage and other soil management systems.

- *Agroforestry:* This practice involves the incorporation of multifunctional trees into agricultural systems, as well as the collective management of nearby forests. Agroforestry contributes to nutrient fixing in soils, enhances carbon sequestration, and plays a major role in improving the health of surrounding watersheds.

- *Use of cover crops:* Rather than letting agricultural lands lie fallow, planting appropriate cover crops can help to replenish soil nutrients and contribute to soil carbon storage. Adaptation and productivity co-benefits are derived from reduced erosion and improved soil fertility and water holding capacity.

- *Integrated nutrient management:* More precise and appropriate use of fertilizer and manure can reduce emissions through decreased volatile losses. These practices also contribute to resilience through improved productivity. Lessening the need for nitrogen-based fertilizers (both synthetic and organic) can help to reduce emissions of nitrous oxide.

Additional cropland management practices include changing planting dates, improved crop/fallow rotation, and incorporation of crop residues, each of which promote retention of carbon and other nutrients in soils and allow for improved production conditions.

Soil and water management

Various soil and water management practices can also provide mitigation and adaptation benefits, while contributing positively to productivity in many cases. Irrigation and water harvesting, for example, contribute to adaptation by making farming systems more resilient to variable precipitation and increased evapotranspiration. They can also contribute to mitigation in areas where fossil fuels are relied upon to drive irrigation equipment. In addition, structural innovations such as the building of terraces, ride and furrow patterns, and diversion ditches enhance water preservation and rainwater management while contributing to the health of soils and minimizing carbon leaching. For example, the production of rice—the fourth largest agricultural source of GHG emissions globally (ADB, 2009)—involves flooding fields, a process which releases methane. There is evidence that improved water management in rice production can reduce the amount of time the crops are flooded—improving use efficiency while also contributing to mitigation (ADB, 2009).

Management of livestock or grazing land

Climate-smart agricultural practices also include an integrated approach to the management of livestock or grazing lands. Improving livestock diets through diversifying, changing and supplementing livestock feeds, for example, can contribute to reduced methane emissions, increase climate resilience by reducing dependence on a small number of feed sources and potentially contribute to livestock productivity through improved diets (Bryan et al, 2011). Overgrazing of lands reduces soil quality and leads to soil carbon leaching. Rotational grazing methods, improved breeds and species, and destocking—whereby the number of livestock per hectare is reduced—can help to maintain the health and productivity of grazing lands while reducing methane and carbon emissions. In addition, integrated crop-livestock systems have been shown to improve livelihoods as well as agro-ecosystems (ADB, 2009).

Restoring degraded lands

Degraded lands have low and declining productivity, as well as limited ability to retain water and store carbon. Restoring degraded lands through revegetation, erosion control and applying appropriate nutrient amendments improves soil quality and reduces erosion, providing high mitigation benefits over the longer term.

Efficiency of food systems

An FAO report calculated that the amount of food lost or wasted every year is equivalent to more than half of the world's annual cereals crop (an estimated 2.3 billion tonnes in 2009–10) (Gustavsson et al., 2011). Food losses are due to insufficient post-harvest storage (particularly in developing countries) and other system inefficiencies, while food waste is a larger problem in developed countries. Minimizing losses and waste, and enhancing efficient distribution systems can help to reduce GHG emissions while providing food security and adaptation benefits through enhanced availability.

Each of the activities described above are examples of an integrated approach to addressing climate change in the agriculture sector. These activities help to improve the resilience of farming systems to changing climate conditions, enhance soil quality and productivity and increase carbon storage potential. In practice, the adaptation and mitigation benefits of each will vary depending on landscape, region and farming system and therefore must be locally adapted to minimize trade-offs and maximize benefits.

Additional trade-offs may be presented when considering broader development and food security objectives. For example, the restoration of degraded lands typically involves taking land out of cultivation for a significant period of time and, in the case of wetlands, sometimes permanently. While these measures provide long-term development, food security, mitigation and adaptation benefits, in the short term there are development and food security trade-offs presented by reduced land availability. At farm level, these trade-offs would impact decisions. For example, developing country farmers will have little incentive to undertake mitigation actions unless there is a clear link to productivity improvements. Ultimately, each country should decide the appropriate entry-point for national decision making around an integrated approach to agriculture, and to balance short- and long-term synergies and trade-offs.

3.0 *Identifying Barriers and Gaps to an Integrated Approach to Mitigation and Adaptation in the Agriculture Sector*

Despite the many benefits of a more integrated approach to agriculture, and while many of these measures make use of knowledge, technologies and practices that are pre-existing and affordable, a number of barriers work against their widespread adoption. Although the nature and extent of these barriers are specific to the context, capacities, and culture of the country or region in question, as well as the type of farming system, a number of common impediments to an integrated approach agriculture have been identified by the literature (ADB, 2009; Bryan et al., 2011; Campbell, et al., 2011; FAO, 2009a; FAO 2010; Hoffman, 2011).

