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Expanding Agriculture's Role in a Post-2012 Climate Change Regime

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Abbreviations and Acronyms

A/R	afforestation and reforestation
AAFC	Agriculture and Agri-Food Canada
AAU	Assigned Amount Unit
AFOLU	Agriculture, Forestry and Other Land Uses
AOSIS	Alliance of Small Island States
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention
BAP	Bali Action Plan
BMP	beneficial management practice
CBD	Convention on Biological Diversity
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH_4	methane
CIDA	Canadian International Development Agency
CMP	Conference of the Parties serving as the Meeting of the Parties
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COMESA	Common Market for East and Southern Africa
COP	Conference of the Parties
EU	European Union
EU-ETS	European Union Emission Trading Scheme
FAO	Food and Agriculture Organization
GDP	gross domestic product
GHG	greenhouse gas
Gt	gigatonne (billions of tonnes)
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
lCER	Long-term Certified Emission Reduction
LDC	least developed country
LEARN	Livestock Emissions and Abatement Research Network
LUCF	Land Use Change and Forestry

LULUCF	Land use, Land-Use Change and Forestry
MMSD	market mechanism for sustainable development
MOP	Meeting of the Parties
Mt	megatonne (millions of tonnes)
MRV	measurable, reportable and verifiable
N_2O	nitrous oxide
NAMA	nationally appropriate mitigation action
NFF	National Farmers' Federation
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OSQP	Offset System Quantification Protocol
PERRL	Pilot Emission Reductions, Removals, and Learnings
R&D	research and development
REDD	reducing emissions from deforestation and forest degradation
RMU	Removal Unit
SADC	Southern African Development Community
SADP	Sustainable Agriculture Development Project
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SSCA	Saskatchewan Soil Conservation Association
tCER	Temporary Certified Emission Reduction
U.S.	United States of America
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
WCI	Western Climate Initiative

Table of Contents

1.0 Introduction

The goal of the United Nations Convention on Climate Change (UNFCCC) is "to achieve… stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." There is a growing consensus that global greenhouse gas (GHG) emissions need to peak in the next 10 to 15 years and be reduced below half of 1990 levels by 2050. Halving these emissions will take place in a world where population is projected to increase from 6.1 billion in 2000 to over 9 billion in 2050 (United Nations, 2009). The developing countries will account for around eight billion people and the greater part of global GHG emissions in 2050. Developing countries will need to make significant progress in economic growth and standards of living in a manner that is significantly less GHG intensive than was the case with the development path of the industrialized world.

Climate change presents a dual challenge: how to reduce GHG emissions–mitigation, while lessening the adverse impacts–adaptation. These challenges are evident in the agricultural sector where a changing climate will have serious impacts on agriculture and food production. A rise in temperature will:

- affect food supply dramatically by shifting crop growing zones;
- change the habitats of pests;
- increase risks of plant disease, insects and weeds;
- shrink the area of cropland due to floods; and
- raise sea levels.

At the same time, mitigating GHG emissions from the agricultural sector will be an important element of climate change and agriculture policy at the national and international levels, and especially so in developing countries where 75 per cent of poor people live in rural areas, most of whom depend on agriculture for their livelihoods directly or indirectly (World Bank, 2008).

Parties to the UNFCCC will meet at the fifteenth Conference of the Parties (COP 15) in Copenhagen, Denmark in December, 2009 with the aim of reaching decision on an agreed outcome to enable the full, effective and sustained implementation of the convention beyond 2012, the end of the first commitment period of the Kyoto Protocol. The Bali Action Plan (BAP), agreed to at COP 13 in December, 2007, identified four pillars to address in reaching a new agreement–mitigation, adaptation, technology development and transfer, and financing and investment. The BAP calls for mitigation actions by all developed countries, including quantified GHG emission reductions objectives, as well as mitigation actions in developing countries, "that are supported and enabled by

technology, financing and capacity building in a measurable, reportable and verifiable manner" (UNFCCC, 2007a, p. 1).

Agriculture could be an important component of a new climate change agreement, addressing two priorities of the BAP:

- Mitigation – Agriculture must play a role in climate change mitigation by storing carbon in soils, reducing its GHG emissions (for example, transportation and livestock) and providing fossil fuel offsets from biomass; and
- Adaptation – Agriculture must adapt to new climatic conditions (increased temperatures, drought, increased climatic variations, among others) to ensure a sufficient food supply for the world and contribute to the maintenance of rural livelihoods and viable rural economies.

This paper focuses on mitigation in the agricultural sector, which is gaining in profile in the UNFCCC negotiations. The agricultural sector has the potential to contribute substantially to GHG emission reductions with potential ranges from five to 20 per cent of total carbon dioxide (CO_2) emissions by 2030, and a global mitigation potential (excluding fossil fuel offsets from biomass) ranging from 5.5 to 6 gigatonnes (Gt) of CO_2 equivalent ($GtCO_2e$) per year by 2030 (Smith *et al.*, 2007). The Intergovernmental Panel on Climate Change (Smith *et al.*, 2007) chapter shows that agriculture is a relatively cost-effective option for significant GHG emission reductions in the short term, and most of the mitigation potential arises from sink enhancement through soil carbon sequestration. The required transformation in energy systems and infrastructure will take time to put in place, meaning that agriculture could have a significant role to play in meeting short- to medium-term GHG emissions reduction targets.

Emission reductions in the agricultural sector can also be a meaningful way for many developing countries to contribute to the goal of the convention and participate in a future regime. The IPCC report estimates that 70 per cent of the mitigation potential in agriculture is in developing countries (Smith *et al.*, 2007). Sustainable agricultural practices that mitigate carbon can have important co-benefits, including increased soil fertility and productivity, enhanced resistance to drought and extreme weather, and better capacity to adapt to climate change. Sustainable agriculture can contribute significantly to increased food production, as well as make a significant impact on rural people's welfare and livelihoods. Despite the significant potential and important sustainable development benefits, minimal progress has been made to capitalize on opportunities in this sector, mainly because of complexities, perceived or otherwise, around accounting, monitoring, verification, non-permanence and other issues.

The aim of this paper is to examine how agriculture can be effectively included in a post-2012 regime. The paper examines issues related to the concerns of developing countries, including how to

effectively engage these countries in mitigation efforts in the agricultural sector in a new regime, and issues related to the concerns of developed countries, including ensuring that accounting of agricultural GHG emissions is applied consistently across Annex I countries. The paper explores Canadian considerations and interests in the climate negotiations on agriculture and puts forward a suggested framework for Canada's approach to agriculture in post-2012 negotiations–a framework that aims to increase opportunities for acting on the potential for agricultural GHG emission reductions in developing countries.

Section 2 provides an overview of agriculture and climate change, and Section 3 examines how agriculture has been included in UNFCCC discussions. Section 4 reviews Canadian actions on agriculture and climate change, including actions at home and abroad, positions in the negotiations, and Canadian interests and considerations. Section 5 reviews the perspectives, interests and priorities of developed and developing countries in the negotiations. Section 6 provides an analysis of issues and options to be considered for including agriculture in a post-2012 regime. The concluding section examines a possible strategic position for Canada.

2.0 Agriculture Emission Sources, Projections and Reduction Potential

The agricultural sector can potentially play a role as either a GHG source or sink. Certain agricultural activities emit GHGs into the atmosphere whereas agricultural soils and trees reduce GHG concentrations by sequestering carbon.

2.1 Agricultural Emission Sources and Emission Growth Projections

Agricultural GHG emissions occur from several sources, including fertilizers (directly through volatilization of gases from fields and indirectly though other pathways), livestock (methane [CH_4] is a waste product of digestion by ruminants), wetland rice cultivation (anaerobic decomposition in flooded rice fields produces CH_4), manure management methods, burning of savannah and agriculture residues (each producing CH_4, CO_2 and/or nitrous oxide [N_2O]), and indirect emissions from such things as fertilizer production and farm machinery. [1] The conversion of forest or long-term grassland to agriculture is the major source of CO_2 emissions from the agricultural sector. [2] Subsequent plowing also reduces soil carbon. The agricultural sector emits considerable quantities of CO_2e directly or indirectly, and about a third of the total originates from human activities (Food and Agriculture Organization [FAO], 2008a).

Taken as a whole, agricultural activities contributed between 10 and 12 per cent of the total global anthropogenic GHG emissions or about 5.1-6.1 Gt of CO_2e in 2005 (Smith *et al.*, 2007). Between 1990 and 2005, GHG emissions from the sector increased by about 18 per cent, the average annual growth being approximately 60 megatonnes (Mt) of CO_2e (Smith *et al.*, 2007). The growth of agricultural GHG emissions occurred mainly in developing countries where most of the world's agricultural production takes place. Between 1995 and 2005, agricultural GHG emissions in developing countries increased by 32 per cent, accounting for about 75 per cent of total agricultural GHG emissions in 2005. During the same period, agricultural GHG emissions in developed countries decreased by roughly 12 per cent (UNFCCC, 2008c).

The FAO (2008a) reports that agriculture GHG emissions growth is and will continue to be driven by greater demand for food as a result of the increasing human population. Per capita calorie intake

[1] Under the Kyoto Protocol, agricultural emissions refer to CH_4 and N_2O emissions (from fertilizers, livestock, rice management, among others) while emissions from land use change (for example, conversion of forest to farmland and subsequent plowing) are considered as emissions from the Land Use, Land-Use Change and Forestry sector (LULUCF). This paper is dealing with all emissions from the agriculture sector– CO_2, CH_4 and N_2O–unless explicitly stated.

[2] In terms of land resource utilization, agricultural lands occupy about 40-50 per cent of the Earth's land surface (FAO, 2008b) and are expanding. They consist of cropland, managed grassland and permanent crops, including agroforestry and bio-energy crops. Most agricultural lands are used for pasture (about 70 per cent), the rest being arable lands (27 per cent) and permanent crops (less than 3 per cent) (UNFCCC, 2008b).

is also projected to rise with an increased demand for a more diverse diet that includes more animal protein as meat and milk products. For example, meat consumption in China has more than doubled in the last 20 years and is projected to double again by 2030 (Centre for World Food Studies, 2005). An increasing share of animal products in the human diet will contribute to rising agricultural GHG emissions, especially in developing nations. Meat-based protein requires more land for production and greater numbers of livestock result in increased methane emissions.

2.2 Agricultural Emission Reduction Potential

Mitigation measures in the agricultural sector could contribute to substantial GHG emission reductions up to 2030 with potential ranges from 5 to 20 per cent of total CO_2 emissions by 2030. The global technical mitigation potential of agriculture, excluding fossil fuel offsets from biomass, is estimated to be between 5.5 and 6 Gt CO_2e per year by 2030 (Smith *et al.*, 2007). [3] However, actually meeting this potential is a complex issue with both technical and economic challenges.

An estimated 89 per cent of the total potential can be achieved by soil carbon sequestration through cropland management, grazing land management, restoration of organic soils and degraded lands, bio-energy and water management (Smith *et al.*, 2007). The National Farmers' Federation (NFF) of Australia reports that globally approximately half of all soil carbon in farmland has been lost to the atmosphere during the past two centuries. This loss, however, creates an opportunity for carbon storage with global additional storage potential in agricultural soils estimated to be in the order of 10 per cent of total atmospheric carbon (NFF, 2008). Net sequestration occurs with farming systems that increase plant material being returned to the soil, reduce carbon loss and/or introduce carbon from external sources such as industrial and urban waste streams. Depending on climatic conditions, minimum tillage or no-till conservation agriculture can increase the soil carbon sequestration of existing farmland by 0.1 to 1 tonnes per hectare per year (International Union for Conservation of Nature, 2008).

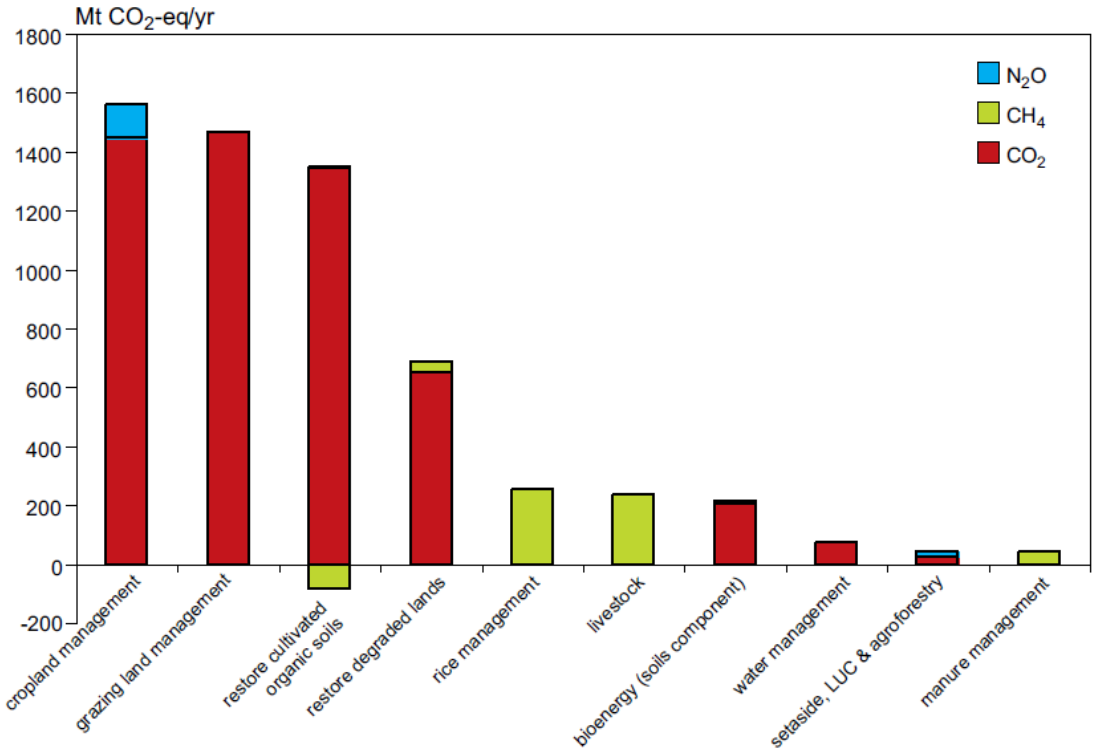
Mitigation of CH_4 can provide an additional 9 per cent through improvements in rice management, and livestock and manure management. The remaining 2 per cent can be achieved from mitigation of N_2O emissions from soils mainly through crop management (Smith *et al.*, 2007).

The wide diversity of agricultural practices around the world means there is a corresponding large array of possible mitigation opportunities. Figure 1 shows the GHG emissions reduction potential for various agricultural practices for CO_2, CH_4 and N_2O, and clearly demonstrates that the largest opportunities lie with land use practices. Mitigation practices can affect more than one GHG. Therefore, it is important to consider the impact of mitigation options on all GHGs.

[3] According to the IPCC, the technical potential is the amount by which it is possible to reduce GHG emissions or improve energy efficiency by implementing a technology or practice that has been demonstrated already. No explicit reference to costs is made but adopting "practical constraints" may take into account implicit economic considerations (Smith, et al., 2007).

Agricultural GHG mitigation options are cost competitive with options in other sectors in achieving long-term (for example, 2100) climate objectives (Smith *et al.*, 2007). The UNFCCC (2008c) estimates that the economic potential in 2030 is 1.5-1.6 Gt CO_2e per year if the carbon price is US\$20/tCO_2e; 2.5-2.7 Gt CO_2e per year if the carbon price is US\$50/tCO_2e; or 4-4.3 Gt CO_2e per year if the carbon price is US\$100 per tonne. [4] Abatement costs, however, are significant compared to current and projected rates of global investment in agriculture.

Figure 1: Global Technical Mitigation Potential by 2030 of Each Agricultural Management Practice Showing the Impacts of Each Practice on Each GHG



Source: Smith *et al.*, 2007.

Although many agricultural practices are economically feasible, they are not implemented due to several barriers, especially in developing countries (discussed below in Section 2.3). Nevertheless, the UNFCCC (2008c) has estimated that the investment needed to overcome barriers to the implementation of agricultural mitigation activities is much less than the total cost of the implementation of the practices.

[4] Economic potential is the amount of GHG mitigation that is cost effective for a given carbon price, based on social cost pricing and discount rates, including energy savings, but without most externalities (Smith et al., 2007).

2.3 Agricultural Emissions in Developing Countries

Developing countries play a central role in agricultural GHG emissions mitigation. Without sufficient mitigation of GHG emissions in coming decades, including those from agriculture, there will likely be severe negative impacts on natural and human systems, including global food supply and food security, and developing countries are most at risk. The agricultural sector is more vulnerable to climate change in developing countries than developed nations, which is a real concern because agriculture in developing countries is a major food provider. Agricultural practices must adapt to changing climatic conditions to ensure sufficient global food supply, while implementing management practices that have the greatest GHG emission reduction potential.

The contribution of agricultural GHG emissions to the world total agricultural GHG emissions varies for developed and developing countries. Table 1 shows that the share of agricultural GHG emissions (CH_4 and N_2O) from developing countries compared to the total GHG emissions from all sectors was 20.5 per cent in 2005, much higher than the share of agricultural GHG emissions from Annex I countries compared to the total GHG emissions from all sectors in those countries (8.3 per cent in 2005).

