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URUGUAY

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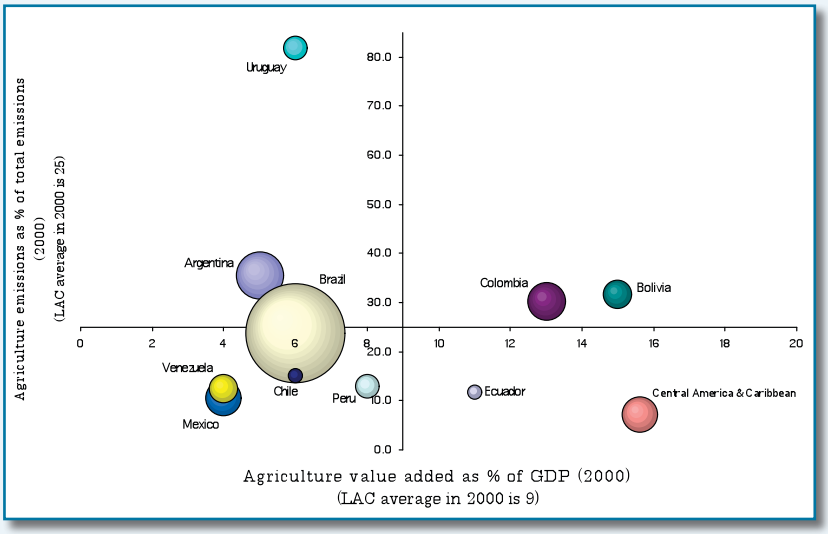
Country Note on Climate Change Aspects in Agriculture

This Country Note briefly summarizes information relevant to both climate change and agriculture in Uruguay, with focus on policy developments (including action plans and programs) and institutional make-up.

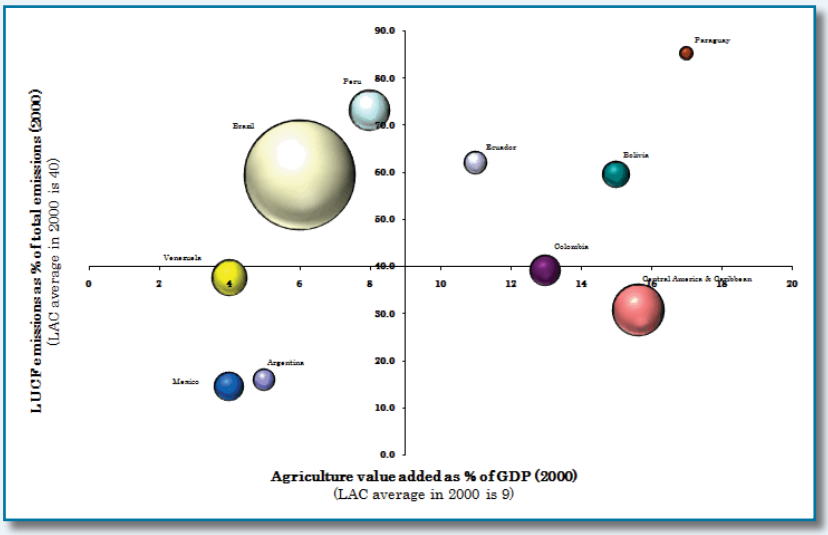
Contribution of agriculture (without LUCF) to the economy and to emissions in LAC countries

(size of bubble in $MTCO_2$ of LUCF emissions; axes cross at LAC average)



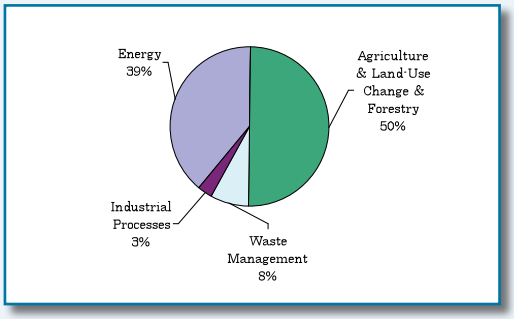
Contribution of agriculture to the economy and of LUCF to emissions in LAC countries

(size of bubble in $MTCO_2$ of LUCF emissions; axes cross at LAC average)



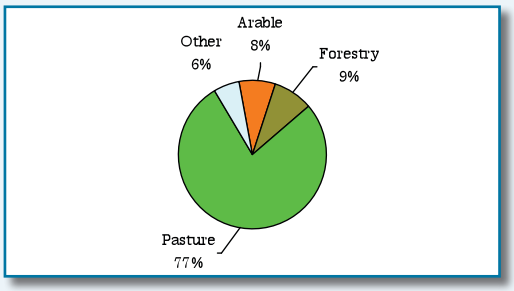
Note: In the first bubble graph, the total emissions for Uruguay do not account for the positive effects of LUCF (i.e. afforestation efforts). If they are considered, agriculture represents 222% of total emissions. Because of afforestation efforts in Uruguay and Chile, land use change and forestry (LUCF) is not a net contributor to emissions; hence the countries do not appear in the second bubble graph, but are considered in the calculation of the average in the vertical axis.