One common set of barriers to integrated mitigation and adaptation measures in the agricultural sector is primarily *financial* in nature.[4] Although there is evidence that the costs of certain climate management practices are negative over their lifecycle, many also involve upfront costs and short-term risks (Hoffman, 2011; McKinsey, 2009; FAO 2009b). For example, soil and water conservation infrastructure may require high upfront costs in labour and external inputs (FAO 2009b). Farmers, in particular in the developing world, may lack the access to credit, insurance, and markets that would allow for investment in integrated agricultural practices (FAO 2009a, 2010). While agricultural carbon credits may provide a financial incentive for some mitigation practices and generate benefits for smallholders, there are a number of uncertainties associated with this approach that must be overcome, and there is likely a need to think creatively about alternate approaches.

An additional set of barriers can be found at the *institutional and policy level*. Nationally, agricultural extension services—the array of formal and informal institutions that have traditionally provided farmers access to new information, agricultural inputs and seed varieties—have weakened significantly in recent years, leaving a capacity gap at the farm level (Campbell, et al., 2011; Hoffman, 2011). In addition, undefined or conflicting land tenure laws may prevent farmers from making investment decisions of a longer-term nature. At both the national and international levels, uncoordinated

[4] This barrier is explored in detail through the fourth paper in IISD's agriculture and climate change series: "Addressing Financing for Agriculture: Ensuring a Triple Dividend for Smallholders."

and at times conflicting policies spanning economic development, climate change mitigation and adaptation, and food security can generate perverse incentives and conflicting goals that hinder a more holistic approach to agriculture.

At the *technical level*, methodological issues related to measurement and monitoring include difficulties in establishing a baseline, high level of uncertainty in emission estimates and lack of information for their assessment, and high costs for measurement and monitoring of emission reductions (UNFCCC, 2009).

Finally, considerable gaps persist at the level of *knowledge and capacity building*. Although in general the principles and approaches that will encourage both adaptation and mitigation benefits are known, further research is needed to determine context-specific trade-offs and benefits. A concern is inducing farmers to adopt new practices and the cost of establishing the systems, including extension services, that can help bridge the knowledge gap and build capacity.

4.0 Policy options and next steps

Addressing the various barriers and challenge will require a multi-pronged approach that transcends traditional divides, provides incentives and builds capacity. Multiple policy approaches at the national and international level can address barriers and advance the adoption of agriculture practices that encourage adaption and mitigation benefits.

National policy options

- *Mitigation, adaptation and agricultural development strategies should reinforce and support one another.* At present, policies that affect the agriculture sector are often developed separately, with at times conflicting goals and objectives that prevent "synergy capture" (FAO, 2009a). There is therefore a need for greater coherence, coordination and integration between these policy processes (Bryan et al., 2001; FAO, 2010). National development strategies, agriculture sector policies, Poverty Reduction Strategy Papers, Nationally Appropriate Mitigation Actions, and National Adaptation Programmes of Action, where they exist, should be screened and reframed to support agriculture and climate change objectives as well as identify policy conflicts, such as issues of pricing and fuel subsidies. Such a review could help to identify and minimize trade-offs and maximize complementarities between mitigation and adaptation.[5]

- *Innovative institutional mechanisms can help to align interests towards achieving both mitigation and adaptation objectives in agriculture and improve collective action.* Institutional arrangements can help to bridge these divides, although it should be recognized that building compatibilities and linkages between various institutions is not an easy or straightforward task and requires political will. Communication can be encouraged among different ministries to help advance synergy identification and the management of trade-offs through facilitated inter-ministerial dialogue, the establishment of interdisciplinary communities of practice, joint planning exercises, and multi-stakeholder processes (Campbell, et al., 2011).

[5] A need for this integration was acknowledged through a Communiqué from the African Ministerial Conference on Climate-Smart Agriculture held in September 2011. Specifically, the document recommends that climate change be mainstreamed into the Comprehensive African Agriculture Development Program. However, there appears to be a discrepancy between African agricultural productivity targets that are defined in policy documents and projections of how climate change may affect agriculture (IIED, 2010).

- *Institutional arrangements that produce and disseminate information to farmers can be improved.* There is a need to ensure that farmers have access to current information and inputs regarding agricultural practices that attain mitigation and adaptation benefits, as well as access to climate science data for agricultural planning. Improving agricultural extension services, which have declined in recent years, is critical. Existing institutions—including farmer field schools, producer organizations, and farmer unions—may be strengthened to enhance smallholder aggregation and participation in capacity building initiatives (FAO, 2009a). Alternative mechanisms for extension, aggregation, and collective action should also be developed, and access to short-term climate forecast as well as longer-term climate projections enhanced (FAO 2009b; Campbell, et al., 2011).

