

**Global Action  
on Climate Change  
in Agriculture:  
Linkages to Food Security,  
Markets and Trade Policies  
in Developing Countries**



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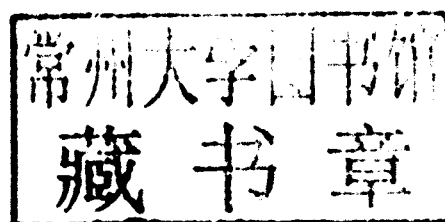
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By

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## Acronyms

<b>AAU</b>	Assigned Amounts Units
<b>ADB</b>	Asian Development Bank
<b>AfDB</b>	African Development Bank
<b>AFOLU</b>	Agriculture, Forestry and Other Land Uses
<b>AfT</b>	Aid for Trade
<b>A/R</b>	Afforestation/reforestation
<b>AWG-KP</b>	Ad-hoc working group on the Kyoto Protocol
<b>AWG-LCA</b>	Ad-hoc working group on long term action
<b>BTA</b>	Border tax adjustment
<b>CA</b>	Conservation agriculture
<b>CDM</b>	Clean Development Mechanism
<b>CER</b>	Certified Emissions Reductions
<b>CIF</b>	Climate Investment Fund
<b>CMP</b>	Meeting of the Parties of Kyoto Protocol
<b>COP</b>	Committee Of Parties
<b>CPC</b>	Central Product Classification
<b>CTF</b>	Clean Technology Fund
<b>CTO</b>	Committee on Trade and Environment
<b>DAC-CRS</b>	Development Assistance Committee's Creditor Reporting System
<b>DSB</b>	Dispute Settlement Body of the WTO
<b>EBA</b>	Everything-but-Arms
<b>EBRD</b>	European Bank of Reconstruction and Development
<b>EE</b>	Energy efficiency
<b>EGs</b>	Environmental goods and services
<b>EIF</b>	Enhanced Integrated Framework
<b>EIT</b>	Economies in Transition
<b>ERU</b>	Emission Reduction Units
<b>FCPF</b>	Forest Carbon Partnership Facility
<b>GATT</b>	General Agreement on Trade and Tariffs
<b>GEF</b>	Global Environment Facility
<b>GHG</b>	Greenhouse gases
<b>GSP</b>	Generalized System of Preferences
<b>HS</b>	Harmonized System
<b>IDB</b>	Inter-American Development Bank
<b>IEA</b>	International Energy Agency
<b>IIRSA</b>	Initiative for Integration of Regional Infrastructure in South America
<b>IPCC</b>	Inter-governmental Panel on Climate Change
<b>IPRs</b>	Intellectual Property Rights
<b>ITA</b>	Information Technology Agreement
<b>JI</b>	Joint Investment
<b>LCA</b>	Lifecycle analysis
<b>LDCF</b>	Least Developed Countries Fund
<b>LULUCF</b>	Land Use and Land Use Change and Forestry

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<b>MCA</b>	Multi-criteria analysis
<b>MDB</b>	Multilateral development bank
<b>MEA</b>	Multilateral Environmental Agreement
<b>MFN</b>	Most favoured nation
<b>MRV</b>	Monitoring, Reporting and Verification
<b>NAMA</b>	Nationally appropriate mitigation actions
<b>NAPA</b>	National Adaptation Programme of Actions
<b>NGO</b>	Non-governmental organization
<b>NTB</b>	Non-tariff barrier
<b>ODA</b>	Official Development Assistance
<b>OECD</b>	Organization of Economic Cooperation and Development
<b>PPM</b>	Process and production method
<b>PTA</b>	Preferential Trade Agreement
<b>R&amp;D</b>	Research and development
<b>REDD</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>SBI</b>	Subsidiary body on implementation
<b>SBSTA</b>	Subsidiary body on scientific and technical advice
<b>SCCF</b>	Special Climate Change Fund
<b>SCMA</b>	Subsidies and Countervailing Measures Agreement
<b>SECCI</b>	Sustainable Energy and Climate Change Initiative
<b>SPSA</b>	Agreement on the Application of Sanitary and Phytosanitary Measures
<b>SSCL</b>	Services Sectoral Classification List
<b>SVEs</b>	Small, Vulnerable Economies
<b>TBTA</b>	Agreement on Technical Barriers to Trade
<b>TRIMS</b>	Trade-Related Investment Measures
<b>TRIPS</b>	Trade-Related Aspects of Intellectual Property Rights
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WTO</b>	World Trade Organization



