Climate Change Mitigation in Agriculture in Latin America and the Caribbean

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Agriculture emissions of greenhouse gases in Latin America and the Caribbean total 1.3 Pg CO_2-eq per year[1], nearly 20% of global agricultural emissions. These emissions increase at an annual rate of approximately 3.5%. Eight countries (Brazil, Argentina, Colombia, Mexico, Venezuela, Bolivia, Peru and Uruguay) produce 90% of agricultural emissions in the region. Just Brazil is responsible for 50% of those emissions.

Methane from enteric fermentation is the main source of sectoral greenhouse gases, representing approximately 40% of total. Nitrous oxide from soils (35%) and methane and nitrous oxide from burning of biomass (22%) are the other main sources. Livestock is the activity producing most greenhouse gases, estimated at nearly two thirds of sectoral emissions.

Expansion of agricultural land by conversion of forest land has been important for the rapid growth in crop and livestock production occurred in Latin America during the last decades. Emissions of greenhouse gases caused by deforestation would be in the order of 0.8-1.2 Pg CO_2-eq per year, mostly attributable to agriculture. Therefore, if emissions from deforestation are considered, agriculture emissions in the region would be in the range of 2.0-2.5 Pg CO_2-eq per year.

The rapid expansion in the area of cropland (nearly 130 million ha between 1970 and 2010, a rate of more than 3 million ha per year) suggests that important losses of carbon may be occurring (perhaps in the order of 0.1-0.3 Pg CO_2-eq per year) due to oxidation of soil organic matter and soil erosion. At the same time, increases in crop productivity and in the adoption of conservation tillage may be partly or completely offsetting those losses. There is a lack of reliable data on the dynamics of soil organic carbon in the region, and it is generally assumed that the balance is nearly zero or slightly negative.

The region has a large potential for contributing to global climate change mitigation effort through the adoption of improved agricultural practices. The IPCC Fourth Assessment Report estimated that the technical mitigation potential (i.e., without consideration of an economic value for carbon) of the region is 0.76 Pg CO_2-eq per year, equivalent to 14% of global potential in agriculture. No estimates were made for economic potentials (i.e. taking into account different carbon prices) at the regional level. At the global level, economic mitigation potentials of agriculture for carbon prices of up to 20, up to 50 and up to 100 US$/t$CO_2$ were estimated at 1.5-1.6, 2.5-2.7 and 4.0-4.3 Pg CO_2-eq per year, respectively. If the global ratios of economic to technical potentials were applicable to Latin America and the Caribbean, the agriculture mitigation potential in the region could be estimated at approximately 0.2, 0.4 and 0.6 Pg CO_2-eq per year for the abovementioned carbon price levels, respectively. Most of this potential (nearly 90%) would consist in carbon sequestration in soils. The reduction of emissions from deforestation was not included in these estimates.

Carbon sequestration in soils improves the quality of the soil and is highly relevant for sustainable development and for adaptation to climate change. It has been estimated that soils of the region have lost, due to past agricultural practices, an average of 30-40 Mg C.ha^{-1}. The amount of carbon that can be sequestered by soils is finite, and smaller that the historical loss. This implies that the mitigation potential given by storing carbon in soils would decline after a period of 30 to 50 years.

[1] 1 Pg is equal to 1 billion metric tonnes.

The mitigation potential estimated by the IPCC report for livestock was based on emissions per animal, and it did not assess the potential for reducing emissions by reducing the number of animals needed to achieve a certain volume of products. In very efficient livestock production systems, such as those prevailing in the most developed regions, emissions per animal are higher than in less efficient systems, but, if measured per unit product, they are actually smaller. In these countries, the prospects for reducing the animal population while keeping the same level of production are very limited, and the strategies for reducing emissions should focus on improvements in the digestion process through, eg., handling the rumen microflora, using dietary additives and animal breeding.

In the group of developing countries, on the other hand, the existing inefficiencies in the livestock production systems provide an opportunity for reducing the animal numbers required for reaching the current production levels. In this case, the focus for reducing emissions should be on increasing the production without increasing livestock population. For a similar level of production of meat and milk, the developed regions produce nearly 60 per cent less emissions than the group of developing countries. There is clearly a potential for dramatically reducing the emissions per unit product in the group of developing countries, including Latin America and the Caribbean.

There are important differences within Latin America and the Caribbean in the emissions of greenhouse gases per unit of livestock product. In the regions where most meat is produced from monogastric animals (Mexico, Central America and Pacific coast of South America), emissions are obviously lower than in those areas where production is based on ruminants (Mercosur area). However, if full life cycle emissions are considered, in some circumstances grazing ruminants may be superior to monogastric animals, due to losses in carbon stocks that may occur associated to production of feeds. There are opportunities in both monogastric and ruminant systems for reducing emissions per unit product through intensification of production.

Of particular relevance is the possibility of pasture improvement, through introduction of more productive species and/or legumes, fertilization and other means, on vast areas of land currently under extensive grazing. These extensive systems have generally low productivity due to various sources of inefficiencies, which would be minimized by pastures of improved productivity and quality. In addition, pasture improvement would result in carbon sequestration in soils, thus maximizing both climate change mitigation and co-benefits.

The possible strategies for the implementation of mitigation measures in Latin America and the Caribbean, as well as possible barriers to be faced will be discussed during the presentation.