Table 1: Comparison of the Contribution of Agricultural Emissions in Developed Countries and Developing Countries to the World Total Agricultural Emissions (CH_4 and N_2O) and to the Total GHG Emissions from all Sectors in their Group

Year	1990		2005	
Group of Countries	**Developed**	**Developing**	**Developed**	**Developing**
Per cent of world total agricultural emissions (CH_4 and N_2O)	32.02	56.26	24.15	61.7
Per cent of total GHG emissions from all sectors	9.3–of Annex I total GHG emissions	26.9–of non-Annex I total GHG emissions	8.3–of Annex I total GHG emissions	20.5–of non-Annex I total GHG emissions
MtCO_2e of agricultural emissions	1,672.3	2,938.8	1,467.2	3,748.5
MTCO_2e per person of agricultural emissions	1.4	0.7	1.2	0.7

Source: based on data found in Climate Analysis Indicators Tool Version 6.0, World Resources Institute, 2009.

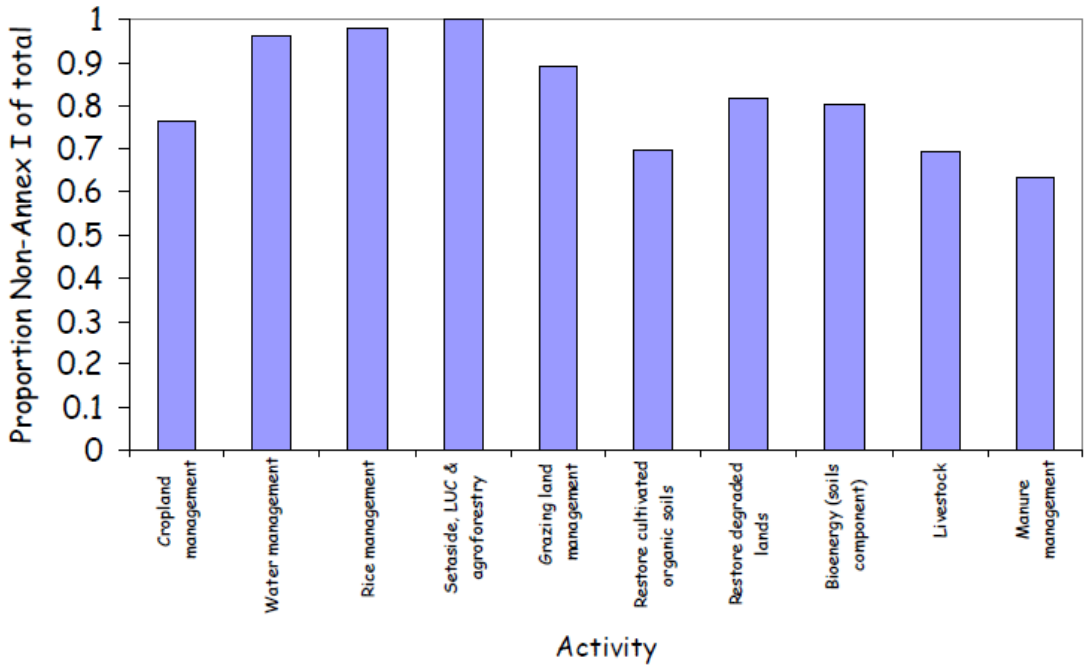
Approximately 30 per cent of GHG emissions reduction potential from agriculture can be achieved in developed countries and 70 per cent in developing countries (Smith *et al.*, 2007). The mitigation potential of developing countries is: about 75-80 per cent of the global potential for soil carbon under bio-energy and the restoration of degraded lands; roughly 90 per cent for grazing land

management; and 98 per cent for rice management, water management, set-aside management and agro-forestry (Trines *et al.*, 2006).

Approximately 89 per cent of the technical mitigation potential in the agricultural sector can be achieved through soil carbon sequestration and about two-thirds of this potential is in developing countries (Smith *et al.,* 2007). Figure 2 shows the mitigation potential of developing countries as a proportion of the global total for each agricultural mitigation activity.

The largest mitigation potentials in agriculture are the restoration of cultivated organic soils and degraded lands, and rice management; developing countries have the largest mitigation potentials. The three above-mentioned options are predominantly applicable to Asia, whereas the first two are relevant for the Russian Federation and Europe. The greatest mitigation potential for South America is the restoration of degraded lands.

Figure 2: Mitigation Potential Found in Developing Countries as a Proportion of the Global Total for Each Agricultural Mitigation Activity



Source: Trines *et al.*, 2006.

Several considerations must be accounted for in identifying mitigation potential, including social factors and leakage. Practices that reduce animal populations and/or grazing intensity can result in reduced GHG emissions, but these practices may not always be viable options for livestock farmers.

These practices may affect employment and food security for rural communities in the regions where the measures are implemented. In addition, reducing animal populations in one country or region may displace GHG emissions to other countries or regions, given the need to satisfy the increasing global demand for meat and dairy products (New Zealand Ministry of Agriculture and Forestry, 2008).

Mitigation is generally most cost effective in developing nations. The FAO (2008c) estimates that mitigation measures in developing countries through agriculture and forestry projects might cost about one-fourth to one-third of total mitigation in all sectors and regions, while generating one-half to two-thirds of all estimated GHG emission reductions.

With growing agricultural GHG emissions and the largest and most cost-effective mitigation opportunities in the agricultural sector, developing countries are likely to play a prominent role in efforts to reduce agricultural GHG emissions. However, these countries also have the greatest barriers to overcome. At the national level, agriculture may be eclipsed by other priorities in many developing countries, such as poverty alleviation. A lack of capacity and political will to encourage mitigation are also contributing factors, where efforts in the agricultural sector are mainly focused on securing food for a growing population.[5] Agricultural policy is viewed by many countries as a sovereign right that is linked to food security, meaning that they are reluctant to open up this sector to any perceived control by an international body. Barriers are often country- or region-related and understanding the situation in different countries is crucial to realizing the mitigation potential in the agricultural sector.

Responses to climate change in these countries should involve measures that aim to reduce poverty and ensure food security (FAO, 2008c). Developing countries will require technology transfer, investment and financial support to implement relevant mitigation strategies in the agricultural sector. And these programs will need to be developed with full consideration of economic and sustainable development. Such programs will need to include methods for verifying and validating GHG emission reductions from agricultural activities and for comparing the effectiveness of various mitigation options, as well as the associated environmental, economic and social benefits and impacts for the overall production cycle. Financing options will need to include grant funding, but there is also a need to develop market mechanisms for sustainable development (MMSDs) that will allow farmers and rural communities to benefit from the carbon market.

[5] Lack of political will is also a barrier in developed countries. Little of agriculture's mitigation potential is projected to be realized by 2010 in the EU due to lack of incentives to encourage mitigation practices (Smith *et al.*, 2005).

3.0 Agriculture in the UNFCCC Discussions

Despite considerable potential for mitigating GHG emissions, agriculture has been approached in a fragmented manner in UNFCCC discussions. It has often been treated as a cross-cutting issue, partially considered within the LULUCF sector with some activities recognized under the Clean Development Mechanism (CDM). The multi-disciplinary nature of agriculture is reflected in current climate change negotiations on a post-2012 agreement, where agriculture is discussed under both the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) and the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). [6]

3.1 Reporting on Agriculture under the UNFCCC and Kyoto Protocol

Under the UNFCCC, GHG emissions from the agricultural sector are considered under agriculture (mainly CH_4 and N_2O emissions from human-induced biological processes) and LULUCF (mainly CO_2 removal from land use and forestry activities, including cropland and grasslands) sectors. Emissions and removals of these and other GHGs are a core element of national reports on implementation of the convention.

Since 1996, Annex I Parties (developed countries) have been required to submit an annual inventory of their GHG emissions to the UNFCCC Secretariat. The UNFCCC (Article 4.1) requires that inventories be developed according to approved IPCC methodologies to reduce uncertainties. These reports include two figures, one without LULUCF and one with LULUCF. Parties can use different accounting methods and tiers for LULUCF accounting. The flexibility provided by the IPCC on LULUCF activities is controversial as it often leads to results that are not directly comparable (Robledo and Blaser, 2008).

Developing counties are not required to submit an annual GHG inventory. They report their GHG data in their national communications, which are submitted at different points in time. Developing countries report on the Land-use Change and Forestry sector (LUCF), which is close but not equivalent to the LULUCF sector. Many developing countries, especially the least developed countries (LDCs), still face reporting challenges.

Supplementary reporting under the Kyoto Protocol for Annex B Parties [7] is the basis for assessing compliance in meeting GHG emission targets and is essential for participation in the Kyoto mechanisms (International Emissions Trading, Joint Implementation [JI] and CDM). Unlike

[7] Annex B Parties are those developed countries that have agreed to control GHG emissions from 2008 to 2012, including OECD countries, Central and Eastern Europe and the Russian Federation.

reporting under the convention, which includes all GHG emissions and removals from LULUCF, the Kyoto Protocol (Article 3.3) restricts mandatory accounting to the GHG emissions and removals from human-induced afforestation/reforestation/deforestation activities since 1990. In contrast to GHG emissions from other sectors, the Kyoto Protocol requires parties to account for emissions and removals from LULUCF activities by adding to or subtracting from their initial assigned amount–for example, the allowable emissions of a party for the first commitment period (2008-2012). Net removals from LULUCF activities result in the issuance of additional GHG emission allowances, called Removal Units (RMUs), which a party may add to its assigned amount. On the other hand, net GHG emissions from LULUCF activities must be accounted for by cancelling Assigned Amount Units (AAUs).

In addition, under Article 3.4 of the Kyoto Protocol, since 1990 parties can elect to include GHG emissions and removals from the human-induced activities forest management, cropland management, grazing-land management and revegetation. In 2006, Annex I Parties decided which activities of Article 3.4 would count toward their mitigation commitments. Parties provided information on 3.3 and elected 3.4 activities in their initial report and must provide updates in their annual reports during the first commitment period. [8] Since accounting of 3.4 activities is optional, countries are unlikely to select activities that constitute a net source of GHGs. Of the 38 Annex I countries, 22 have opted to report on forest management, four on cropland management, two on grazing land management and three on revegetation (see Table 2).

Accounting of GHG emissions from the agricultural sector (CH_4 and N_2O) is currently covered under emissions in Annex A of the Kyoto Protocol and, therefore, is mandatory. To avoid double counting under Annex A and Article 3.4, parties may again choose to report these CO_2 emissions and removals from agricultural soils under the agricultural sector (Annex A of the Kyoto Protocol) or the LULUCF sector (cropland and grazing land management).

Table 2: Annex I Countries Electing to Report on Land-use Activities under Article 3.4 of the Kyoto Protocol

Forest Management	Cropland Management	Grazing Land Management	Revegetation
22 - Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Latvia, Lithuania, Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom	**4** – Canada, Denmark, Portugal, Spain	**2** – Denmark, Portugal	**3** – Iceland, Japan, Romania

[8] Parties must provide supplementary spatial information on units of land subjected to Articles 3.3 and 3.4 activities and information that demonstrates that those activities are human-induced and have taken place since 1990. Absence of overlaps between Article 3.3 and Article 3.4 activities must be demonstrated and uncertainty of emissions and removals estimates must be documented.

Source: from information in UNFCCC, 2008b.

LULUCF was a very controversial subject during the Kyoto Protocol negotiations, and parties did not reach agreement on all technical and methodological considerations including: how to define a baseline or a reference scenario; how to treat leakage, permanence and additionality; and how to monitor and report GHG emission reductions and carbon sinks. The LULUCF regime and its accounting rules were agreed to in the Marrakech Accords, a set of agreements reached at COP 7 in 2001 on the rules for meeting targets set out in the protocol. Some feel that this process led to a diminished role for LULUCF activities, including agriculture, in mitigating GHG emissions (Trines *et al.*, 2006; Benndorf *et al.*, 2007; and Schlamadinger *et al.,* 2007).

It is important to note that parties have agreed to a "main idea" in an international agreement, consenting to work out the details in later negotiating sessions. While negotiators may not have all the answers to the agriculture question in Copenhagen in December, 2009, the precedent exists to have agriculture recognized with the details and modalities developed in later sessions.

The IPCC has continued work on methodological considerations for LULUCF and agriculture, including completing the *2006 Guidelines for National Greenhouse Inventories* (Eggleston, *et al.*, 2006). Volume 4 provides guidance for preparing annual GHG inventories in the Agriculture, Forestry and Other Land Use (AFOLU) sector, unifying the guidance previously provided separately for agriculture and LULUCF. The new IPCC guidance is expected to diminish some of the uncertainties related to methodological issues. The new guidelines have not yet been agreed to and adopted by the UNFCCC COP.

3.2 Clean Development Mechanism

As of March, 2009, agricultural CDM projects have been implemented in the areas of manure management and urea offset. Under the first commitment period, CDM LULUCF activities are limited to afforestation and reforestation (A/R). Activities in bio-energy are also eligible until 2012, including electricity generation using biomass from newly developed dedicated plantations.

A/R projects have not been widely taken up under the CDM. As of March 1, 2009, there were only two small-scale CDM projects in the A/R sector (with 34 projects in the CDM pipeline). As shown in Table 3, in March 2009 there were 120 registered CDM agricultural projects, accounting for 8.4 per cent of total registered CDM projects and 2.3 per cent of the total CERs expected in 2012. Current agriculture CDM project activities focus on improved animal manure management systems and bio-energy production from agricultural biomass waste. These projects are concentrated in the Latin America and the Asia Pacific regions. Of the 231 CDM agricultural projects in the CDM pipeline, 78 per cent are in Latin America (including 108 in Mexico and 59 in Brazil) and 20 per cent in Asia Pacific (including 15 in Indonesia, 15 in the Philippines and 12 in Malaysia).

Table 3: Distribution of CDM Projects in the Agriculture and A/R Sectors in March, 2009

CDM Sector			Agriculture	Afforestation	Reforestation
Registered projects	Number of projects		120	0	2
	Per cent of total projects		8.4	0	0.14
	2012 kCERs (1000 CERs)		34,474	0	205
	Per cent of total 2012 kCERs		2.3	0	0.06
Project requesting registration			4	1	1
Projects at validation			107	4	31
Total CDM projects in pipeline			231	5	34
Approved methodologies			5 (1 large scale, 3 small scale and 1 consolidated)	16 (9 large scale, 5 small-scale and 2 consolidated)	
Geographical distribution of CDM projects in pipeline (registered, requesting registration and at validation)	Latin America	No. projects	180	1	10
		2012 kCERs	46,264	93	5,313
	Asia Pacific	No. projects	48	3	13
		2012 kCERs	5,186	76	2,200
	Europe and Central Asia	No. projects	1	0	2
		2012 kCERs	377	0	932
	Africa	No. Projects	0	1	9
		2012 kCERs	0	1,696	1,291
	Middle East	No. Projects	2	0	0
		2012 kCERs	98	0	0

Source: UNFCCC, 2009 and UNEP Risoe Centre, 2009.

The slow uptake in of A/R projects may hold lessons for including agricultural soil projects under the CDM. Initially, there were difficulties in developing A/R baseline and monitoring methodologies–although that is being overcome with 16 methodologies available to project developers as of March, 2009. Some project developers still encounter data collection problems and the preparation costs of A/R projects remain high as international expertise is often required. Under the Marrakesh Accords, the total number of credits that an Annex I Party may claim from A/R project activities under the CDM has been limited to one per cent of the party's total GHG emissions in 1990 multiplied by five. The European Union Emission Trading Scheme (EU-ETS) currently excludes forestry CDM credits.

Perhaps the largest concern is the temporary nature of CERs from A/R projects, whereby the credits expire after a predefined period. The issue of non-permanence of the carbon sequestered through A/R projects has been addressed through temporary CERs (tCERs) and long-term CERs (lCERs). The tCERs expire at the end of the commitment period following the one during which they were issued, while lCERs expire at the end of the project's crediting period, which can be 20

years (renewable twice) or 30 years without a renewal option. Once these tCERs and lCERs expire, the holder of the credit must replace them with new ones or achieve an equivalent amount of GHG emission reductions elsewhere. The expiring nature of these credits means that A/R projects are regarded as a less attractive investment option than other types of CDM projects. The temporary nature of credits under forestry CDM projects is a major barrier preventing funds and companies from purchasing these CERs (Ecosecurities, 2006).

Many activities with the greatest value to rural communities in poorer developing countries were excluded from the CDM in the first commitment period with sinks activities restricted to A/R. While reducing GHG emissions from deforestation and forest degradation (REDD) is being discussed in the post-2012 negotiations as a separate mechanism/activity, there are still strong arguments for expanding the CDM or even moving beyond a project-based mechanism to a broader MMSD that allows for such projects as soil carbon sequestration through improved agricultural practices, including reduced tillage.

3.3 AWG-KP

The AWG-KP is the main forum for discussion of LULUCF and the CDM. Under this forum, there is a specific agenda item on LULUCF, where all activities included in Article 3 of the protocol are under discussion in regard to accounting in a future regime. This includes activity-based approaches included in Articles 3.3 and 3.4 of the Kyoto Protocol, land-based approaches based on reporting under the convention, and harvested wood products. Furthermore, discussions are currently being held in this forum on whether or not to incorporate reporting of agricultural carbon sequestration activities and other land-based activities in Annex A of the Kyoto Protocol (UNFCCC, 2008e). The conclusions of the AWG-KP are likely to have an impact on monitoring and reporting requirements for the LULUCF sector of Annex I Parties.

The discussions on possible improvements to the project-based mechanisms under the Kyoto Protocol include an expansion of the CDM. Parties have proposed that sustainable forest management and other sustainable land management practices be included under the CDM, including the need to explore non-permanence and methodological issues, and modalities for including such LULUCF activities. There is also consideration of a cap for newly eligible LULUCF activities. Sectoral approaches and crediting on the basis of nationally appropriate mitigation actions (NAMA) could also impact discussions on inclusion of agriculture. Of course, ensuring environmental integrity and assessment of additionality are key considerations.