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# Executive Summary

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The objective of this report is to catalyse thinking about the ways in which agriculture – which has a vital role in global food security, development and natural resources use – can and must be fully integrated into national strategies and a consensus-based multilateral framework to address the challenges of climate change. The report brings forth questions that will occupy the world community over the next decade or more regarding the role of agriculture in climate change adaptation and mitigation. The report offers some answers and concrete proposals – while recognizing that much more needs to be learned, more questions formulated, and more experience gained, to build an effective strategy to support global agricultural adaptation while harnessing its significant potential contribution to climate change mitigation and taking into consideration development objectives and food security concerns.

## **Climate change and agriculture**

Agriculture is among the most vulnerable sectors to the effects of climate change because changes in temperatures and rainfall, more frequent weather extremes, and the growing presence of carbon dioxide (CO<sub>2</sub>) in the atmosphere have mostly negative effects on productivity. Yet, the projected increase in world population during the next 40 years, which should reach 9.1 billion in 2050, calls for agriculture to significantly step up its productivity and production levels. Agricultural activities also account for a substantial share of total greenhouse gas (GHG) emissions and these are expected to increase in the future due to a variety of drivers, including population and income increases, diet changes and technological change. Together, these factors demonstrate the urgency of implementing measures that favour actions and policies that simultaneously address climate change mitigation and adaptation in agriculture

while supporting development objectives and ensuring food security.

## **Agricultural mitigation and adaptation**

In industrial economies, a fundamental rethink of the way agriculture is practiced needs to be initiated. Mitigation practices include conservation agriculture, organic agriculture and greater reliance on renewable energy for domestic use in rural households in developing countries. Finding ways to reduce reliance on chemicals and synthetic fertilizers and creating incentives to promote the use of renewable energy throughout the modern agricultural systems is of the utmost urgency and requires concerted policy action.

Adaptation to climate change is a multi-dimensional, ecological and socio-economic process. Much agricultural adaptation occurs autonomously at the local level as farmers adjust their planting systems to climatic change. Planned adaptation occurs at the sectoral and national levels and includes policies such as addressing changes in food insecurity, identifying vulnerabilities, re-assessing agricultural research priorities, and strengthening agriculture extension and communication systems. Planned action on climate change adaptation should build on, coordinate with, and remove impediments to autonomous local adaptation, while pursuing sector-level and long-term adjustment.

## **A role for agriculture in the multilateral UNFCCC framework**

Agriculture's potential contribution to climate change mitigation has yet to be fully harnessed in the coordinated, multilateral climate mitigation action being undertaken within the UNFCCC framework. A role for agriculture was addressed in a draft decision

produced by the *Ad-hoc* working group on long term action (AWG-LCA) for the 2009 UNFCCC Copenhagen meeting, which outlined a commitment for members to promote and cooperate in research and development and technology transfer to mitigate GHG emission while promoting agricultural efficiency and productivity and taking into account development priorities and food security. Climate change talks in Copenhagen did not focus on agriculture in time to settle the technicalities necessary for reaching even a political agreement on agriculture's inclusion in the accord. Hence, neither agriculture nor food security are mentioned in the Copenhagen Accord, despite their critical importance for developing countries. However, the proposed agriculture text in Copenhagen was dropped in Cancun (only calling for a work programme of the Subsidiary Body on Scientific and Technical Advice - SBSTA). Now it remains as "agriculture as a driver of deforestation" in REDD+.

### **GATT/WTO rules: "Climate first, trade second"**

The most challenging question for world trade that is posed by actions taken to adapt to and mitigate climate change is whether the rules-based global trade system under the GATT/WTO can achieve a balance between ensuring an open and fair multilateral trading system while providing sufficient scope for multilateral and national action to mitigate climate change.

Climate change is now recognized as primary – "Climate first, trade second." Within the framework of a multilateral consensus on climate change targets and mandates, multilateral trade rules should not hinder policies that encourage a switch to more sustainable patterns of consumption and production, and trade rules should themselves encourage the sustainable use of resources.