- *Legal and regulatory frameworks should not provide a disincentive.* Unclear property rights and land-tenure laws may create a disincentive to investing in agricultural practices that require a long-term investment. Many authors argue that clarifying and enforcing land laws will help to advance a holistic approach to agriculture (Campbell, et al., 2011; FAO, 2009a; Hoffman, 2011). In addition, market regulations should create positive incentives for smallholder investment in sustainable land management practices (FAO, 2009a).

- *Spending on agriculture should be enhanced to achieve the aforementioned objectives, and innovative financial mechanisms examined.* There is a need for enhanced allocation of resources towards the agricultural sector in order to overcome the aforementioned barriers associated with an integrated approach to mitigation and adaptation. Innovative financial mechanisms and business models—including agricultural offsets, where appropriate—should be examined. In 2003, African leaders recognized a need for greater investment by pledging to allocate 10 per cent of their budgets towards agriculture (however, by 2008, many countries had not achieved this target). Enhanced financing can be targeted towards research, capacity building, institutional innovation, as well as investments in transportation and food storage to ensure access to markets and to minimize waste.

International Policy Options

- As at the national level, there is a need to better integrate international policy discussions and initiatives around trade, food security and addressing climate change in the agriculture sector. In many cases, these initiatives proceed without significant acknowledgement of evident linkages and complementarities.[6] A more integrated approach would ensure that climate change actions take full account of the availability, accessibility, and use of food, and that food security discussions reflect the current and future challenges posed by a changing climate (Campbell, et al., 2011). There is also a need to ensure that international trade policies are supportive of climate-smart agriculture (Hoffman, 2011).

- Multilateral and bilateral donor support towards agriculture should be enhanced, and an integrated approach to mitigation and adaptation adopted. Many developing countries rely on international donors to support their agricultural development objectives and agriculture's share of Official Development Assistance has declined from a high of 18 per cent in 1979 to 6 per cent in 2009 (Hoffman, 2011; FAO, 2009a). While there is increasing recognition of the importance of mainstreaming both mitigation and adaptation considerations into the

[6] As observed by the FAO, "Two parallel global dialogues on reducing food insecurity and responding to climate change have until now had remarkably little substantive integration…" (FAO, 2009a: 23).

agriculture sector, there are opportunities to ensure this integrated approach is implemented both at the policy level and on the ground.

- International agricultural research programmes should integrate climate change considerations more significantly into their programming. There is a clear need for enhanced research that integrates agricultural development and climate change considerations. Further research is required in a number of areas, including: institutional innovations such as information and dissemination mechanisms; an examination of context-specific trade-offs and synergies; innovative approaches to financing; and enhanced knowledge around farmer decision-making processes under a number of conditions. In addition, research is needed on the adoption and diffusion of proven low-cost mitigation-friendly adaptation technologies. Certain international research organizations—including the Climate Change, Food Security and Agriculture program of the Consultative Group on International Agricultural Research (CGIAR) and the Global Research Alliance on Agricultural Greenhouse Gases—are working to fill these research and knowledge gaps.

- International research networks can investigate innovative approaches to financing of agriculture, including the potential to produce carbon offsets from agriculture while encouraging adaptive actions, and can identify emerging best practices and lessons learned. The World Bank, FAO, CGIAR, International Food Policy Research Institute, and other organizations are spearheading efforts to examine the potential of agricultural offsets to contribute financing to smallholders and advance agricultural practices that integrate mitigation and adaptation. Through these and similar agricultural pilot initiatives, there are significant opportunities to advance research, to resolve methodological questions, and build readiness for an integrated approach to mitigation and adaptation.

The international climate change negotiations under the UNFCCC offer a particular opportunity to advance these objectives. Many countries have expressed an interest to forward an agenda on agriculture at COP 17 in Durban, South Africa and increasingly recognize the complementarities between mitigation and adaptation actions. Specific options to link mitigation and adaptation in the discussions on agriculture include:

- *Encourage an agreement on agriculture and climate that covers both adaptation and mitigation:* An agreement under the UNFCCC should promote both adaptation and mitigation in the agricultural sector. There are concerns that the current focus on sectoral approaches will emphasize mitigation, and many developed countries stress that adaptation is a greater priority in the agricultural sector.