3.4 AWG-LCA

Agricultural sector discussions also occur in the AWG-LCA. Agriculture is discussed by this group as one of several options for increasing mitigation of GHG emissions in a new agreement and as an important consideration in adaptation programs. New Zealand and Uruguay are the main

proponents of an expanded role for agriculture and many developing countries stress the importance of agriculture in adaptation frameworks. The UNFCCC secretariat, at the request of the AWG-LCA, prepared a technical paper on the opportunities and challenges for mitigation in the agricultural sector and an in-session workshop was held April 2009 at the fifth AWG-LCA session.

3.5 Major Barriers to including Agriculture in a Future Climate Change Agreement

Barriers in the international negotiations to expanding the role of agriculture in a post-2012 agreement are mainly technical and relate to disagreements over uncertainties and accounting methodologies. Some parties claim that there are too many uncertainties to ensure long-term GHG emission reductions, especially concerning Article 3.4 activities. As an example, the EU (2008a) notes that voluntary election of Article 3.4 allows parties to leave out activities where there are methodological problems and as a consequence the uncertainties related to GHG emissions or removals are high or where the risk of GHG emissions due to natural disturbances is perceived to be high. New Zealand (2008) states that there is significant scientific uncertainty over what is really happening in some activities, such as those of Article 3.4. According to Uruguay (2008), the uncertainties of non-CO_2 emission factors from the livestock agricultural sector are almost 50 per cent. The terrestrial carbon pool is three orders of magnitude greater than annual fossil fuel emissions and can result in very large emission releases or reductions because of natural occurrences that are beyond human control (Benndorf *et al.,* 2007). Emission releases due to natural disturbances are not as problematic with agricultural soil GHG emissions as compared to forestry, but if soil management practices change, the carbon can quickly be released. Uncertainty associated with changes in LULUCF GHG emissions and removals can be large, particularly in comparison with the uncertainty of fossil fuel emission reduction commitments.

Other barriers noted in the UNFCCC paper include difficulties in establishing a baseline due to the lack of information in some countries, a high level of uncertainty in GHG emissions estimates, and a lack of information for assessments (especially for CH_4 and N_2O that present large variations across landscapes and regions). Achieving carbon sequestration in agricultural soils does not require advanced technology. However, it does require significant economic incentives to allow farmers and industry partners to implement changes in practices (McCarl *et al.,* 2007 and Rosenberg *et al.,* 2001).

The permanence issue is also a barrier to a broader role for agricultural soil carbon sequestration. [9] The NFF (2008) notes that it can be difficult to meet current permanence criteria as soil carbon

[9] The Kyoto permanence principle requires that credits, created through avoided emissions and sequestration to offset emissions, be permanent. This is to guarantee the validity of the carbon credit and preserve the integrity of the carbon market. Yet, carbon sequestration in soil is non-permanent because of the possibility that carbon in reservoirs can be emitted at any time due to different risks that are beyond human control. including fires or pests. As previously noted, the current solution to the permanence issue in CDM A/R projects has been the issuing of temporary credits.

fluxes can be rapid, moving in and out of soil on a daily basis, and the fluxes may be due to natural disturbances that are beyond human control, irrespective of land use practices. Current Kyoto accounting rules do not allow a distinction to be made between anthropogenic and non-anthropogenic soil carbon losses. Alternatives to the current accounting rules have been proposed by some parties, such as the forward-looking baseline put forward by Canada (Canada, 2008h). However, these alternatives have been proposed for forest management activities; none have been put forward for cropland and grazing land management activities.

CDM projects face other barriers, including high transaction costs, the costs of and lack of capacity to carry out measurement and monitoring, lack of investment capital, concerns about competitiveness, slow progress in technological development, risk of saturation or leakage, demonstrating additionality and the need to be consistent with or break from traditional practices (UNFCCC, 2008c).

While there are barriers, these obstacles can be overcome–and indeed need to be overcome–to create opportunities for developing countries to be partners in mitigation efforts and to benefit from the carbon market. Methodologies, mechanisms and approaches to deal with these problems do exist and are being continuously improved and simplified. The UNFCCC report (2008b: 7) on challenges and opportunities for mitigation in the agricultural sector notes that uncertainties associated with the estimates of agricultural GHG emissions and sinks, "need to be carefully considered and managed, but should not become an additional barrier for the implementation of mitigation measures in the sector because emission reductions can be estimated with the methodologies included in the IPCC guidance." Furthermore, methodological and reporting guidance and procedures to review GHG emissions and sinks from agriculture have already been implemented successfully in the context of the UNFCCC processes in many national GHG inventories and CDM projects (UNFCCC, 2008c). The FAO (2009a: 3) notes that, "the fundamental issue with respect to direct measurement of soil carbon stocks and stock changes is not so much an issue of measurement capabilities *per se*, but rather a question of applying efficient sampling designs and rigorous protocols." The Voluntary Carbon Standard (VCS) buffer approach is a good example of a rigorous protocol for addressing the non-permanence issue in agricultural soil sequestration projects. The buffer approach includes a project risk assessment to determine the number of non-tradable buffer credits to be held in reserve to cover unforeseen losses in carbon.

4.0 Agriculture and Climate Change in Canada

GHG emissions in 2006 from agricultural sources in Canada (enteric fermentation, manure management and agricultural soils) accounted for 8.6 per cent of Canada's total GHG emissions (Environment Canada, 2008a). The Organisation for Economic Cooperation and Development

(OECD, 2008) notes that the increase of gross agricultural GHG emissions over the period 1990-92 to 2002-04 (18 per cent) was substantially above the OECD average (-3 per cent), but was lower than the 23 per cent increase in total Canadian GHG emissions. Approximately 80 per cent of the increase in agricultural GHG emission between 1990 and 2006 is associated with animal production.

If we consider overall agricultural GHG emissions, agricultural soils constituted the largest emitting category in the agricultural sector Canada in 2004, contributing 46.1 per cent of total agricultural sector emissions, while enteric fermentation and manure management contributed 40.2 and 13.7 per cent, respectively (OECD, 2008). Cropland GHG emissions have steadily declined, from 14MtCO_2e in 1990 to a net removal of one MtCO_2e in 2006, largely related to the adoption of conservation tillage practices and reductions in summer-fallow (Environment Canada, 2008a).

Canada has taken domestic action to mitigate GHG emissions in its agricultural sector and actively participates in international climate change negotiations. Canada has elected to report on cropland management activities for the entire commitment period under Article 3.4 of the Kyoto Protocol and has proposed new accounting rules for LULUCF. Canada's contributions to the international negotiations and its experience in mitigating agriculture GHG emissions have laid a foundation that can help inform the effective incorporation of agriculture in a post-2012 agreement.

4.1 Actions in Canada to Mitigate GHG Emissions in the Agriculture Sector

Canada's approach to mitigating global GHG emissions is outlined in Environment Canada's 2008 regulatory framework *Turning the Corner* (Environment Canada, 2008d). This plan puts in place a regulatory regime to meet Canada's target of reducing GHG emissions by 20 per cent from 2006 levels by 2020. This regulatory framework for industrial GHG emissions includes an emissions trading system under which two of compliance mechanisms could impact on emissions from the agricultural sector–offsets and the CDM.

Canadian firms can use certain CDM credits, but access to these credits for compliance purposes will be limited to 10 per cent of each firm's total target. Credits for forest sink projects are not accepted for compliance with Canadian regulations, although all other CDM project credits are allowed. The temporary nature of forest sink credits is considered to add complexity to the domestic system without significantly reducing compliance costs for regulated industry. Agricultural CDM projects (CH_4 and N_2O) can be used for compliance with domestic regulations.

Canada's offset system for GHGs provides the opportunity to gain tradable credits from the implementation of verified non-regulated activities that reduce GHG emissions. All sectors of the economy, including agriculture, are encouraged to provide offsets. To gain offset credits, GHG emission reductions must be verified according to an Offset System Quantification Protocol (OSQPs) that is approved by Environment Canada. OSQPs are currently developed under a

standard protocol development process or Fast Track process. The Fast Track process is used for protocols that are already approved by other offset programs and that rely on a level of rigour comparable to Canada's system (Environment Canada, 2008b). As noted in Table 4, in February 2009, the fast track process included eight agriculture protocols in the areas of soils (one), manure management (four), and livestock feeding (three). There is no guarantee that any of these protocols will be used as part of, or become, an OSQP.

The Canadian offset rules specify that sink-based projects using activity-based measurement, where evidence of the activity will be lost over time (such as evidence of tillage), must have their project verified on an annual basis. Sink-based projects that propose to measure the projected carbon stock must have reductions and removals verified at least every five years.

Table 4: Agriculture Protocols on Canada's GHG Offset System's Fast Track Process Protocol Eligibility List, February, 2009

Source	Protocol Name	Project Type Description
Livestock – Feeding		
Alberta	Quantification Protocol for including Edible Oils in Cattle Feeding Regimes	Reductions in enteric methane emissions from cattle due to changes to the finishing diet. The feeding of edible oils, which suppress methanogenesis from the rumen of cattle, is also eligible.
Alberta	Quantification Protocol for Reducing Days on Feed of Cattle	Quantification of GHG emissions reductions on the basis of the reduction of days required for finishing groups of cattle, , and GHG emissions from manure handling, storage and application during the period animals are being finished in feedlots.
Alberta	Quantification Protocol for Reducing the Slaughter Age of Cattle (Beef Lifecycle Quantification Protocol)	Quantification of enteric methane emissions from calves, cows and bulls, and emissions from manure handling, storage and application.
Livestock – Manure		
Alberta	Quantification Protocol for the Anaerobic Decomposition of Agricultural Materials	Quantification of GHG emission reductions resulting from the displacement of fossil-fuel-based electricity, thermal energy or natural gas in gas transmission systems with the biogas (CH_4) from the anaerobic digestion of organic feedstocks produced from agricultural materials, such as manure, silage and dead animals.
California Climate Action Registry	Livestock Project Reporting Protocol Capturing and Combusting Methane from Manure Management Systems	Capture and combusting of biogas in manure management systems from manure treatment and/or storage facilities on livestock operations.
Climate Change Central	Consolidated Methodology for GHG Emission Reductions from Manure Management Systems --- Version 3	Anaerobic digestion of farm animal wastes to produce biogas fuel.
Alberta	Quantification Protocol for Innovative Feeding of Swine and Storing and Spreading of Swine Manure	Quantification of GHG emission reductions resulting from alternate feeding practices and manure management on pig farms.
Soils		
Alberta	Quantification Protocol for Tillage System Management (November, 2007 ver. 1.2)	Quantification of GHG emission reductions associated with changes in tillage practices–from conventional tillage to reduced tillage or no-till–used on Canadian agricultural soils.

Source: Environment Canada, 2008b, Annex J.

As is evident in Table 4, the province of Alberta is a leader in the development of offset protocols for the agricultural sector. This is in response to legislation requiring an intensity-based reduction of 12 per cent beginning July 1, 2007 by firms emitting more than 100,000 tonnes of GHGs per year. A compliance option for firms is offsetting through the purchase of verified credits created by other Alberta projects. In addition to the five protocols in Table 5, Alberta has approved a pork quantification protocol and a protocol for the dairy industry is under review. Protocols are being developed for N_2O reduction, wetlands management, reduced summer-fallow, beef-residual feed intake, conversion to perennial forages and rangeland/pasture management (Haugen-Kozyra, 2008).

Theoretically, Alberta's tillage protocol could be used across Canada, but work is needed for soil zones outside of the prairies with respect to the assurance factor, which addresses the issue of permanence. [10] Albertan soil carbon credits are permanent with this assurance factor, which includes a built-in discount to account for future losses, and risk-sharing between farmers and government. The assurance factor for the tillage protocol accounts for the average risk of reversal across all farms within Alberta. It is a conservative estimate based on expert opinion and risk assessment of frequency of reversal of tillage practices. The Alberta government backs the liability of a reversal of soil carbon and shaves off carbon for every tonne created into a reverse-holdback.

Alberta's early experience indicates that aggregation of projects can keep transaction costs manageable for farmers. In 2007, Alberta's first compliance year, three of seven projects that received offsets were for reduced/no-till projects. Each of these projects was registered by an aggregator, who bought the offsets from over 1,100 individual farmers. Another important element of Alberta's experience is the use of sampling to establish baselines and to monitor and verify emission reductions. [11]

The Western Climate Initiative (WCI) also intends to allow offsets in the agricultural sector. The WCI, launched in 2007, is a coalition of four Canadian provinces–British Columbia, Manitoba, Ontario and Quebec–and seven U.S. states that has set a regional GHG emission reduction goal of 15 per cent below 2005 levels by 2020. The WCI is designing a regional cap-and-trade program that will include offsets to help reach the target (in addition to regulations, incentives programs, fees and tax programs and voluntary programs in the region). The 2009 work plan of the WCI Offset Committee includes protocol development in the priority areas of agriculture (soil sequestration, manure management and anaerobic digestion), as well as forestry and waste management.

[10] For example, the Ontario provincial government is evaluating a draft protocol for tillage system management that draws on Alberta's protocol, but is revised for Ontario's different carbon sequestration conditions. There tends to be lower potential for no-till systems to sequester carbon in eastern Canada than western Canada, but there is strong potential for crop rotation practices to sequester carbon in both areas (Hager, 2008).
[11] Most CDM methodologies do not permit sampling because all reductions from a project must be verified to be certified.

Agriculture and Agri-Food Canada (AAFC) will review and approve protocol development for Canada's domestic offset system. This federal government department is also undertaking important research to contribute to the development and rigour of agricultural protocols with recent work comparing no-till protocols and examining approaches for quantifying soil carbon and N_2O related to soil nutrient management. AAFC has conducted research on new farming practices that reduce agricultural GHG emissions and enhance carbon sequestration in biomass and soils. The Model Farm program involved research into quantifying agricultural GHG emissions and identifying effective ways of reducing these emissions. This initiative contributed to the development of Holos, a whole-farm modeling software program that estimates GHG emissions based on information entered for individual farms. [12]

Beneficial management practices (BMP) are encouraged by AAFC through the implementation of the National Environmental Farm Planning Initiative that has been designed to help Canada's agricultural producers develop and implement environmental farm plans through provincially delivered programs. AAFC (2009) reports that adopting BMP (for example, soil conservation, land use conversion and land use enhancements, fertilizer management and grazing and manure management) over the long term will turn Canadian agricultural land from a GHG source into a carbon sink. The Greencover Canada program is a five-year, $110-million initiative that aims, *inter alia*, to improve grassland management practices and reduce GHG emissions through such actions as converting environmentally sensitive land to perennial cover, planting trees on agricultural land and helping producers adopt BMP.

Previous programs included AAFC's $21 million Greenhouse Gas Mitigation Program for Canadian Agriculture (2002-2006) that promoted voluntary adoption of farm practices to reduce GHG emissions and increase carbon sinks. The program included demonstrations of good management practices and outreach to increase farmers' understanding of their impact on reducing GHG emissions and increasing carbon sequestration. Projects included direct seeding, zero tillage (no-till), pasture rejuvenation, manure management and nutrient balancing (Currah, 2003). The Pilot Emission Reductions, Removals, and Learnings (PERRL) Initiative, a pilot project designed to help the government and private sector learn about GHG emissions trading, included two soil sequestration projects undertaken in cooperation with the Saskatchewan Soil Conservation Association (SSCA) and Horizon Vert Centre-du-Québec. In 2005, SSCA launched a pilot carbon trade for farmers through this initiative. This was the first agricultural soil sink offset trade in Canada, selling "Temporary Emission Removals" from zero-till farms across Canada to PERRL from 2005 to 2007 (Environment Canada, 2008c).

Through these measures Canada has gained significant policy and technical expertise in GHG

[12] Available for download at: http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1226520810511&lang=eng.

mitigation practices and measurement in the agricultural sector. In this sector, Canada is a leader in developing carbon accounting practices and standards, and methodologies and protocols for offsets, as well as sustainable agricultural practices that sequester carbon (such as reduced tillage). Lessons learned from these domestic actions have contributed to Canada's input to UNFCCC discussions on the LULUCF and agricultural sectors.

4.2 Canada's Engagement on Agriculture in Development Cooperation Programs

Canada is also engaged in agriculture projects through its official development assistance (ODA) programs. The Canadian International Development Agency (CIDA), which is the lead agency for delivering development assistance, aims to reduce poverty, support sustainable development and promote human rights. CIDA's 2003 policy, *Promoting Sustainable Development through Agriculture*, sets out the parameters for Canadian ODA expenditures on agriculture, and includes a focus on strengthening national capacity, improving knowledge, enhancing food security, promoting agricultural sustainability and developing markets. Canada's ODA has had no climate change focus since 2006, when the $100 million Canada Climate Change Development Fund ended. Current programming includes one climate change project, *Building Nigeria's Response to Climate Change,* focused on building capacity to meet international commitments.

In fiscal year 2005-2006, bilateral ODA in the agricultural sector represented 4 per cent of total bilateral aid ($128 million of a total bilateral ODA of $3,272 million) (CIDA, 2008). This percentage is consistent with the global figures. The World Bank (2008) reports that only four per cent of global ODA is directed to agriculture while 75 per cent of the world's poor live in rural areas in developing countries. The share of global ODA allocated to agriculture has dropped from a peak of 17 per cent in 2002 to approximately 4 per cent in 2006. This is a low figure given the reality in many developing countries where agriculture contributes to the bulk of employment and remains an important part of gross domestic product (GDP) and export earnings. In sub-Saharan Africa, agriculture accounts for 20 per cent of GDP and employs two-thirds of the total labour force (Cabral and Scoones, 2007).