A review of the multilateral trade framework and an analysis of trade rules from an environmental perspective find that the WTO

Appellate Body has adopted interpretations of GATT provisions that now give environmental measures a better chance to pass muster. Unilateral trade measures can be justified as long as they are applied flexibly and in connection with good-faith negotiating efforts to reach a multilateral agreement on the policy issues that eventually prompted the unilateral trade measures. Unilateral trade measures in accordance with trade restrictions embedded within a multilateral environmental agreement (MEA), even if applied to countries that are not parties to the MEA, could likely be justified as long as membership to the MEA is open to all countries to which the trade restrictions apply.

Overall, however, the long and arduous process in the adjustment of GATT/WTO trade rules to environmental concerns has demonstrated the continued primacy of trade over environmental concerns. Many trade rules need to be reconfigured in light of the mounting concerns over sustainability of natural resources and the increasingly pressing challenges posed by climate change. Proposed areas in which global trade rules could be "greened" include a reduction in fossil fuel subsidies; increased renewable energy subsidies; liberalized trade in biofuels and in environmental goods and services; mandatory and voluntary standards, certificates and labels; and technology transfer.

### **The funding chasm**

A critical obstacle to developing countries' adaptation and mitigation activities in agriculture is their ability to marshal the resources needed to build the capacity to identify, plan, prioritize and implement effective climate change programmes. The UNFCCC incorporates the principle of differentiated obligations, which include the provision of financial support from developed to developing countries. The multilateral community has also stepped up to provide a number of funding mechanisms. Nevertheless, the financing 'chasm' is still far from being bridged and represents one of the



key obstacles in the coordinated, multilateral fight against global climate change.

Since climate change impacts the economic development of developing countries, it constitutes both an economic and an environmental challenge. Therefore, international financing should address economic development and climate change in a complementary way. Allowing developing countries to ensure that funded activities correspond to their needs, views and priorities; that multiple funding sources are streamlined and coordinated; and that the financing is used to support an over-arching, programmatic strategic approach are among the principles that would help to ensure the most effective use of funding provided to developing countries.

### **Meeting the challenges**

Meeting the challenges of ensuring food security and supporting agricultural development, at the same time as coping with the need for farming systems to adapt to and mitigate climate change, will require broad-based commitment by the global community, more substantial financial transfers to developing countries than has so far been achieved, and concerted national and multilateral policy action involving the convergence of adaptation, climate change mitigation and trade.

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## Chapter 1

# Introduction

In its Fourth Assessment Report on climate change, published in 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that the warming of the Earth's climate system is "unequivocal", and that human activities are "very likely" the cause of this warming.<sup>1</sup> Global greenhouse gas (GHG) emission levels are projected to continue growing over the coming decades.<sup>2</sup> Key drivers of GHG emissions include economic growth, population growth and technological progress, along with changes in consumption and production patterns.<sup>3</sup>

Agriculture is one of the sectors that is most vulnerable to the effects of climate change. Agricultural production and productivity are impacted in multiple ways: (i) higher temperatures affect plant health, increase the occurrences of pests, and lower water availability; (ii) modified rainfall patterns reduce water availability and shift rainy seasons, with consequences both for irrigated and rainfed agriculture and for farming systems; (iii) enhanced frequency of weather extremes worsens supply variability; (iv) enhanced carbon dioxide (CO<sub>2</sub>) concentration in the atmosphere may improve yields and crop productivity in some cases; and (v) the rise in sea level and frequent flooding disturb global

agricultural production patterns, generating losses for some farmers and countries.

While the magnitude of the impact on global agricultural production is uncertain at this time, countries in the temperate zones of North America, Northern Europe and Asia are expected to benefit from increased agricultural productivity. In contrast, regions around the Mediterranean and especially in tropical zones are expected to be net losers from declining productivity. For most developing countries in semi-arid, arid and tropical zones, yields are expected to drop significantly, reducing current production levels and making it more challenging to reach the even higher productivity goals needed to meet their growing food demands in the next decades.<sup>4</sup>

As production possibilities shift across agro-ecological zones, global agricultural trade flows will also shift dramatically. Because the disruption of agricultural production is expected to be most severe in developing countries, both their import food requirements and their import financing needs will increase substantially. Thus, the expected effects of climate change on global agricultural production will have serious and negative impacts on food security for many countries.