- *Establish a work programme under Subsidiary Body on Scientific and Technical Advice (SBSTA):* A work programme on agriculture under SBSTA could focus on both adaptation and mitigation, including:

  - Provision of evidence on existing best practices that deliver adaption and mitigation benefits—including identification of low-cost technologies with potential for uptake;
  - Examination of the linkages between the two, including guidelines for identifying synergies and trade-offs (e.g., capturing adaptation benefits in mitigation plans, and mitigation benefits in adaptation plans; and
  - Exploration of finance actions that combine mitigation and adaptation, and measurement of results, including methods to quantify both mitigation and benefits.

- *Leverage funding to overcome financial and non-financial barriers and to secure long-term partnerships:* An agreement on agriculture under the UNFCCC could provide impetus for greater funding for the agricultural sector; and

countries could work to allocate funding to agricultural initiatives that bring both mitigation and adaptation benefits. A program or framework to promote agriculture should include capacity building in developing countries, as well as the sharing of information about country- and farm-level efforts that promote mitigation and adaptation.

- *Ensure that the Climate Fund recognizes the need for an integrated approach that encourages mitigation and adaptation outcomes:* Efforts to establish the Climate Fund are underway, and it is important to ensure that funding windows do not inadvertently compartmentalize mitigation and adaptation efforts within the agriculture sector. While markets may offer some opportunities for investment in climate-smart agriculture, it is clear that grant-based funding will also be required. Some actions to promote synergistic mitigation-adaptation action in the agricultural sector may not be suitable for funding through the carbon market.

Adaptation and mitigation have been treated as two separate approaches in the climate change negotiations. An agreement on agriculture under the UNFCCC could produce a more integrated approach that promotes both mitigation and adaptation benefits in the agricultural sector.

References

Asian Development Bank [ADB] (2009). *Building climate resilience in the agriculture sector in Asia and the Pacific.* Manila: ADB.

Bryan, E., Ringle, C., Okoba, B., Koo, I., Herrero, M., & S. Sivestri (2011). *Agricultural management for climate change adaptation, greenhouse gas mitigation, and agricultural productivity: Insights from Kenya.* Washington. D.C.: IFPRI.

Campbell, B., Mann, W., Meléndez-Ortiz, R., Streck C., & Tennigkeit, T. (2011). *Agriculture and climate change: A scoping report.* Washington, D.C.: Meridian Institute.

Food and Agriculture Organization [FAO] (2008). *Climate change adaptation and mitigation in the food and agriculture sector.* Technical Background Document. Rome: FAO.

FAO (2009a). *Food security and agricultural mitigation in developing countries: Options for capturing synergies.* Rome: FAO.

FAO (2009b). *Low GHG agriculture: Mitigation and adaptation potential of sustainable farming systems.* Rome: FAO.

FAO (2010). *Climate smart agriculture: Policies, practices for food security, adaptation and mitigation.* The Hague Conference on Agriculture, Food Security and Climate Change. Rome: FAO.

FAO (2011). *The state of food insecurity in the world: How does international price volatility affect domestic economies and food insecurity?* Rome: FAO.

Foresight (2011). *The future of food and farming: Challenges and choices for global sustainability – executive summary.* London: The Government Office for Science.

Gustavsson, J., C. Cederberg, U. Sonesson, R. van Otterdijk and A. Meybeck (2011). *Global losses and food waste: Extent, causes and prevention.* Rome: FAO.

Hoffmann, U. (2011). *Assuring food security in developing countries under the challenges of climate change: Key trade and development issues of a fundamental transformation of agriculture.* UNCTAD Discussion Paper No. 201. Geneva: UNCTAD.

International Institute for Environment and Development [IIED] (2010). *The impacts of climate change on food security in Africa: A synthesis of policy issues for Europe.* London: IIED.

OECD (2010). *Climate change and agriculture: impacts, adaptation, and mitigation.* Paris: Trade and Agriculture Directorate, Environment Directorate.

Ramirez, J., Jarvis, A., & Laderach, P. (2011). Empirical approaches for assessing the impacts of climate change on agricultural production: The EcoCrop model and a case study with sorghum *(Sorghum bicolor M.). Agriculture and Forest Meteorology*, under review.

Smith, P., Martina, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., O'Mara, F., Rice, C., Scholes B., & Sirotenko O. (2007). Agriculture. In B. Metz, O.R. Davidson, P.R. Bosch, R. Dave & L.A. Meyer (Eds.) *Climate Change 2007: Contributions of working group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge, U.K.: Cambridge University Press.

UNFCCC (2008, November 21). *Challenges and opportunities for mitigation in the agricultural sector: Technical paper.* FCCC/TP/2008/8.

World Bank (2007). *World development report 2008: Agriculture for development – overview.* Washington, D.C.: World Bank.

iisd International Institute for Sustainable Development / Institut international du développement durable

Published by the International Institute for Sustainable Development.

International Institute for Sustainable Development
Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Web site: www.iisd.org