In January 2009, there were 18 CIDA-funded projects in the agricultural sector (see Table 5). None of these had a climate change focus, although some include actions that could improve climate resiliency or increase capacities to mitigate GHG emissions in the agricultural sector. One such project is the Sustainable Agriculture Development Project (SADP) – Phase II in China managed by AAFC. This project aims to promote sustainable agriculture management practices in selected western provinces in China through technology transfer and information exchange.

The International Development Research Centre (IDRC) also delivers Canadian ODA (as well as delivering specific ODA programs for other countries such as the United Kingdom). IDRC funds

research in developing countries, provides expert advice to researchers and builds local capacity for research and innovation. The Rural Poverty and Environment Initiative aims to ensure secure sources of food and water for the poor in rural and urban areas, and delivers projects that focus on adapting agriculture to climate change in developing countries. The Climate Change Adaptation in Africa research and capacity development program is helping the rural poor cope with the negative impacts of climate change on agricultural systems by providing natural disaster preventive communication tools and disseminating information on available agricultural technical innovations. The adaptation initiative is a joint program of the IDRC and the United Kingdom's Department for International Development, which provides 70 per cent of the funding.

Table 5: CIDA's Contracts and Agreements in the Agriculture Sector in Winter, 2009

Project	Organization	Country/Region	Amount (CAN$)
Support to Livestock Farmers	FAO	West Bank Gaza	2,500,000
Revitalization of Agri-food Sectors	Tecsult International Limitée & UPA Développement International	Burkina Faso	8,691,777
Farmer-responsive mechanisms in extension and research	CHF partners in rural development	Ghana	9,700,000
Proagri common fund	Ministerio da agricultura e desenvolvimento rural	Mozambique	19,000,000
Sustainable Livelihoods and Agriculture Project	Oxfam Canada	Mozambique	6,000,000
Agriculture Policy Support Facility	International food policy research Institute	Nigeria	2,880,000
Proagri common fund	Ministerio da agricultura e desenvolvimento rural	Mozambique	19,000,000
Improving agriculture	Inter-American Institute for Cooperation on Agriculture	Jamaica	49,000,000
Farmer based organizations' development fund	Bank of Ghana	Ghana	1,300,000
Nile Basin, Trade and Agriculture Production	World Bank	Panafrica	9,700,000
Andean Agriculture in Altiplano	International Potato Centre	South America Regional	10,000,000
Agriculture Marketing Project	Agriteam Canada	Cambodia	4,200,000
Agriculture in Mine-affected Areas	Geospatial/Salasan Consulting	Cambodia	2,552,847
Sustainable Agriculture Development Phase II	AAFC	China	19,044,000
Integration of Women Producers into Effective Markets	Mennonite Economic Development Associates	Pakistan	6,720,000
Facilitating Agricultural Reform and Marketing in Sughd	Centre d'études et de cooperation internationale	Tadjikistan and Central Asia	4,209,000
Food and Agriculture Products Quality	Université de Montréal	Vietnam	16,000,000
Agriculture Market Information Systems	Agriteam Canada	Vietnam	4,451,370

Source: CIDA, 2009.

4.3 Canadian Interests and Considerations with Respect to the Role of Agriculture in a Post-2012 Agreement

Agriculture as a Means to Reduce GHG Emissions by 50 Per Cent by 2050

Canada believes that a shared vision for long term cooperation must include continued economic growth and sustainable development while reducing global GHG emissions by at least 50 per cent by 2050. Canada has not stated a specific target for the agricultural sector, but notes that GHG emission reduction objectives should cover the vast majority of emission sources in developed and developing countries. Canada has also proposed that all parties adopt rules and practices for managed forest and agricultural lands, including through REDD, that incentivize GHG emission reductions and removals recognizing the significant mitigation potential that exists in these areas (Canada, 2008a).

Realizing the Potential Represented by Carbon Sinks

Mitigation approaches and mechanisms in a post-2012 agreement should include initiatives that can take greater advantage of the potential represented by carbon sinks (Canada, 2008h). Canada has been a long-time supporter of incorporating carbon sinks, including agricultural sinks, in the international regime. In 2000, the multi-stakeholder climate change table on agriculture recommended that the federal government continue its efforts to have agricultural soils recognized as carbon sinks in the protocol (Forge, 2001).

A Greater Understanding of the LULUCF Rules

The Government of Canada has submitted that consideration of further commitments for post-2012 will be facilitated by a broader understanding of LULUCF rules (Canada, 2008f). LULUCF can make an important contribution to mitigation potential in Annex I countries, and the rules around LULUCF will in part determine the mitigation potential of parties and have implications for the structure and magnitude of further commitments or actions the parties are able to undertake (Canada, 2008e).

Canada has stated that the rules guiding the treatment of LULUCF could be more effective in providing incentives to reduce GHG emissions and enhance removals. As such, Canada is calling for a review of the existing rules governing LULUCF under the Kyoto Protocol and a revision of the framework for the treatment of LULUCF so that it will enhance the sector's contribution to meeting the objectives of the convention in a post-2012 agreement (Canada, 2008e). Canada has indicated that a new set of rules needs to be consistent with, and should allow for, the use of current measuring and monitoring systems. Revised LULUCF rules should be broadly applicable across developed and developing countries, "taking into account the substantial differences that exist in terms of the characteristics of their land, how it is used and managed, and the institutional and policy settings" (Canada, 2008b: 1). Canada has also noted that it is critical that rules for the treatment of

LULUCF are agreed before targets or commitments are established to allow parties to make commitments with full understanding of the potential of their LULUCF sector to contribute (Canada, 2008d).

A Comprehensive Treatment of Agriculture

Canada is investigating a "holistic approach" that treats agriculture as a sector, whereby integrated domestic policies can enhance sinks and reduce GHG emissions. In UNFCCC discussions, Canada has called for a comprehensive treatment of agriculture in a post-2012 agreement. A Canadian submission to the Subsidiary Body for Implementation (SBI) puts forward that the LULUCF sector has become too restrictive and there is considerable mitigation potential from a range of activities in the AFOLU sector that are not currently recognized under the Kyoto Protocol. Accounting for GHG emissions and removals from agricultural land management should not be considered separately from other agricultural activities, and Canada supports the use of the 2006 IPCC GHG Inventory Guidelines. These provide a broader treatment of AFOLU and form a strong methodological basis for measuring, reporting and verifying actions in the AFOLU sector (Canada, 2008f). In March 2008, Canada called for the creation of an Expert Sub-Group on AFOLU (Canada, 2008h), but this request has not been acted upon.

Taking into Account Natural Disturbances: the Forward-looking Baseline Approach

A forward-looking baseline is discussed by Canada as an improved accounting method for forest management, but Canada notes that this baseline can be used for agriculture and other activities (Canada, 2008g). Current forest management accounting rules do not distinguish between GHG emissions and removals due to direct human activity or those that occur due to natural or indirect human causes, such as wildfires and the consequences of a changing climate. In Canada's managed forests, the impacts of natural disturbances such as fire and insect infestations on forest carbon can far outweigh the impacts of forest management. Thus Canada's managed forests have fluctuated between being a large source and a large sink from year to year, depending on the amount of wildfire that occurs. In recent years, Canadian forests have been a source of GHG emissions primarily because of a mountain pine beetle infestation since 1999 (Canada, 2008d).

The forward-looking baseline is a net-net approach that accounts for anthropogenic GHG emissions and removals, and ensures that accounting provides an improved incentive structure for sustainable land management. Through this approach, estimated GHG emissions and removals in the commitment period are compared to a projected baseline, which would better reflect forest dynamics and business-as-usual forest management practices in the commitment period. Given the importance of the baseline in a net-net accounting system, a set of guidelines or rules will be required to ensure that each country's forest management baseline meets a common methodological standard (Canada, 2008b).

Increasing the Potential of Market-based and Project-based Mechanisms

The market should be a key vehicle for financing mitigation for all parties, provided that existing and new market mechanisms meet a high standard of environmental integrity (Canada, 2008a). Canada recognizes the role of market-based mechanisms in mobilizing necessary financial flows. As previously noted, Canada is currently designing a GHG emissions trading system with an offset system that will include agricultural credits. Canada (particularly the province of Alberta) is a leader in developing offset protocols for agriculture, and this experience could inform the debate on expanding the CDM or developing other appropriate MMSDs.

The temporary nature of CDM A/R project credits has been a barrier to project development and progress and uptake in this sector has been slow (Canada, 2008e). Revision of LULUCF CDM rules for the post-2012 period needs to consider if and how to create permanent credits for the LULUCF sector. Canada notes that expanding the scope of CDM-eligible LULUCF activities beyond A/R could also have a significant impact on the regional distribution of CDM projects and help to increase the number of projects in LDCs (Canada, 2008f).

5.0 Perspectives on the Role of Agriculture in a Post-2012 Agreement

The role of agriculture in a post-2012 agreement has varying perspectives. Developed countries are discussing if agricultural soil carbon sequestration should be included in overall accounting of GHG emissions and removals, and how to provide incentives in agriculture for developing countries. Many developing countries are concerned about access to the carbon market and having mechanisms that include carbon sequestration in agricultural soils. Intensity targets in the agricultural sector are also an issue, recognizing the fact that food production will need to increase to keep pace with growing populations and improvements in standards of living. The perspectives of different countries are set out below, which has been informed by interviews with representatives from eight countries and desk research. The specific views of interviewees are not noted, rather a summary of responses is provided. A list of people interviewed is included in Annex 1.

5.1 Developed Country Views on Agriculture in a Post-2012 Regime

All developed countries representatives interviewed indicate that it is very important to include agriculture in a post-2012 agreement and provide appropriate incentives for developing country participation in this sector, although there are different views as to the best way to do this. There is a sense that any agreement in Copenhagen will be a broad text where the main ideas are fixed, with negotiation on the details continuing over two to three years. Markers must be included for agriculture in this broad agreement, but care must be taken to ensure that short-sighted and simplistic outcomes are not adopted for a post-2012 agreement. The level of understanding of the complexities of the sector is low in the international negotiations, and most developed countries are still working through the issue and have no confirmed positions on agriculture.

Accounting for GHG Emissions in Agriculture

In regard to accounting for GHG emissions in the agricultural sector, some developed countries representatives suggest that these emissions continue to be treated as in the old Chapter 4, seeing no need to have agriculture as a separate sector, although many suggest that LULUCF needs to include a broader coverage of carbon stocks in soils. Most agree that reporting of agricultural GHG emissions, currently voluntary under Article 3.4, should be mandatory to provide countries with a better incentive to take action in the agricultural sector; although improved monitoring and reporting frameworks are needed. Two respondents noted that for all countries there will be considerable technical challenges and costs, especially with reporting of soil carbon, and that information is not available for 1990, the base year in the current accounting framework. Different base years might be an option, especially if other countries are brought into Annex I (and this could apply to other sectors). Most respondents are in favour of keeping net-net accounting, thus treating

agriculture like other sectors. There is a general sense that a projected baseline or time-out mechanism would make accounting more difficult.

The technical issues related to accounting and reporting on carbon stocks in soil have been sorted out at the national level in developed countries, and there are sufficient methods and data available to make good estimates of changes in these carbon stocks. While some developed countries still have difficulties with accounting, the expertise exists to overcome these challenges. Barriers to measuring some other types of agricultural GHG emissions include measuring N_2O in soils is technically more difficult and measuring some gases is prohibitively expensive, which indicates the important role for research in this area.

Emissions from livestock could be looked at in a broader manner. Reducing livestock GHG emissions overall can be challenging, but efficiencies can be introduced and emissions intensity per unit decreased. The current reporting framework does not support accounting by GHG emissions per unit of production (for example, intensity-based) and currently there are considerable technical barriers to developing such an approach.

The technical issues related to monitoring and reporting can translate into political issues, as there can be a general uncertainty as to how different aspects of a new agreement might affect overall accounting. In addition, countries with a high proportion of agricultural GHG emissions may favour less stringent targets because mitigation in agriculture is proportionally smaller than in other sectors. There may need to be consideration of less stringent targets for countries with high agricultural GHG emissions, for example., taking into account unique national circumstances.

Expanded reporting in developing countries would be an incentive for action. One respondent suggested applying the original agricultural sectors as set out in the Kyoto Protocol (CH_4 and N_2O) in LDCs, and engaging other developed countries more broadly in reporting on agriculture (for example, including cropland, grazing land, among others)–although developing countries are not likely to agree to reporting on land use.

Barriers that Impact Developing Country Participation

While developed countries are well positioned to account for GHG emissions and removals in the agricultural sector, many developing countries lack data and monitoring expertise. The current climate change framework has few incentives in the agricultural sector for developing countries–there is no research and development (R&D) and no technology cooperation in this sector. There are also political considerations for food and energy security. Increases in demand for food and changing diets (more animal protein) will work against mitigation of GHG emissions in this sector. One respondent noted that it is hard to envision how the agricultural sector in developing countries can contribute to substantial GHG emission reductions in the short term without damaging food

production and development.

Incentives for Developing Country Participation

Several respondents suggest expanding the CDM to further develop and adjust activities related to agriculture. There is support for carbon sequestration in agricultural soils, noting the need to first address methodological and cost barriers. These challenges prevent including a crediting mechanism for agriculture in the short term, but it is possible to include agricultural soils in a robust trading system before 2020.

Programmatic CDM might be a way to encourage agricultural soil carbon sequestration activities, but research and support will be needed to overcome barriers that prevent the effective implementation of this mechanism. A sectoral approach could possibly work for more advanced developing countries. But before agreeing to expand the CDM, negotiators will need a reasonable measurement of expected reductions under the mechanism. What types of targets will be adopted by developed countries and will they generate sufficient demand for the amounts of CERs that would be generated through an expanded mechanism? And the design of an expanded CDM will need to consider the variability of agricultural structures around the world. There are millions of small farmers. Can a market mechanism be designed to bring these participants into the carbon market at a reasonable cost? Not addressing these issues would limit the effectiveness of any market mechanism. The global community needs to collectively agree to enable the market to apply to agriculture and develop the system accordingly (for example, intensity targets for agriculture and a system that will facilitate this).

Not all were in favour of expanding the CDM, suggesting that the experience of the A/R sector demonstrates that the CDM does not work for the land-use sector. The temporary nature of the credits means that developing countries will need insurance, creating an extra and unrealistic burden. One respondent remarked that a market mechanism should not be used for agricultural soils, as expectations will be created in developing countries–and these expectations will be unfulfilled.

Support and action for the agricultural sector could be encouraged through NAMA plans. Countries could include agriculture in their national plans, and receive financial and technical support for policies and measures that lead to reductions that are backed by a reliable reporting system. This reporting does not have to be linked directly to tonnes of GHG emissions removed or reduced, but to the implementation of policies with well documented effects. Intensity targets could be considered, but implementation and comparison would be difficult and some countries are better able to achieve efficiencies than others.

Other incentives include the use of South-South cooperation to transfer technology from countries with expertise such as Brazil, Tunisia and Madagascar. Investment in science and research is needed,

and an improved understanding of the various agricultural systems around the world is required to better design mitigation and adaptation programs. Of course, decisions to encourage agricultural efforts in developing countries will be linked to financing discussions. Agriculture could be linked to adaptation with support provided through the Adaptation Fund and any new funds established for adaptation. Another option is grant funding in the short term to support research on intensity targets and a market mechanism for agricultural systems with the intent of introducing agricultural market mechanisms in the medium term, as current information will not allow us to establish an effective system that is operational in 2013.

Synergies between Adaptation and Mitigation

One respondent noted that adaptation is at the forefront of land use, and this is where agriculture can be included in a post-2012 regime. Most noted that enhancement of carbon in soil stocks provides both mitigation and adaptation benefits. Other respondents noted that adaptation and linkages between adaptation and agriculture are issues to be addressed at the national level. Mitigation and adaptation are different (for example, mitigation deals with individual farmers and adaptation deals with groups of farmers) and it is difficult to build synergies. Food production is linked to adaptation and the ability to adapt interacts with mitigation. This means that any post-2012 incentives will needed to consider the broader impacts of programs.

Linking Agriculture and Forestry under REDD

Respondents noted that the link between REDD and agriculture needs to be recognized. Most deforestation is due to agricultural expansion and success on REDD will mean increased efficiency of food production on existing farmland. But this is an issue to be dealt with at the country level as governments develop strategies to deal with deforestation. Support for mitigation in the agricultural sector is likely to have sustainable land management and sustainable production benefits and have a positive effect on deforestation by reducing demand for more agricultural land.

While there is recognition of potential benefits from one common sector, there is little support for linking REDD and sustainable land management or agriculture in a post-2012 agreement. There is no political momentum at this time for a broader discussion and it will be difficult to expand REDD in the short term (for example, for Copenhagen). Many developing countries have a difficult time with monitoring and reporting. Introducing sustainable land management would require that developing countries undertake full carbon accounting, but few have the capacity to do this. Linking REDD and sustainable land management is unrealistic and could jeopardize momentum on REDD. A credible REDD mechanism can be agreed to at COP 15, but that mechanism could be lost if other issues, such as agriculture, are forced upon the mechanism.