The disruption in global agriculture will occur as the world population during the next 40 years increases to a projected 9.1 billion in 2050, thus requiring that agriculture significantly step up

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1 UNEP - WTO - Trade & Climate (2009, 194 pp.), at vii.

2 UNEP - WTO - Trade & Climate (2009, 194 pp.), at vii.

3 UNCTAD - Trade & Development Report, 2009 - Climate Change Mitigation & Development (218 pp.), at 135.

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4 FAO - Organic Agriculture and Stability of Food Supply (5 May 2007, 32 pp.), at 7.



production and productivity in the coming decades. Without sufficient adjustment by existing agricultural systems, the number of people living in hunger will rise rapidly over the next 50 years. For example, a recent study suggested that without adaptation efforts, decreased yields in South Asia could threaten the food security of more than one billion people, and the number of malnourished children in Africa could increase by 10 million more to a total of 52 million by 2050.<sup>5</sup> Climate change thus is expected to result in impacts on all four dimensions of food security: availability, stability, utilization and access (Schmidhebe et al. 2007).

The Stern Review and IPCC reports also draw attention to the particular necessity to adapt agriculture to be more climate-resilient in developing countries because of the heavy reliance of their economies on this climate-sensitive sector (Wiegman, 2010).

Measures and actions taken in respect of climate change can be organized into two broad categories: mitigation and adaptation, although this distinction is not airtight. Often adaptation measures also serve mitigation purposes and vice versa. An important distinction between mitigation and adaptation is that mitigation activities, wherever they occur, generate a global benefit of reduced GHG emissions. Adaptation activities respond to specific climate change impacts and they benefit those locally who pay for it (Wiegman 2010).

Mitigation measures aim to reduce the volume of accumulated GHG emissions and their associated impacts in the future, thereby reducing or avoiding the “worst case” climate change scenarios. In order to reduce GHG emissions, mitigation measures intend, notably through technological change and substitution, to shift global production and consumption patterns towards the use of more climate-

friendly primary commodities, production equipment and consumer goods; mitigation measures also intend to enhance carbon sinks that sequester carbon, such as forests and oceans.<sup>6</sup>

Adaptation measures mainly relate to addressing the impacts of global warming that have become unavoidable and that are already being experienced or that have a high probability of occurring within a relatively short timeframe. Adaptation measures aim at attenuating the negative impacts of climate change or exploiting its potential beneficial effects and at increasing the ability of people or natural systems to cope with the impacts of climate change.<sup>7</sup>

The cost of adaptation to climate change is difficult to estimate because it depends upon projected climate changes, assessments of vulnerability, and data about adaptation activity at the farm and national levels that are often limited. Therefore, cost estimates of adaptation vary widely, ranging between USD 9 billion and USD 86 billion (Müller, 2008).

Developing countries will have difficulty in marshalling the sizeable resources that will be needed to finance their adaptation to a changing climate. The global community is being called upon to help provide the urgently needed funds that developing countries require to build their capacity to plan and prioritize adaptation actions, and to implement effective adaptation policy while at the same time meeting their policy objectives for development, poverty reduction and food security.

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<sup>5</sup> IFPRI - Climate Change - Impact on Agriculture and Costs of Adaptation (2009, 30 pp.).

<sup>6</sup> UNCTAD - Trade & Development Report, 2009 - Climate Change Mitigation & Development (218 pp.), at 133, and UNEP - WTO - Trade & Climate (2009, 194 pp.), at 24-25.

<sup>7</sup> UNCTAD - Trade & Development Report, 2009 - Climate Change Mitigation & Development (218 pp.), at 133, and UNEP - WTO - Trade & Climate (2009, 194 pp.), at 24-25.

Agricultural mitigation and adaptation activity at the farm and national levels, and the costs and financing of adaptation, are the subject of Chapter Two of this report.