Priorities for Agriculture in a Post-2012 Agreement

The world will have to deal with agriculture in the broader picture, as agriculture is a cross-cutting

issue and much activity is outside the purview of the UNFCCC. The demand for agricultural products will continue to increase at a time when production becomes more difficult partially due to climate change and also because of efforts to deal with deforestation.

However, there is a huge opportunity to engage developing countries in both mitigation and adaptation efforts. Adaptation actions will take place at the country level and need to be supported by funding under and outside of the UNFCCC. Existing structures, such as the Adaptation Fund and Special Climate Change Fund, should be used to manage this funding though the UNFCCC–new institutions are not needed. ODA still has a large role to play in promoting sustainable agriculture in developing countries, especially in LDCs, and should not be neglected as countries increase funding for climate change actions.

For mitigation, NAMA plans registered with the UNFCCC could include policies and measures in the agricultural sector. The CDM could be expanded to include agricultural soils, this being a priority for Africa–recognizing that implementation will be difficult in this region. More research is needed, and the world needs to think creatively to ensure that a post-2012 agreement effectively engages developing countries in mitigation efforts in the agricultural sector in a realistic and doable manner.

5.2 Developed Country Interests and Priorities

Annex 2 includes a summary of comments on agriculture in party submissions to the AWG-LCA. The summary and additional research informs the discussion in this section.

Australia

Australia supports that parties report estimates of GHG emissions and removals using rolling averages over a period of time to ensure that trends reflecting anthropogenic changes can be established. Australia notes that there is broad interest in better exploring the role that soil carbon could play in a post-2012 outcome on LULUCF. There are gaps in Australian agricultural systems information. Australia has committed to improving its understanding of carbon fluxes, the impacts of management practices in soil carbon, and the role Australian soils could play in sequestering CO_2 from the atmosphere.

Australia promotes collaborative research, to assist developing countries, that is focused on the intersection between climate change, sustainable development and agriculture (Garnaut, 2008, Chapter 10). Australia favours including forestry, agriculture and land management in its GHG emissions trading scheme at the earliest possible time. Australia has proposed that agriculture be included from 2015 with a final decision to be taken in 2013. Full inclusion requires that issues be resolved regarding measurement and monitoring of GHG emissions and removals, as well as consideration of changes to the current emissions accounting provisions for these sectors under the Kyoto Protocol. A comprehensive GHG emissions accounting system could be applied to

agriculture, but given the difficulties associated with measurement, investigation is needed to determine if other policy options might create greater emission reductions at lower cost. Accreditation of carbon in soils and vegetation is a main issue (Garnaut Report, 2008: Chapter 14).

European Union

The Commission of the European Communities (2009) released Towards a comprehensive climate change agreement in Copenhagen, which assessed different policy options for the main issues under negotiation for a post-2021 climate agreement. Key issues related to agriculture are outlined below:

- For LULUCF rules, the EU favours full land-based accounting as currently carried out under the UNFCCC inventories with a net-net accounting approach for all LULUCF activities.
- The EU is not likely to favour including agriculture soils under the CDM in a post-2012 agreement, noting that forestry credits should only be considered in the EU-ETS after a thorough review of experience using deforestation credits for government compliance and only for the period after 2020.
- Costs for mitigation to reduce GHG emissions from agriculture are estimated as €6.5 billion in 2020, of which developing countries represent €5.0 billion. The large share for developing countries is partly due to the fact that the EU research study looked at cost efficient options, which led to a relatively higher share of reductions in developing countries.
- Some mitigation options in the agricultural sector (for example, changing animal diets, optimizing manure management and limiting grazing, reducing methane emissions from rice production and improving fertilizer use efficiency) increase agriculture productivity and decrease GHG emissions for a similar amount of agricultural production. These are the type of measures that also need to be implemented to reduce GHG emissions from deforestation, while simultaneously allowing afforestation for bio-energy purposes to increase.
- Barriers to implementation remain and significant increases in agricultural productivity will require support for research and capacity building, and investment in agricultural infrastructure and rural development in developing countries, especially Africa.
- In addition to expected population growth, it will be crucial to address pressures on agriculture stemming from climate policies, REDD and increased demand for bio-energy—while increasing agricultural productivity. A new international agreement needs to ensure that the right balance can be found between these opposing forces.

Japan

Manure management is the main concern of Japan, and it is interested in soil carbon sequestration in a post-2012 agreement. In anticipation of reporting on soil carbon being mandatory in a post-2012 agreement, Japan is developing land management practices that sequester carbon (Ministry of Agriculture, Forestry and Fisheries, Japan, 2008). This includes introducing policies to provide

farmers with incentives for soil carbon sequestration, and improving their accounting and reporting methodologies. Japan plans to include carbon credits from agriculture (for example, CH_4 reduction through manure management) in its GHG emissions trading system.

Rice cultivation represented 30 per cent of Japan's CH_4 emissions in 2005 (Japan, 2005). Japan is a leader in research to reduce methane emissions from rice cultivation and has undertaken collaborative research with developing countries in Asia. For example, the National Institute for Agro-Environmental Science is leading the Monsoon Asia Agro-Environmental Research Consortium, which furthers information exchange and joint research.

Japan is supportive of a sectoral approach with agriculture and forestry and other land-use as two of eight sectors. In Japan's proposed sectoral approach, mid-term national targets for each major emitting country will be determined by adding up each sector's potential GHG emission reductions. A cooperative sectoral approach will encourage developing country action, which will be supported by developed countries through the transfer and diffusion of technologies and a sectoral crediting system. Japan notes that sectoral approaches can support national efforts in developing countries by identifying and transferring best available technologies and practices.

New Zealand

New Zealand is a leader in the discussions on agriculture, reflective of the country's unique position among developed countries. Agriculture made up 53 per cent of total merchandise exports in 2007 and agricultural GHG emissions were 48.4 per cent of total emissions in 2005 and are increasing (Clark, 2008). New Zealand has stated that policies and measures under the convention should be designed to ensure that food production is not threatened. New Zealand is in favour of increased global collaborative R&D of technologies, recognizing that mitigation measures will need to be evaluated at various levels according to particular environmental, social and economic circumstances. Mitigation measures that do not threaten food production are required. Creativity is needed to identify appropriate ways to include the agricultural sector in a post-2012 agreement.

New Zealand has called for the consideration of the inclusion of agriculture soil carbon as an eligible activity under the CDM. It notes that methodologies will need to be developed, additionally will need to be demonstrated and the non-permanence issue will need to be addressed. The issuance of lCERs and tCERs could be used.

United States

The U.S. notes the need to consider agriculture in sectoral approaches and has expressed interest in a broader consideration of REDD to include a sustainable land management approach. The U.S. is more open than most other countries toward agricultural soil projects and credits, partly because of a strong farm lobby that has an interest in land-based carbon projects. The U.S. has been an

advocate for bio-carbon projects in general and there is considerable interest in having agricultural soil credits as offsets in GHG emissions trading schemes. The Chicago Climate Exchange (CCX) has protocols for offsets for agricultural methane, agricultural soil carbon and rangeland soil carbon management (among others). The soil carbon protocols are not considered as robust as those developed elsewhere (Alberta or VCS), but several soil carbon offsets from Canada and the U.S. have been transacted under the CCX.

5.3 Developing Country Interests and Priorities

Several countries are interested in incentives to encourage actions to reduce GHG emissions from the agricultural sector, and have made submissions to the AWG-LCA on this subject (see Annex 1 for a summary of comments on agriculture in party submissions to the AWG-LCA). Several developing countries—including the Alliance of Small Island States (AOSIS), Bangladesh, India, Uruguay and Maldives on behalf of LDCs—mention the need to consider agriculture in adaptation strategies. Developing country submissions on mitigation in the agricultural sector include:

- Argentina supports continued exploration of issues related to the mitigation of GHG emissions in the agricultural sector, stressing that actions should only take place if they are supported by international cooperation. This includes R&D to face challenges, such as reduced land availability due to climate change and competition with other land uses. Mitigation actions in developing countries need to account for the unique social, economic and environmental circumstances of each country. Baseline and monitoring methodologies need to be developed.
- Argentina, Chile and Uruguay note that mitigation in the agricultural sector needs to account for regional and national circumstances. Discussions on this sector should consider developing country needs for technology transfer, financing and investment, capacity development and R&D.
- Belize notes that biochar is a solution that reverses and slows down the processes of land degradation and is a feasible mechanism for carbon sequestration. [13] Decisions on methodologies for project-based action for carbon sequestration from soils, including biochar, should account for the integration of several agricultural systems in a synergistic manner. Carbon in soils is an innovative opportunity for the UNFCCC negotiations and should be on the agenda of COP 15.
- Cuba indicates that agriculture is one sector where there are viable alternatives for GHG emission reduction actions.
- The Republics of the Gambia, Ghana, Lesotho, Mozambique, Niger, Senegal, Swaziland, Uganda, Zambia and Zimbabwe flag the importance of a decision that includes the potential of dryland soils in sequestering carbon. Biochar is one way to help reduce GHG emissions

[13] Biochar is a charcoal rich in carbon content created by pyrolysis of biomass. Biochar can sequester carbon in the soil for hundreds to thousands of years and is a soil amendment. It can prevent the leaching of nutrients out of the soil, increase the available nutrients for plant growth, increase water retention and reduce the amount of fertilizer required. Additionally, it has been shown to decrease N_2O and CH_4 emissions from soil, thus further reducing GHG emissions (Laird, 2008).

by displacing fossil fuel use and sequestering carbon in stable soil carbon pools. A post-2012 agreement needs to include practical measures to promote sustainable land management. One way forward is the expansion of the CDM to include agricultural land uses. This would provide a new rationale for engaging developing countries in the mitigation and adaptation agendas. It is important to raise awareness of the political significance of land management issues for developing countries.

- Uruguay has supported research and information exchange in reducing GHG emissions from livestock and N_2O from agriculture soils.

Views differ on including and encouraging GHG emission reductions in the agricultural sector among developing countries. In submissions to other UNFCCC processes:

- Papua New Guinea notes that it is moving toward supporting the inclusion of forest compatible agricultural activities within REDD programs. It has put forward as an example its phased REDD readiness approach for forests and agriculture, which will be ready for the post-2012 regime.
- Sri Lanka feels there are more important GHG emission sources and sinks to be considered before conducting research on reducing emissions from agriculture. A higher priority research area is the identification and development of tree species with high CO_2 absorption capacity.
- Tuvalu, for AOSIS, has stated that there should be no expansion of LULUCF in the CDM and is generally sceptical and not supportive of sinks projects.

The large developing country emitters include consideration of agriculture in their climate change plans:

- For Brazil, the key mitigation interventions in the agricultural sector include enhancing soil storage, restoring degraded areas, intensifying bovine ranching, improving cultivation/fertilization to reduce CH_4 and N_2O emissions and cultivating bio-energy crops.
- For China, the mitigation interventions include the promotion of bio-energy, including bio-fuels; and adaptation measures include eco-friendly agriculture in intensive areas and improving agricultural infrastructure, high yield and stress resilient crops, and improved livestock management. China also plans to prevent grassland desertification.
  For India, sustainable agriculture is one eight "missions" in India's Climate Change Action Plan, but no clear objectives have been set. For adaptation, a key intervention is drought and pest-resistant crop development. Mitigation interventions include the promotion of renewables including biomass.
- For Mexico, mitigation priorities include the promotion of conservation tillage, and improved fertilizer and manure management. Adaptation actions include deepening the understanding of the impacts of climate change on agriculture, reducing soil degradation, modernizing hydro-agricultural infrastructure and developing databases on the resilience of key crops.

Several African organizations are calling for increased incentives in agriculture. Africa has contributed only 3.8 per cent of the GHG concentrations in the atmosphere, yet the continent will be affected by climate change in terms of food security, sustainable water supply and extreme weather phenomena such as floods, droughts and threats of desertification. A significant proportion of Africa's poor are smallholder farmers and Africa's agricultural sector is particularly vulnerable to climate change. The African Bio-Carbon Initiative calls for a post-2012 agreement that encourages sustainable agriculture in Africa, including carbon markets and financial mechanisms that reward improved agricultural and forest-management practices that will also help the poor adapt to climate change. This initiative, supported by the Common Market for Eastern and Southern Africa (COMESA), seeks to ensure that a post-2012 agreement includes support for REDD-AFOLU, calling for the full range of bio-carbon to be included in the CDM with credits being issued for A/R, agroforestry, enhanced natural regeneration, revegetation of degraded lands, reduced soil tillage and sustainable agricultural practices (COMESA, 2008).

5.4 How can Canadian Interests be brought to Bear in the Negotiations?

A Canadian priority is to advance negotiations on climate change over the coming year with the intent of reaching a comprehensive global agreement for the period beyond 2012 when the current Kyoto targets expire. Canada has been in favour of broadening the inclusion of carbon sinks in agricultural soils in an international agreement, building on the experience acquired through successful domestic programs. Canada recognizes the importance of agriculture in developing countries, and the important co-benefits for sustainable development of mitigation action in this sector (for example, food security, poverty reduction and improving agro-ecosystem resilience).

Under the LULUCF rules for developed countries, Canada wants improved incentives for mitigation benefits through sustainable land management, an accurate accounting of the LULUCF sector's contribution to GHG balances and accounting that focuses on anthropogenic emissions and removals in the LULUCF sector. The current rules do not include reductions in the agricultural sector with optional reporting on cropland and grazing. If agricultural soils are not included, there is little reason for governments to create incentives for farmers to adopt sustainable practices through domestic agricultural policy. There seems to be a general tendency toward such reporting being mandatory for Annex I countries, although there are concerns about the 1990 baseline. Several countries are open to changing the baseline, which will likely be necessary if new countries are to be added to Annex I (as they are not likely to have the required data to establish a 1990 baseline).

Canada has long been a strong supporter of sinks as a viable means to mitigate GHG emissions. Canada could be a proponent of a broader role for agriculture in a post-2012 agreement, including expanding the scope of the CDM or developing a new MMSD that would recognize land-use activities beyond A/R. This would likely play well with many developing nations. Agricultural soil

carbon sequestration offers potential for significant reductions and sustainable development in these countries, and a market mechanism that includes agricultural land use could have a significant impact in several LDCs, including African nations that have been largely excluded from the carbon market to date.

To bring these countries into such a framework will require improvements in capacities to monitor and measure GHG emissions. In this instance, Canada's experiences may be aligned with the interests of developing countries. Research in Canada demonstrates that it is possible to measure changes in the carbon stock of agricultural soils in a transparent, reliable and verifiable way. The experience with domestic conservation agriculture programs, and the Alberta and growing federal experience in the development of offset protocols means that Canada is a leader in these areas. This expertise could guide the development of robust measurement and monitoring frameworks for other countries.

While the Canadian offset protocols may not be directly transferable, cooperation with established research institutions in developing countries could be a way to encourage the development of methodologies appropriate for these countries. Such support could be a way for Canada to gain allies in the negotiations and further Canadian interests. While it may not be possible to establish such programs before Copenhagen, Canada might consider directing ODA or other support toward climate change and sustainable agriculture, and by announcing this in the run-up to COP 15. While recognizing that Canada's bilateral aid program is donor driven, a greater coherence between ODA and climate change objectives could help to further Canadian interests.

Canada recognizes the trade-off between GHG reductions and increased agricultural production. Canada might chose to support intensity-based per unit targets as measurement options for developing country actions. This could be an incentive that encourages developing countries to include agriculture in NAMAs. More research is needed in this area and Canada might consider working with researchers in developing nations to encourage and account for land-use intensification that provides more food, fibre and fuel, as well as increased carbon sequestration in soils.

Support for a broadened CDM or new MMSD may come from other developed countries. France and New Zealand are interested in expanding the CDM to include carbon soils. France, following on obligations made during its recent EU presidency, is particularly interested in expanding opportunities in African nations. The U.S. is also interested in a broader sustainable land management approach, and could prove to be a valuable ally as many countries will likely be willing to make some concessions to the U.S. to ensure the county signs on to or participates in a post-2012 regime in a meaningful way.

That said, there is a strong constituency of governments and groups–including some influential members of the G-77 and China, including Brazil and China, countries within the EU and environmental groups–that are very opposed to an expanded role for sinks in a new agreement. The main concerns are the permanence of these GHG emission reductions and technical difficulties associated with additionality, baselines, system boundaries and leakage and measurement and monitoring. Some environmental groups maintain that these projects are used to avoid domestic reductions in developed countries, diverting political and financial resources away from the urgent task of reducing fossil-fuel-related GHG emissions and encouraging transformational change in energy systems. The major developing nations are concerned about sovereignty issues in that sinks activities could lead to international rules for land management.

A consideration in the discussion of broadening the CDM or establishing other MMSDs that support agricultural soil sequestration projects is the risk of flooding the carbon market. One of the key benefits of expanding market mechanisms under a new post-2012 agreement is a large quantity of GHG reductions, but a question is whether the resulting flow of credits from developing countries will find buyers or to what extent the price of credits would reach disastrous lows. A clear implication for a post-2012 regime that includes credits for carbon sequestration in agricultural soils is the need for ambitious targets for developed countries that will fuel demand for these additional credits.

As well, there will need to be consideration of who will buy these credits. The EU-ETS currently excludes forestry CDM credits (largely because of questions around permanence). Australia intends to take a decision on including forestry, agriculture and land management in its GHG emissions trading scheme in 2013. The proposed Canadian framework, *Turning the Corner*, refused to accept credits from forest sink CDM projects for compliance with Canadian regulations, considering the temporary nature of forest sink credits as adding complexity without significantly reducing compliance costs for regulated industry. Encouraging mitigation through market mechanisms that include agricultural soil projects in developing countries means that developed countries will need to be willing to purchase the generated credits. Agreeing to a market mechanism for agricultural soils will create expectations in developing countries, and developed countries, such as Canada, must be sure they are willing to fulfill those expectations.

6.0 Agriculture in a Post-2012 Climate Change Regime

6.1 Advancing Agriculture in a Post-2012 Regime: Considerations

The post-2012 negotiations provide an opportunity to incorporate agriculture as an integral part of the regime and encourage greater participation on the part of developing countries in reducing GHG emissions in the sector. Significant cost-effective reductions are available in the agricultural sector in the short- and medium-term, but there is no guarantee that countries will design an agreement that effectively includes agriculture. Several barriers work against the uptake of agricultural opportunities, including transaction costs, technical barriers, lack of data in developing countries, lack of capacity and lack of political will. Despite recognition of these barriers, overcoming them is difficult and a concerted effort led by interested countries will be needed to ensure an agriculture-friendly climate regime is agreed to in Copenhagen.

Several issues and linkages should be considered in the design of a post-2012 agreement that includes agriculture, including the inter-connectedness of sustainable development and sustainable agriculture, structure of agricultural systems in developing countries, linkages between mitigation and adaptation actions and linkages with other international conventions and agreements.

Sustainable Agriculture and Sustainable Development

In addition to reducing GHG emissions, agricultural mitigation measures have other social, economic and environmental benefits, particularly in regard to sustainable development, food security and making progress towards meeting the objectives of the Millennium Development Goals. The list of co-benefits linked to soil carbon sequestration include reduced soil erosion, improved soil fertility and structure, improved water quality, reduced levels of phosphorous and nitrogen pollution, buffering against drought and improved agricultural performance.

The 2009 *New Delhi Declaration on Conservation Agriculture* recognizes the importance of conservation agriculture that encourages minimum mechanical disturbance of the soil, permanent organic cover of the soil surface and a diversified sequence or association of crops. The declaration requests that conservation agriculture be the central mechanism for agricultural sector climate change mitigation in a post-2012 agreement (FAO, 2009).

Including agriculture in a post-2012 agreement should be an opportunity to improve national circumstances and to broaden the access to benefits in developing countries, especially in LDCs (Trines *et al.,* 2006). In many developing countries, the carbon market could offer significant opportunities to support agricultural programs. As well, yield improvement measures can enhance food security by increasing productivity while contributing to a higher income for farmers, and thus

help to alleviate poverty.

Securing food for a growing population is a major global concern for developing countries and is a primary objective of agricultural policies. As such, mitigating climate change must not result in reduced food production (FAO, 2008a). There are limits to GHG emissions reductions in the agricultural sector because of its importance in providing food for a growing global population. Improvements in efficiency may be a more reasonable approach than absolute reductions in developing countries GHG emissions from agriculture.

Considering the Structure of Agricultural Systems in Developing Countries

The capacity to implement mitigation options in the agricultural sector differs between countries. A post-2012 climate regime should propose an array of mitigation options. Mitigation of GHG emissions in the agricultural sector should account for sustainable development objectives and recognize that not all mitigation options are applicable in all countries. It is necessary to differentiate agricultural systems and the mitigation potential of these systems. This is particularly so for poorer developing countries where agriculture is the principal source of overall growth.

Linking Mitigation and Adaptation Efforts

Agriculture is a sector that can be used to link mitigation and adaptation policies and actions. Many mutually reinforcing synergies exist between specific mitigation and adaptation solutions that can lead to more efficient allocation of "climate response" resources (FAO, 2008a). Synergies may occur in cases where mitigation-driven actions in agriculture have positive adaptation consequences (for example, carbon sequestration projects with positive drought preparedness aspects) or when adaptation-driven actions have positive consequences for mitigation (for example, residue return to fields to improve water holding capacity will also sequester carbon) (Smith *et al.,* 2007). A large proportion of the mitigation potential of agriculture (excluding bio-energy) arises from soil carbon sequestration, which has strong synergies with sustainable agriculture. Soil carbon sequestration reduces agriculture's vulnerability to climate change and can help to reduce poverty in rural areas of developing countries (Verchot *et al*., 2007).

However, trade-offs may also occur when mitigation-driven actions in agriculture have negative adaptation consequences (for example, if heavy dependence on biomass energy increases the sensitivity of energy supply to climatic extremes) or when adaptation-driven actions have negative consequences for mitigation (for example, increasing use of nitrogen fertilizer to overcome falling crop yields leads to increased N_2O emissions) (Smith *et al.,* 2007).

Overall, an integrated approach can help climate policy makers maximize benefits while reducing climate vulnerability of mitigation measures and reducing energy intensive adaptation measures (Okubo and Michaelowa, 2008). Linking adaptation and mitigation measures have both positive and

negative aspects, depending on national circumstances and agricultural systems. A future climate regime should encourage countries to recognize and enhance positive impacts.

Synergies with other Conventions and Agreements

Actions to encourage climate change mitigation in the agricultural sector have several potential synergies with other international agreements and conventions, particularly the Rio Conventions—the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). [14] Efforts to integrate the conventions are led at the international level by the Joint Liaison Group (JLG) of the UNFCCC, CBD and UNCCD, established in 2001. This group facilitates collaboration between the secretariats of the three Conventions and promotes integration through sharing of information, coordination of activities and identification of measures that simultaneously address all three issues.

Cowie *et al.* (2007) note that the three Rio Conventions (UNFCCC, CBD, UNCCD) deal with several issues that are intertwined and related to climate change:

- climate change is a major threat to conservation of biodiversity and is likely to exacerbate desertification and drought in some regions;
- deforestation reduces biodiversity, reduces carbon stocks in biomass and soil thereby exacerbating climate change and can lead to desertification;
- desertification further contributes to climate change through increases in land-surface albedo; and
- dryland salinity, a symptom of desertification, threatens biodiversity.

Multiple benefits can result from seeking synergies in the implementation of these conventions, including strengthening the effectiveness of actions undertaken in support of the conventions and ensuring efficient use of human and financial resources in planning, implementing, monitoring and reporting. Efficiencies from linking these activities, such as through sharing data and tools, and development of policy mechanisms and approaches will benefit from sharing collective wisdom on successful approaches. There are also economic benefits to joint regulation (Cowie *et al*, 2007).

The role that land (for example, soils, plants and vegetation) plays in sequestering carbon is an issue of importance for the three Rio Conventions. Including soil carbon sequestration in a post-2012 agreement can help achieve the objectives of the UNFCCC, as well as mitigate the effects of drought (namely desertification and land degradation) and reduce biodiversity loss in dryland ecosystems. Policy frameworks that target the conservation of soils can contribute to the increased

[14] The three "Rio" Conventions resulted from the 1992 United Nations Conference on Environment and Development. The UNCCD aims to address the issues of land degradation including desertification as well as the effects of drought. The objective of the CBD is the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

capacity of ecosystem services from these lands, the generation and availability of goods to improve livelihoods and food security. The utilization of biochar in sequestering carbon in soils has been recognized by the UNCCD, which call for the inclusion of biochar in the CDM (UNCCD, 2008).

There are also linkages with the Ramsar Convention on Wetlands, which is the framework for cooperation for the conservation and wise use of wetlands and their resources. Agricultural reclamation includes such activities as drainage, in-filling and cultivation. In addition, conversion of wetlands to agricultural lands can lead to increases in GHG emissions. The Ramsar Convention encourages the sustainable use of wetlands, including sustainable agricultural systems related to these wetlands. Wetlands management should be considered in tandem with other land use mitigation measures, including agriculture. There is a considerable lack of information on the interactions between wetlands and croplands and the movement of substances such as nitrogen. The role of wetlands will evolve in the climate discussions as uncertainty decreases.

The promotion of sustainable agriculture in a new post-2012 agreement would have positive effects for all three Rio conventions and the Ramsar Convention.

6.2 Agriculture in a Post-2012 Agreement: Options to Encourage Developing Country Participation

A future climate agreement can encourage climate change mitigation in the agricultural sector in several ways. On option is to encourage developing countries to include agricultural actions in their NAMA plans and thus be eligible for assistance from developed nations. Another option is for developed countries to provide support for capacity building and technology cooperation in the agricultural sector (for example, support for R&D, measurement and monitoring, new methodologies and protocols for market mechanism). A promising option, which is explored in more detail in this section, is to include a market mechanism for agricultural soil carbon sequestration.

Expanded CDM

An expanded CDM could include several activities that sequester carbon in agricultural soils, including reduced soil tillage, sustainable agricultural practices and biochar. As previously noted, there is large mitigation potential in developing counties, including in many lesser developed nations that have largely been excluded from the CDM to date.

The main issue to be dealt with is the non-permanence of credits generated through soil sequestration projects. It can be difficult to meet current permanence criteria for agricultural soil sequestration projects as soil carbon fluxes can be rapid, moving in and out of soil on a daily basis. But there are robust methodologies for baselines and monitoring that are working and used in

Canadian systems, such as Alberta's tillage protocol, under which soil carbon credits are permanent. Permanence is created through an assurance factor that includes a built-in discount factor to account for future losses and risk sharing between farmers and government. The VCS also has introduced robust rules that allow agricultural land management activities to generate permanent carbon. The *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination* includes a project risk assessment to determine the number of non-tradable buffer credits to be held in reserve to cover unforeseen losses in carbon (VCS, 2008). These methodologies could be adapted to be baseline and monitoring methodologies for developing countries.

Programmatic CDM could facilitate the aggregation of projects in the agricultural sector, offering potential for soil sequestration and other agricultural projects. One program of activities in the agricultural sector is at the validation stage, *Methane capture and combustion from Animal Waste Management Systems of the 3S Program farms of the Sadia Institute* in Brazil. Programmatic CDM allows the bundling of many similar projects into one single project. This is attractive for smaller projects where the transaction costs are high and projects are fragmented over a large geographical area–difficulties that have contributed to the lack of projects in the agricultural sector to date, and would likely apply to soil sequestration projects. The agricultural sector has considerable potential under CDM programs of activities, but procedural and methodological barriers need to be overcome.

Sectoral CDM

Sectoral CDM refers to specific sectors within a country and could include agriculture. In common with programmatic CDM, sectoral CDM seeks to reduce transaction and monitoring costs and to package together what would otherwise be several separate projects. Such considerations are particularly acute for the agricultural sector.

Sterk and Wittneben (2007) describe two types of sectoral CDM: policy-based CDM and clustered CDM. They note that clustered CDM is a mechanism through which private actors would implement local projects that would be clustered along the lines of a specific sector. An example of clustered CDM would be to define baselines for activities in the agricultural sector. Investments that contribute to staying below the baseline level could then receive the difference between the baseline level and the achieved level in the form of CERs. Policy-based CDM would promote national or local policy initiatives by rewarding the government with CERs. If it targets the agricultural sector, sectoral CDM could provide incentives to developing countries to implement mitigation measures in this sector.

Under sectoral CDM, a baseline is established for a sector and GHG emissions reductions below the baseline are eligible to receive credits. Sectoral baselines could be in absolute terms or as intensity baselines. Sectoral CDM partly avoids the counter-factual and hypothetical assessment of the motivation of private entities to demonstrate additionality; the main challenge is the uncertainty of

the GHG emissions projection (Schneider, 2007).

Sectoral CDM could be a way to include activities which have beneficial development aspects, but are not as cost effective as others. Sectoral CDM that includes policy-based projects could also solve the problem of governments being reluctant to implement climate protection policies and measures for fear of making future CDM projects non-additional. Instead, it would reward them for their efforts to mitigate climate change. Several methodological issues would need to be addressed to include sectoral CDM for agriculture, including: establishing boundaries; establishing baselines that encourage the sector to reduce GHG emissions; collecting robust data from several farmers; and ensuring that emissions reductions are measurable, reportable and verifiable.

Allocation-based MMSD

An allocation-based MMSD could be one market mechanism to include credits generated through soil carbon sequestration in developing countries. This would be similar to policy or sectoral CDM in that it be a move away from a project-based approach. An allocation-based MMSD would first grant an "allocation," which could include the impacts of expected reductions, to the agricultural sector. Any reductions beyond this allocation, measured in tonnes of carbon, would be eligible for sale through the carbon market. The intent of a broader MMSD is to move away from credits for project-based GHG emissions and the need to demonstrate additionality–an issue that has proven controversial over the life of the CDM and introduces particular difficulties for soil carbon sequestration projects, where it can be very difficult to prove additionality.

These allocations could be set out in NAMA plans and agreed to by the COP. The allocations would be subject to MRV (measurable, reportable and verifiable) requirements. Through a reporting system, which could take the form of a registry–as proposed by South Korea (Republic of South Korea, 2008)–allocation-based MMSDs could be rewarded with carbon credits. Crediting should act as an incentive to take action to mitigate climate change in areas that would not have seen action because of a lack of financial support.

A key question will be the determination of the allocation for the agricultural sector and the MRV requirements. It is essential that buyers have sufficient confidence that the abatement claimed is sufficiently robust to warrant them paying for the actions. If confidence is not high, the likely result is buyers will limit the share of allocation-based MMSDs in their overall portfolios.

7.0 Conclusion

As we move toward Copenhagen, time will be the enemy of a comprehensive role for agriculture that effectively encourages developing country participation. The pace of the negotiations will increase over 2009 with a series of meetings of the AWG-LCA, AWG-KP and Subsidiary Bodies, and COP 15/CMP 5 taking place in December, 2009. As illustrated by the submissions that countries and organizations have made to the AWG-LCA and the AWG-KP regarding agriculture, the lack of consideration of the agricultural sector in the current agreement is a concern. The negotiations on a post-2012 agreement provide an opportunity to incorporate agriculture as an integral part of the regime for both developed and developing countries. The international discussions also provide the chance to reassess procedures, extend the list of eligible agricultural activities and simplify the manner in which agricultural activities are included in the future climate change regime.

A strategic framework for Canada to encourage effective and meaningful developing country participation could consist of:

- insuring that agriculture is planted as a flag/marker in the Copenhagen Agreement;
- encouraging a broader accounting of agricultural GHG emissions, such as the IPCC guidance on AFOLU that unifies agriculture and LULUCF;
- encouraging a broader role for agricultural GHG emission reductions in emissions trading systems;
- advocating for carbon sequestration of agricultural soils in the CDM or other MMSD and adopting an negotiating stance that supports this;
- providing ODA and other support for project and programs in the agricultural sector in developing countries; and
- communicating the successes for Canada and the world that result from effective engagement in the agricultural sector with developing countries.

Agriculture Planted as a Flag/marker in a New Climate Change Agreement

It is critical to have a flag or marker for agriculture in a new post-2012 agreement. Missing this opportunity to provide incentives for sustainable agriculture will mean that several poor countries will, once again, be denied access to a stream of carbon financing. A flag or marker could be as simple as including wording in the broad negotiating text, such as "agriculture will be considered as a legitimate area to carry out mitigation activities." The details and modalities would be elaborated in later negotiating sessions. Or the marker could be more focused or elaborate, perhaps indicating that an MMSD to generate credits from the agricultural sector will be included in a post-2012 regime. There seems to be general consensus that any text out of Copenhagen will be a broad agreement with details to be negotiated.

This position may be problematic, given that Canada's submission to the AWG-KP indicated that there needs to be a clear understanding of the treatment of the LULUCF sector before establishing targets or commitments. It is unlikely, or indeed impossible, that a fully fleshed-out agreement for agriculture will be ready for Copenhagen.

Broader Accounting of Agricultural GHG Emissions

A broader accounting of agricultural GHG emissions could provide incentives for developed countries to take action. Increased action in developed countries would, over time, help to build up a knowledge base and expertise that could provide direction to developing country efforts. Developed countries could move to a system of accounting that focuses on AFOLU, considering the agricultural system as a whole. There could be consideration of more advanced developing nations also adopting this system of accounting and reporting. While many countries object to this type of accounting, the post-2012 international agreement should strive to have comprehensive and comparable reporting and measurement between countries. Canada could encourage mandatory reporting of agricultural GHG emissions under an AFOLU accounting structure, for developed and advanced developing nations and provide support to transfer Canadian expertise.

A Broader Role for Agricultural Reductions

Several GHG emissions trading systems are under development. Some propose to include domestic agricultural soil credits as offsets (for example, Alberta and WCI), while others exclude them (for example, the EU-ETS currently does not allow for agricultural offsets). The way CDM sinks credits are handled can differ with many countries choosing to exclude sinks because of their temporary nature. Canada needs to introduce options to the international community that address the temporary nature of international sinks credits, helping to increase the likelihood of linking various GHG emissions trading systems in the future and increasing opportunities for developing countries in agricultural soils sectors under a new agreement. Canada's considerable experience in developing protocols could form the basis of collaborative R&D and capacity building efforts with developing countries that will aim to develop methodologies and protocols appropriate to their domestic conditions.

Market Mechanisms for Soil Carbon Sequestration

An expanded CDM, another MMSD or some other means that includes soil carbon needs to be in place to foster sustainable land use. An effective mechanism needs to address leakage and have permanent credits (building on the experience of Alberta's protocols and the VCS buffer reserve approach) that require projects to maintain an adequate buffer of non-tradable credits to cover the potential for future losses. It is important that action in the agricultural sector not be sidelined by the credits being temporary or non-permanent.