Because climate change is a global problem, its mitigation requires concerted and coordinated multilateral action to reduce the growth in GHG emissions that are the cause of global warming. Since 1990, the United Nations Framework Convention on Climate Change (UNFCCC) has served as the forum in which multilateral action on climate mitigation measures and commitments are negotiated and implemented. In 1997, the UNFCCC framework led to the signing of the 1997 Kyoto Protocol, which mandates UNFCCC Annex I countries<sup>8</sup> to reduce, either individually or jointly, their aggregate anthropogenic GHG emission levels between 2008 and 2012. Negotiations continue on a post-Kyoto accord but, despite the growing urgency of aggressive action, the complexity and enormity of the task has stalled progress on defining new GHG reduction mandates.

In Chapter Three, we analyse and assess the current and potential role of agriculture in the multilateral UNFCCC framework, and the costs and funding of developing countries' implementation of UNFCCC climate change mitigation action.

In part as a response to the difficulties being encountered by the international community in finding multilateral solutions to address global warming, many countries are pursuing and enacting unilateral "climate smart" policies to mitigate against global warming and to ensure greater ability to adapt to the

immediate impacts of climate change. To do so, many current laws, policies and actions are changing in order to prompt a shift to a low-carbon economy and towards more sustainable patterns of production and consumption. As a result, domestic measures that address climate change but that impact trade have been multiplying.

National actions intended to address environmental concerns raised fears of protectionism long before global warming garnered any political attention. Now that the fight against climate change heads the international political agenda, there is growing debate as to whether international trade rules unduly impede climate-friendly measures and, more important, whether they allow the climate-friendly potential of trade to be fully exploited.

Today, trade is being called upon to serve climate change objectives and not the reverse. In Chapter Four, a review of the multilateral trade framework and an analysis of trade rules from an environmental perspective describe an evolving interpretation of the General Agreement on Trade and Tariffs/World Trade Organization (GATT/WTO) rules that now provide greater opportunity for members to pursue unilateral, trade-related measures that have environmental objectives. The chapter also identifies nine areas in which WTO members could change GATT/WTO rules to achieve a better balance between safeguarding the principals of an open trading system and the increasing demands for environmental protection and sustainable use of natural resources, while simultaneously supporting development, poverty reduction and food security goals.

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8 Annex I countries: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America.



## Chapter 2

# Agriculture and Climate Change Mitigation and Adaptation

Agriculture is one of the sectors whose production is most vulnerable to the effects of climate change. While the magnitude of effects remains uncertain, changes in temperature and water availability, weather extremes and flooding, and changing CO<sub>2</sub> levels in the atmosphere all have direct and significant impacts on agricultural productivity and result in shifting crop production patterns across agro-ecological zones (see UNCTAD, page 3).

Agriculture also has the potential to make a significant contribution to mitigating climate change. A full assessment of the GHG emissions due to agriculture is still in the making. What is clear is that modern industrialized agriculture from developed economies is a major source of GHG emissions; but the extent and magnitude have not yet been established. In developing countries, major agricultural production systems also contribute to the cumulative GHG emission from agriculture. However, as agriculture represents the main income-earning activity in many of these same countries, mitigation actions must also be designed to help ensure food security and alleviate poverty reduction.

### Agriculture and GHG Mitigation

In industrial economies, a fundamental “rethink” of the way agriculture is practiced needs to be initiated. Finding ways to reduce reliance on chemicals and synthetic fertilizers and creating incentives to promote the use of renewable energy throughout the modern agricultural systems is of the utmost urgency and requires concerted policy action.

The concern over climate change and the need to shift to more sustainable systems has raised the profile of and interest in many long-standing practices, including conservation agriculture and organic agriculture, and greater reliance on renewable energy for domestic use in rural households in developing countries.

### *Conservation Agriculture*

Conservation Agriculture (CA) aims to conserve, improve and make more efficient use of natural resources through integrated management of available soil, water and biological resources combined with external inputs.<sup>9</sup> It contributes to environmental conservation as well as to enhanced and sustained agricultural production. It can also be referred to as resource-efficient/resource-effective agriculture. A variety of CA practices deemed GHG reducing should be encouraged. Among these:

- agronomic practices (promoting the use of perennial crops, which can be cultivated for longer periods, instead of annual crops, which require periodic turning of soil; extending crop rotations);
- more careful land nutrient (most notably fertilizers) management;
- improved fallows;
- improved grazing land management;

9 [ftp://ftp.fao.org/agl/agll/ch10/ch104.pdf](http://ftp.fao.org/agl/agll/ch10/ch104.pdf)