Canada could adopt a negotiating stance that:

- calls for including agricultural soils in the CDM or another MMSD, or some other means to recognize agriculture as a legitimate mitigation activity;
- puts forward robust methodologies for baselines and monitoring that are working and used in Canadian systems (for example, the Alberta and VCS protocols); and
- indicates that if there is no approval under a new post-2012 agreement to include agricultural soils, Canada will set its own standard for international credits and use these credits to meet its domestic target. (That is, if agricultural soils are not included under the CDM or another MMSD, or recognized by some other means, Canada will use a standard of its own choice to import credits/units to meet national targets because countries have a sovereign right to adopt nationally-appropriate policies and actions to meet commitments.)

Of course, Canada would need to reverse its current policy of not allowing forest sink CDM credits, which would mean looking at options to address the temporary nature of these credits. Such a stance would require outreach and communication to ensure that critics understand the robustness of the proposed methodologies and the importance of having mechanisms that allow Canada to work with least developed and African countries to address climate change.

Canada might be supported by the U.S. in such a stance and many African countries are likely to support this position, provided there is real intent behind the words. This would mean providing support to building capacity in these countries, likely through the ODA budget in the short term.

It is important to note that companies and buyers of carbon credits are interested in agricultural projects that have real sustainable development benefits, especially in poorer countries that find it hard to undertake energy-related CDM activities due to their lack of fossil fuel consumption. Agriculture should be included, using sound and robust methodologies and baselines that are developed by international experts in cooperation with developing country research institutes and experts.

ODA and other Support for Project and Programs in the Agriculture Sector

Financial and technical support is required to help developing countries address climate change in the agricultural sector. Actions in poorer developing nations can have multiple benefits, as soil carbon sequestration projects can help address rural poverty and improve soil resiliency, helping farmers adapt to climate change. Given the many advantages of sustainable agriculture for climate change as well as social equity and farmers' livelihoods, Canada could consider increasing its ODA budgets for agricultural projects. An emphasis should be placed on projects that build capacity in African countries to allow them take advantage of opportunities in the post-2012 carbon market. This would build on Canadian leadership in protocol development, monitoring and measurement and sustainable farming methods. R&D and technology cooperation are needed to position the

poorer countries to take advantage of market mechanisms.

Projects that have mitigation and adaptation benefits could also be a priority. Canada is a leader in conservation agriculture and could build on the experience gained through previous and on-going projects, such as the SADP in China. Such projects could also deliver important benefits under other multilateral environmental agreements, including the CBD and UNCCD.

There may be a need for greater coherence between Canada's aid agenda and the climate change negotiations. It would appear that Canada might be able to generate some support for its positions in the climate discussions from LDCs by supporting their calls for a crediting mechanism that includes soil carbon sequestration. But, in reality, actions in other arenas have jeopardized Canada's potential goodwill. Canada is not well placed to generate support from African nations in the climate change negotiations, having removed eight African nations that are LDCs or lesser developed nations from its list of focus countries in its bilateral aid program. [15] In addition, Canada has not allocated ODA for climate change programs and projects since the $100 million Canada Climate Change Development Fund sunset in 2006. While it is recognized that Canada's bilateral aid program is donor driven, there is a need for a common front in the negotiations. Identifying specific funds to support climate change actions in developing countries that complement aid programs could be an important step in building allies.

Communicating Successes

An important consideration will be communicating successes to the international community to gain support in the negotiations and the domestic constituency to gain support of the Canadian public. Should Canada decide to be an active promoter of GHG emission reductions in the agricultural sector in developing countries, it will be important to convey this to developing countries. This message could be reinforced by an announcement of funding support for sustainable agriculture. Canada needs to emphasize its expertise in measurement, reporting and protocol development and provide examples of how these methodologies could work in developing country situations. Canada will also need to communicate its intention to allow Canadian emitters to purchase these offsets under the country's GHG emissions trading scheme.

The Canadian public needs to be informed of:

- Canadian successes and leadership in this area;
- the benefits of including agricultural projects as offsets, both domestically and internationally; and
- the real opportunity to engage poor developing nations in a manner that has both mitigation and adaptation benefits–as well as improving livelihoods in rural areas.

[15] Eight African countries that were removed from Canada's list of focus countries in February 2009 (Benin, Burkina Faso, Cameroon, Kenya, Malawi, Niger, Rwanda and Zambia).

Canadians will need to be assured of the robustness of the international protocols, which could be informed by Canadian models and of the appropriateness of using Canada's domestic GHG emissions trading scheme to support agricultural projects in the world's poorest countries that have mitigation and adaptation, as well as sustainable development, benefits.

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Annex 1: List of People Interviewed

Rosemarie Benndorf, Germany

Bas Clabbers, Netherlands

Nathalie Guesdon, France

Peter Iverson, Denmark

Daniel Martino, Uruguay

Hayden Montgomery, New Zealand

Ken Newcombe, United States

Ryudai Oshima, Japan

Klas Osterberg, Sweden

David King, France

Annex 2: Submissions to the AWG-LCA that include Reference to Agriculture

Developing Countries
ALLIANCE OF SMALL ISLAND STATES (AOSIS) **December 2, 2008 – AOSIS input into the assembly paper on adaptation** http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p01.pdf, p. 16 The livelihoods of communities in AOSIS member states are heavily dependent on a limited number of economic activities including tourism, agriculture and fisheries that are particularly vulnerable to climate change impacts. Support to identify options and build capacity for small island developing states to diversify from dependence on specific vulnerable natural resource-based economies is required, and could be provided through the mechanisms and institutional arrangements proposed by AOSIS as part of a flexible structured approach to adaptation.
ARGENTINA **February 6, 2009 – Submission for the AWG-LCA – Mitigation in the agricultural sector** http://www.unfccc.int/files/kyoto_protocol/application/pdf/argentina060209b.pdf, p. 3 ▪ Argentina supports continuing to explore issues related to the mitigation of GHG in the agricultural sector, stressing that actions on this sector should take place only if they are adequately supported by the international cooperation. ▪ International cooperation for R&D will also be needed to face challenges such as the decrease of land availability due to competition with other land uses and to the effects of climate change. ▪ Mitigation actions on the agricultural sector need to contemplate social, economic and environmental circumstances for each country as well as the diversity in agricultural systems, suggesting that not all mitigation options and technologies are applicable in all countries. Finally, in view of this diversity, methodological issues such as the establishing of baselines and monitoring methodologies are particularly relevant and should be discussed and scientifically dealt with in the months ahead. ▪ Agriculture is a very important economic activity representing about 10 per cent of the GDP of Latin America. Studies in Argentina, Chile, Uruguay and some other Latin American countries, based on General Circulation Models and crop models, project decreased yields for numerous crops (for example, maize, wheat, barley and grapes) even when the direct effects of CO_2 fertilization and implementation of moderate adaptation measures at the farm level are considered.
ARGENTINA, CHILE AND URUGUAY **December 6, 2008 – Agenda Item 3.b of the AWG-LCA** http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p01.pdf, p. 49 ▪ Emissions from the agricultural sector represent a major share of total GHG emissions for our countries. ▪ The Technical Paper on Opportunities and Challenges for the Agricultural Sector provides a good basis for the exchange of ideas within the context of the AWG-LCA, by framing the discussion considering all the elements addressed by the BAP, including: through technology transfer and/or dissemination, investment and financial needs for the implementation of available and future practices; and the need for capacity-building to enable developing countries to implement relevant mitigation strategies and programs, as well as R&D. ▪ Mitigation in the agricultural sector is an issue that should be tackled with due consideration of the regional

and national circumstances related to the feasibility and applicability of the mitigation practices.

BANGLADESH

February 24, 2009 – Submission on Bali Action Plan regarding Work Programme of the Ad-Hoc Working Group on Long-Term Cooperative Action under the Convention

http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01.pdf, p. 12

- In Bangladesh, weather-related natural calamities are increasing in frequency and severity. These, as well as other climate related phenomenon, pose severe threat to agriculture and food security, create large scale uncertainties with water availability, and endanger the livelihood of people while exposing them to malnutrition, disease and morbidity and also to premature death. Adaptation, therefore, is at the core of actions to build and nurture a climate-resilient process of sustainable development. In fact, Bangladesh would like to have a protocol on adaptation within the UNFCCC to be discussed by the AWG as part of the post Kyoto regime.
- For adaptation, the policy focus has to be directed to the vital sectors of the economy such as agriculture, forestry, fisheries, land, human settlement, water resources, health and coastal zones. In short, the whole of Bangladesh has to be made climate resilient.
- Bangladesh has an extensive R&D system in crop agriculture, livestock, fisheries, forestry and water.

BELIZE

February 17, 2009 – Ideas on paragraph 1 of the Bali Action Plan: Measures to include carbon pools in soils, and their improvement with biochar: establishment of global baseline and the corresponding monitoring system

http://www.unfccc.int/files/kyoto_protocol/application/pdf/belize170209.pdf, pp. 2-3.

- Belize's different soil types supports extensive forests (broadleaf, pine forests, low scrubby woodlands and coastal mangrove forests) with approximately 12 per cent of these lands deforested primarily to support growing agriculture and human settlements /urban dwellings.
- Belize agrees that for achieving the ultimate objective of the UNFCCC in a cost-effective manner, there is the need that country parties engage seriously in further practical ways for reducing GHG emissions. These solutions cannot obviate the pools contained in soils. Biochar (charcoal) is one solution that reverses and slows down the processes of land degradation from, among others, unsustainable agricultural practices.
- There are many examples of the positive impact of biochar as a soil amendment and feasible mechanism for carbon sequestration.
- Belize agrees that carbon in soils provides an innovative opportunity to UNFCCC negotiations within the Copenhagen negotiation process. This is true when considering not only the incentives for sustainable land management, but also the benefits that biochar practices produce on soil fertility and renewable energy production through pyrolisys. Annex I countries and primary/secondary producers of non-annex I countries can directly benefit from the inclusion of carbon pools in soils.
- When deciding on methodologies for project-based action for carbon sequestration from soils, including biochar, issues on integration of several agricultural systems can be done in a synergistic way. The end result could be that land-use systems, such as shifting cultivation, can benefit from increased and sustained soil fertility.
- Belize requests that due to the significant role played by soils in capturing carbon and, therefore, helping in the realization of the ultimate objective of the convention, carbon pools contained in soils be subject to discussion and placed in the agenda of COP 15 for a decision on the matter.

CUBA

February 5, 2009 – The fulfillment of the Bali Action Plan and the components of the agreed outcome to be adopted by the Conference of the Parties at its Fifteenth Session (AWG-LCA)

http://www.unfccc.int/files/kyoto_protocol/application/pdf/cuba050209.pdf, p. 3

- Some viable alternatives for emission actions in developing countries to be considered during the forthcoming negotiating process could take into account the sustainable development policies, strategies and programs, since they include or may include several sectoral actions (energy, transportation, construction, agriculture, tourism, among others), where mitigation actions may be identified.

THE REPUBLICS OF THE GAMBIA, GHANA, LESOTHO, MOZAMBIQUE, NIGER, SENEGAL, SWAZILAND, UGANDA, ZAMBIA AND ZIMBABWE

February 6, 2009 – Ideas and proposals on Paragraph 1 of the Bali Action Plan: Concrete action for the inclusion of soil organic carbon restoration as a significant mitigation and adaptation tool to climate change

http://www.unfccc.int/files/kyoto_protocol/application/pdf/swazilandonbehalfofo60209.pdf, p. 1

These African countries have jointly prepared this submission to flag the importance and relevance of a decision for including the potential of dryland soils in sequestering carbon. One such exponent is biochar (charcoal), a soil-amendment technology, and bio-energy co-production from agricultural and forestry biomass that can significantly help in reducing GHG emissions by displacing fossil fuel use and sequestering carbon in stable soil carbon pools.

It becomes imperative to put in place practical measures to promote sustainable land management in line with the expected results of the UNFCCC COP 15 outcomes. One such practical measure is the utilization of biochar to increase soil organic matter and improve its oxidation, a process that could enhance the long-term, water-retention capacity of the soil, enabling it to sustain terrestrial vegetation that will help to arrest land degradation and desertification.

Bringing agricultural land use into the realm of implementation mechanisms on climate change would not only foster carbon sequestration, but could also create considerable added value through simultaneous impact on land fertility.

The political implications, as well as the increase of volume in financial and technological transactions targeting agriculture, could be enormous. In concrete terms, one way forward would be to expand the coverage of the Clean Development Mechanism towards agricultural land uses.

This would require new conceptual approaches, appropriate monitoring methodologies and strong political will, expertise and negotiation skills from interested parties.

For developing countries, strengthened attention to agricultural land use in the context of climate change could provide a new rationale for engaging in the adaptation and mitigation agendas, considering that for many of them the land and soils are the most important natural resource. Up to now, land and soils have not been featured as major themes in the climate negotiations, and raising awareness on the political significance of related issues would be important.

INDIA

October 17, 2008 – Enhancing action on adaptation

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a01.pdf, p. 21

- More specific information is now available across the regions of the world concerning the nature of future impacts, including for some places not covered in previous assessments. In addition to LDCs and small island developing states (which are already acknowledged as vulnerable regions under the convention), other

regions have been identified. For example:

- Africa is likely to be the continent most vulnerable to climate change especially with respect to food security and agricultural productivity, particularly regarding subsistence agriculture, increased water stress, potential for increased exposure to disease and other health risks. Approximately 1 billion

  people in South, South-East and East Asia would face increased risks from reduced water supplies, decreased agricultural productivity and increased risks of floods droughts and cholera.

MALDIVES ON BEHALF OF THE LEAST DEVELOPED COUNTRIES

February 27, 2009 – Bali Action Plan regarding Work Programme of the Ad-Hoc Working Group

http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01.pdf, p. 33

- For adaptation, the policy focus has to be directed to the vital sectors of the economy such as agriculture, forestry, fisheries, land, human settlement, water resources and coastal zones. In short, the LDCs and SIDS will have to be made climate resilient.

MEXICO

August 15, 2008 – Approaches and positive incentives on issues relating to REDD , and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

http://www.unfccc.int/resource/docs/2008/awglca3/eng/misc04a01.pdf, p. 10

- Other areas of interest for Mexico, as stated in our Special Climate Change Program–currently in its final stages of completion-, are carbon conservation, carbon sequestration, carbon substitution and the stabilization of the forest-agriculture frontier. We consider that positive incentives should also be channelled towards such areas where actions result in local and global benefits.

URUGUAY

August 8, 2008 – Enhanced national/international action on mitigation of climate change

http://www.unfccc.int/resource/docs/2008/awglca3/eng/misc02.pdf, p. 62

Considering the request from the AWGLCA to the Secretariat contained in the document FCCC/AWGLCA/2008/L.5, paragraph 6 (a), to prepare a technical paper on challenges and opportunities for mitigation in the agricultural sector for its consideration at the fourth session of the AWGLCA. Taking into account:

- the submission dated July 16, 2008 made by Argentina, Australia, Canada, Chile, Environmental Integrity Group, European Community and its Member States, Iceland, Japan, New Zealand, Norway, Paraguay, Russian Federation, South Africa, U.S. and Uruguay, concerning the above referred Technical Paper on Challenges and Opportunities for Mitigation in the Agricultural Sector;
- the submission made by Uruguay on March 16, 2008 on the possible future work on mitigation, in particular for non-CO_2 emissions from the livestock agricultural sector (methane from enteric fermentation of cattle and nitrous oxide from agriculture soils);
- the recent Livestock Emissions & Abatement Research Network (LEARN) workshop held in Montevideo (July 21-24, 2008) on "Measurement and mitigation of greenhouse gasses in grazing livestock systems," where more than 60 scientists and researchers from more than 13 countries participated with the aim to exchange experiences to improve the understanding and quantification of non-CO_2 emissions from animal agriculture;
- Uruguay considers that all the above mentioned elements will contribute together with the technical paper in the discussion of this issue in Poznan.

Uruguay proposes to hold a workshop in Poznan at the 4th session of the AWGLCA on Mitigation in the Agricultural Sector. Uruguay offers to present its national experience in developing national specific GHG

emissions factors for methane from enteric fermentation and nitrous oxide from agriculture soils. This is very important to further work on these emission factors, due to their high uncertainties (almost 50 per cent), to better understand the challenges and opportunities for mitigation in this sector.

February 11, 2009 – Bali Action Plan

http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01.pdf, p. 89

- In this framework, adaptation actions should address all parties, especially developing countries, which sustainable development depends to a great extent on their natural resources, such as coastal resources, agriculture and water resources. At the same time, their natural resources are extremely vulnerable to the adverse effects of climate change.

Developed Countries

AUSTRALIA

March 6, 2009 – Land Use, Land-Use Change and Forestry (LULUCF) sector: Soil carbon

http://www.unfccc.int/files/kyoto_protocol/application/pdf/australia060309.pdf, p.11

- There is broad interest internationally to better explore the role that soil carbon might play in a post-2012 outcome on LULUCF. The current rules provide for accounting for changes in soil organic carbon for all lands subject to Article 3.3 activities and elected Article 3.4 activities.
- There remain significant information gaps about the potential to achieve and sustain increases in soil carbon in Australian agricultural systems. Management strategies such as minimum tillage in cropping systems and establishing perennial pastures in grazing systems could offer soil carbon sequestration benefits under certain circumstances.
- Australia has committed to improving our understanding of soil carbon fluxes, particularly measuring carbon levels in agricultural systems, understanding the impacts of management practices for soil carbon and the role Australian soils could play in sequestering CO2from the atmosphere.

November 24, 2008 – Land Use, Land-Use Change and Forestry (LULUCF) sector: Attachment

http:/www./unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p01.pdf, p. 71

- Rules should be adopted to allow parties to report estimates of GHG emissions and removals using rolling averages over a period appropriate to ensure that a party can establish a trend reflecting anthropogenic changes. In this way, parties' national accounts would more comparably reflect changes in activity data and some of the artefacts of choosing different good practice estimation methods would be removed. Reporting using an average is provided for in the Revised 1996 IPCC Guidelines3 for the Agriculture and Land-Use Change/Forestry categories.

August 21, 2008 – Emissions trading and the project-based mechanisms

http://www.unfccc.int/resource/docs/2008/awglca3/eng/misc02a01.pdf, p. 10

- The Australian scheme will be one of the most comprehensive in the world. It will have maximal coverage of GHG emissions and sectors to the extent that this is practicable. As currently proposed, the Australian scheme will cover stationary energy, transport, fugitive GHG emissions, industrial processes, waste and forestry and all six Kyoto Protocol GHGs. Forestry will be included on an opt-in basis and it is proposed that agriculture be included from 2015, subject to a final decision in 2013.

CANADA

February 27, 2009 – Views and proposals on Land Use, Land-Use Change and Forestry

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc05.pdf, p. 25

- The current net-net with base year approach to cropland management, grazing land management and revegetation can result in perverse effects because of eventual carbon saturation. This is expected to be the case for Canada in the next few decades as our croplands near their maximum carbon storage capacity and

will no longer be able to remove carbon at the same rate as in the base year (Canada's croplands were a net sink of about 2 Mt CO2eq in 1990). If current rules are maintained, Canada would be debited because sequestration will be lower than in the base year although there are no GHG emissions from these lands and management practices have not changed. This saturation issue will need to be addressed in new rules for agriculture.

March 14, 2008 – Views regarding the Work Programme for the AWG-LCA

http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01a02.pdf, p. 11

- In exploring means to enhance action on mitigation through AFOLU, Canada urges parties to take into consideration relevant discussions, recommendations and on-going processes under the UNFCCC and its Kyoto Protocol. In particular, the convention AWG will need to draw upon and take into consideration the work of the Kyoto AWG sub-group dedicated to LULUCF issues to be established at AWG 5.1. Canada also believes that the 2006 IPCC Guidelines for National Greenhouse Gas Inventories already form a strong methodological basis for measuring, reporting and verifying actions in the AFOLU sector.
- Globally, in addition to REDD, there is considerable mitigation potential from a range of activities in the AFOLU sector that are not currently recognized under the Kyoto Protocol (a comprehensive treatment of agriculture would be useful in this regard). Further, the policy approaches or incentives that will be most effective in enhancing such actions depend to a great extent on each party's national circumstances. The convention AWG would be best served by tasking an Expert Sub-Group to address the means to enhance actions in the AFOLU sector. Such an Expert Sub-Group on AFOLU would then begin its work at the second meeting of the AWG.

CROATIA

March 12, 2009 – Information on issues identified in paragraph 49 of document FCCC/KP/AWG/2008/8

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc01.pdf, p. 17

- The emissions trading system should also be applied in a wider sense in terms of quantified GHG emissions determination for certain sectors (small industry, households, services, transport, agriculture and waste).
- With regard to sectors with major GHG emissions sources, a global market should be enabled. The other possible solution would be to determine targeted technological standards for emissions-intensive sectors.

CZECH REPUBLIC ON BEHALF OF THE EUROPEAN COMMUNITY AND ITS MEMBER STATES

March 12, 2009 – AWG-KP: Consideration of the scale of emission reductions to be achieved by Annex I Parties in aggregate; Consideration of the contribution of Annex I Parties, individually or jointly, consistent with Article 4 of the Kyoto Protocol, to the scale of emissions reductions to be achieved by Annex I Parties in aggregate; and other issues arising from the implementation of the work programme, with due attention to improving the environmental integrity of the Kyoto Protocol

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc01.pdf, p. 19

- In December, 2008, the EU adopted its climate and energy package. The package includes a unilateral commitment to reduce EU-27 GHG emissions by at least 20 per cent by 2020 compared to 1990 levels and by 30 per cent provided that other developed countries commit themselves to comparable emissions reductions and that economically more advanced developing countries contribute adequately according to their responsibilities and respective capabilities. These goals will be achieved mainly though legislation adopted in December, 2008 that includes GHG emissions reduction targets for sectors not covered by the ETS (for example, agriculture, buildings, transport and waste).

February 12, 2009 – Definitions, modalities, rules and guidelines for the treatment of land use, land-use change and forestry (LULUCF in the second commitment period (AWG-KP). Views and proposals for further elaboration of the options, elements and issues contained in Annex III to the report of the first part of the sixth session, and Annex IV to the report at the resumed fifth session, including views on how and which

proposals could address cross-cutting issues

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc05.pdf, p. 36

- For cropland management, grazing land management and revegetation, the EU is of the view that, in the context of an activity based accounting, current net-net accounting rules for cropland management, grazing land management and revegetation are satisfactory.

FRANCE ON BEHALF OF THE EUROPEAN COMMUNITY AND ITS MEMBER STATES

December 6, 2008 – EU ideas on elements contained in paragraph 1 of the Bali Action Plan, for the purpose of the assembly document

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p01.pdf, p. 131

- We also recognized that there are sector specific technologies such as water management and agriculture It is important to recognize and seek the contribution of such international sectoral organizations as the Consultative Group of International Agricultural Research to and seek ways to engage them.

July 30, 2008 – Adaptation, including technology and finance

http://www.unfccc.int/resource/docs/2008/awglca3/eng/misc02.pdf, p. 11

- The Framework for Action on Adaptation would assist in identifying priority technology needs for adaptation. The framework for action on adaptation would also mobilize those organizations with relevant expertise (for example, the Global Climate Observing Systems or the Consultative Group on International Agricultural Research). Furthermore, it would facilitate support for technology R&D, deployment and diffusion, including from the private sector. The priority areas aimed at strengthening the adaptive capacities of the most vulnerable countries could include *inter alia* technologies to facilitate monitoring, forecasting and modelling climate change, those for improving the resilience of agriculture to the impacts of climate change and technologies for coastal zone management.

JAPAN

February, 2009 – Japan's view on the treatment of land use, land-use change and forestry (LULUCF

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc05.pdf, p. 44

- The IPCC AR4 has revealed that agricultural activities would perform a large mitigation potential and most of it would be able to be brought out through using currently available technologies.
- In particular, carbon sequestration into the agricultural soil offers a large mitigation potential and it is essential to take full advantage of the mitigation potential in terms of efficient and effective prevention of climate change. Therefore, cropland management and grazing land management should continue to be included in the Article 3.4 activities as one of the means available to Annex I Parties to reach their national commitments as in the first commitment period.
- As for carbon sequestration through cropland management and grazing land management, there are various management practices across countries and regions, such as application of compost in Japan. Therefore, it is crucial not only to promote such practices, but also to offer such treatments for adoption by as many countries as possible.
- Enhancing carbon sequestration into the agricultural soil not only contributes to mitigation of climate change, but also ensures crop productivity and bio-diversity conservation and promotes organic waste recycling.

September 30, 2008 – For preparation of the Chair's document for COP 14

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05.pdf, p. 41

- The Sectoral Approach compiles reduction potentials in each sector, using indicators such as energy efficiencies or GHG intensities, with due consideration to the marginal abatement costs and total abatement costs as a percentage of GDP. Sectors for analysis are, for example: iron and steel, cement, aluminum, power generation, other industries, residential /commercial , transportation (freight / passengers), **a**griculture, LULUCF and wastes.

March 7, 2008 – Views Regarding the Work Programme of the AWG-LCA
http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01a01.pdf, p. 5

- Agriculture is one of the possible sectors put forward for MRV in major emitting countries.

NEW ZEALAND

February 15, 2009 – Land Use, Land Use Change and Forestry
http://www.unfccc.int/resource/docs/2009/awg7/eng/misc05.pdf, p. 57

- New Zealand supports the continuation of voluntary Article 3.4 activities for post-2012.
- It is clear that there are many issues associated with Article 3.4 activities that make accounting for these activities as part of meeting national obligations very difficult. These issues vary according to the characteristics and accounting approach of each specific activity, but include data limitations and uncertainty, the high cost of measurement and monitoring, factoring out non-anthropogenic effects of climate change (such as drought and inter-annual variability) and managing the effects of historic management practices (legacy effects).
- Clearly, accounting for Article 3.4 activities is not appropriate in every party's circumstances. This is evidenced by the small number of parties electing 3.4 Activities in the first commitment period of the Kyoto Protocol.
- An additional barrier is the net-net method of accounting for Grazing land, Cropland and Revegetation**.** Net-net accounting creates some important and non-intuitive consequences. There are data problems (having to know the net GHG emissions in 1990). There can also be problems with "saturation" and ongoing liabilities even though GHG emissions may not be occurring. For example, if a country that was losing carbon in 1990 is still losing carbon in the commitment period, but at a lower rate, then it would get credits. On the other hand, if a country that was gaining carbon in 1990 is still gaining carbon in the commitment period, but at a lower rate, then it would get liabilities.
- Also, accounting for carbon loss due to erosion is problematic where it is difficult to distinguish between anthropogenic and natural erosion in a volcanic and tectonically active landscape.
- Finally, we need to consider whether accounting for these activities makes a material difference. The Fourth Assessment Report of the IPCC notes the large global technical potential for increasing storage of soil carbon in agricultural lands soils. However, it also notes that while agricultural lands generate very large CO_2 fluxes, both to and from the atmosphere, the net flux is small (estimated at 40 $MtCO_2$-eq, less than 1 per cent of global anthropogenic CO_2 emissions).
- With the above challenges in mind, and given that agricultural soils are not a significant net source of GHG emissions, New Zealand considers that it is unnecessary and unrealistic to expect compulsory accounting by parties at this point in time.
- New Zealand believes that we should consider the inclusion of agriculture soil carbon as an eligible activity under the CDM.
- New Zealand recognizes that methodologies will need to be developed at the project level to ensure verified removals/emissions of soil carbon (and other agriculture GHGs**)** below baselines, will need to be demonstrated, and as with A/R in the CDM non-permanence, will need to be addressed appropriately.
- New Zealand considers that the same approach suggested to address non-permanence in CDM A/R activities could be applied to CDM soil carbon activities– through the issuance of *l*CERs or *t*CERs or by non-Annex I Party voluntarily taking on responsibility for any reversal.

December 6, 2008 – Agriculture
http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p02.pdf, p. 40

- We need to recognize that although globally there is technical potential for mitigation in the agricultural sector, in many types of agricultural systems and source categories within the agricultural sector there are barriers to realising this in practice. One example is the specific agricultural system (whether a it is grazing livestock system or a housed system).
- Without question, we need global cooperation on R&D of technologies. However, one size does not fit all

and mitigation measures will need to be evaluated at various levels according to particular environmental, social and economic circumstances. In the broader context, countries need to look at their domestic settings to see if these create perverse incentives that tend to increase global GHG emissions from agriculture or impede the ability to reduce emissions.

- We should give due consideration to the need to produce food for a global population that is expected to continue to grow in the coming decades and the need for this food to be produced in the most efficient manner globally.
- We need to build on the convention–we need to be creative and innovative when considering how to address this important sector in a future climate change agreement. New Zealand remains hopeful that we can all share a vision on this.

December 6, 2008 – Submission by New Zealand in relation to item 1b of the Bali Action Plan

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05a02p02.pdf, p. 41

- New Zealand feels policies and measures to address climate change should be designed where possible to foster socio-economic and development co-benefits, for example with respect to agriculture
- New Zealand proposes that consideration be given to how policies and measures for mitigation under the convention can be designed to ensure that food production is not threatened. Consideration needs to be given to what messages can be sent from the AWG LCA process to actors outside of the convention, including international organizations, to encourage positive climate outcomes. For example, good outcomes from the WTO Doha Round can help reduce harmful effects on the climate, including through substantive outcomes in agriculture negotiations, and progress to reduce or eliminate tariffs on a range of environmental goods and services.

September 30, 2008 – Cooperation in agriculture technology R&D

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05.pdf, p. 47

- New Zealand considers that we need to focus more attention on cooperation on R&D of innovative technologies for the agricultural sector.
- New Zealand is committed to international cooperation on R&D of technologies in the livestock agricultural sector and believes we should be seeking other countries to actively cooperate in this effort. New Zealand established LEARN (http://www.livestockemissions.net) to facilitate collaborative R&D on non-CO_2 GHG emissions in livestock production systems and welcomes the active cooperation of other countries in this effort.
- Agricultural systems are highly differentiated with more variability between production systems than in any other sector. When developing mitigation strategies, we need to better understand the processes involved in the production of GHGs and the social and environmental context in which agricultural production occurs.
- In the context of food security concerns, New Zealand strongly believes that we need to develop mitigation practices that do not threaten food production and that enable economic development to proceed in a sustainable manner. In this regard, cooperation on R&D of win-win solutions will be critical.
- MRV – For mitigation in the agricultural sector, national GHG inventories can allow for mitigation opportunities to be more readily identified. New Zealand is willing and able to provide information and advice on the development of GHG inventories in the livestock agricultural sector. New Zealand launched the LEARN Fellowship Programme4 on World Environment Day in June, 2008 to provide capacity building opportunities for researchers from developing countries.
- Cooperation on technology and research – Soft technology (information and knowledge) is an important element of technology cooperation, particularly in sectors where significant knowledge gaps exist (for example, agriculture).

August 14, 2008 – REDD

http://www.unfccc.int/resource/docs/2008/awglca3/eng/misc04a01.pdf, p. 12

- Any REDD mechanism must provide developing countries with adequate financial resources to compensate them for the economic benefits they forgo by reducing deforestation (and a corresponding reduction in development, especially for agriculture, forestry and mining).

- Any country already at its socially optimal forest cover (that had been deforesting and has now stopped of its own accord) will not require compensation to retain that level of forest cover. The exception is the opportunity costs of forest retention will rise in the future, something that could readily happen with rising food prices, increasing benefits of forest conversion to agriculture. In such cases, some financial incentive may be required for countries to maintain forest cover even though they had recently had little or no deforestation.

NORWAY

February 9, 2009 – The fulfillment of the Bali Action Plan – Views from Norway on the development and transfer of technologies – Priority sectors for technology transfer

http://www.unfccc.int/files/kyoto_protocol/application/pdf/norway090209a.pdf, p.2

- Support for technology transfer should be practical and it should be directed to the sectors with the largest GHG emissions and/or potential for emissions reductions. This includes energy production, energy use, certain industries, transport, agriculture and deforestation–corresponding to the synthesis report on technology needs, published in 2006 (FCCC/SBSTA/2006/INF.1).

February 22, 2008 – Bali Action Plan

http://www.unfccc.int/resource/docs/2008/awglca1/eng/misc01.pdf, p. 27

- In addition, it is essential to consider mitigation within the LULUCF sector in relation to adaptation strategies. The LULUCF sector, and particularly the forest sector, is an important supplier of a variety of socio-economic and environmental services. Hence, sustainable management of forests, agriculture areas and other LULUCF sectors is essential to effectively mitigate, as well as adapt, to climate change

SWITZERLAND

February 16, 2009 – Submission on possible options for consideration relating to Land-Use, Land-use Change and Forestry

http://www.unfccc.int/resource/docs/2009/awg7/eng/misc05.pdf, p. 67

- To further promote the comprehensiveness of the next LULUCF regime, Switzerland wishes that Article 3.4 +of the Kyoto Protocol be implemented to make any accounting for all activities, as listed in 11 CP.7 and 16/CMP.1 paragraph 1 of the Annex, including any new activities, compulsory as of the second commitment period. This will also help to avoid risks of double-accounting and offers the advantage of treating in general Article 3.3 and 3.4 of the Kyoto Protocol in a more consistent and similar manner.

October 3, 2008 – Funding Scheme for Bali Action Plan: A Swiss proposal for global solidarity in financing adaptation

http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05.pdf, p. 97

- Furthermore, the Insurance Pillar will develop pilot projects for weather risk insurances (for example, for agriculture) at sub-regional levels. Also, a small amount of the budget can be used for developing the data basis required for such schemes (technical assistance)

August, 2008 – Funding Scheme for Bali Action Plan: A Swiss proposal for global solidarity in financing adaptation

http:/www./unfccc.int/resource/docs/2008/awglca3/eng/misc02a01.pdf, p. 44

- Insurance Pillar – This pillar aims at investing financial resources into safeguarding public goods, which in particular insures climate related risks, which are not covered by private insurance companies because premiums are not affordable for local insurance takers (low probability and high consequences risks). The focus is on vulnerable institutions, enterprises and segments of population in medium and low income countries. Insuring the rehabilitation of core infrastructure of an affected area, or compensation of lost assets of the most vulnerable groups, shall have priority. Furthermore, the Insurance Pillar will develop pilot projects for weather risk insurances (for example, for agriculture) at sub-regional levels. Also, a small amount

of the budget can be used for developing the data basis required for such schemes (technical assistance).

UNITED STATES OF AMERICA

September 30, 2008 – Adaptation – Ad Hoc Working Group on Long Term Cooperative Action
http://www.unfccc.int/resource/docs/2008/awglca4/eng/misc05.pdf, p. 110

- In terms of details for a framework, a portfolio of possible areas of action and international cooperation on adaptation should be included. There are several ways to structure such a framework. Possible organizational structures could be the following or some combination thereof: A Sectoral Approach – organizing by economic or resource sectors (for example, agriculture, coastal zones, forests and water) or a functional approach or by level and type of actor.