Percent of GHG emissions in CO_2 equivalent, by sector (2000)



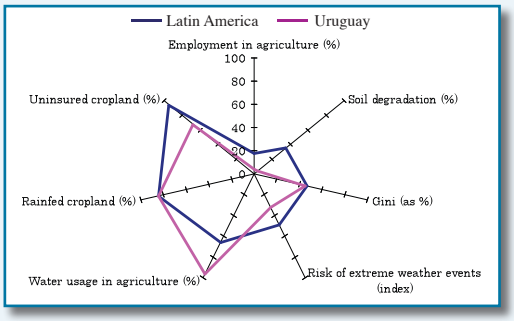
Source: World Resources Institute http://cait.wri.org

Land use (2005)



Source: World Development Indicators

Vulnerability Indicators



Note: Employment in agriculture (% of total employment)*; Rainfed cropland (% of total cropland)*; Gini*; Water usage in agriculture (% of total annual fresh water withdrawals)*; Uninsured cropland (% of total cultivated land area)**; Soil degradation (% of total land)***; Risk of extreme weather events (index; annual average 1997-2006)****

Sources: *World Development Indicators 2007, 2000-2007 average; **IADB, IICA, 2002/2003 figures; ***FAO AGL 2005[1]; ****Germanwatch

[1] http://www.fao.org/landandwater/agll/glasod/glasodmaps.jsp?country=URY&search=Display+map+%21

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Summary

Uruguay is one of the four developing countries in the World to have submitted two national communications to the United Nations Framework Convention on Climate Change (UNFCCC), indicating strong commitment by the government for addressing climate change across sectors. Agriculture (including land use change and forestry) is the largest contributor to GHG emissions in the country and it is also one of the most important sectors in the economy, representing 65% of the county's export sources. Significant steps have been made in reforestation and carbon sequestration in the country, reducing the net effect of the sector on total GHG emissions. Given that the emissions reduction potential of the sector is large, carbon trading opportunities have not yet been explored in the country. Reducing vulnerability to climate change and, in particular, to seasonal variability and variations in precipitation is of increasing importance in the agricultural sector (and, particular, for water management), coupled with more sustainable land management practices and production decisions.

Working definitions

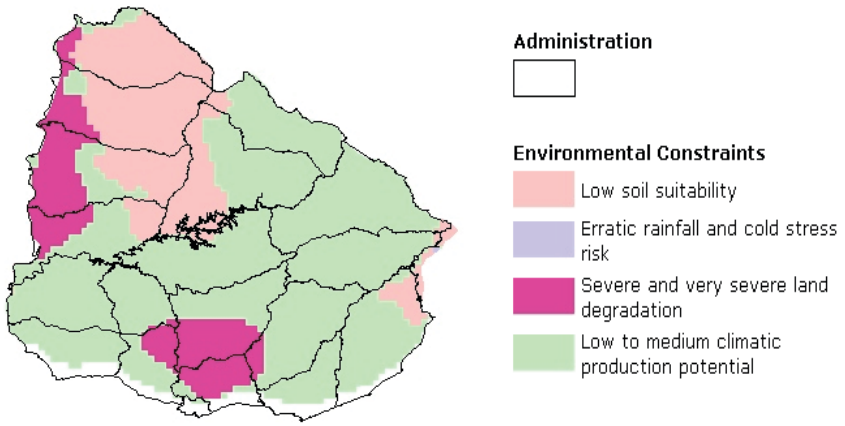
Agriculture is defined as a managed system of crops, livestock, soil management, forest resources (productive use, goods & services) and water resources (irrigation), including land use and land use change. **Climate change** encompasses both **mitigation** and adaptation activities within the agricultural sector. On the mitigation side, the focus is on the potential to reduce green house gas emissions by the different sub-sectors. On the **adaptation** side, the focus is on the potential to build resilience to climate and to increase the adaptive capacity through sustainable management of agriculture and other complementary factors (e.g. financial instruments). There is no specific **time frame** used in the country notes. An effort was made to collect the most recent available information on country indicators and policy matters.

Acknowledgments:
This *Country Note* was produced by a World Bank team of specialists (in agriculture, forestry, social development, risk and knowledge management) from the Latin America and the Caribbean region and other units of the World Bank. The team is very grateful for all the comments and suggestions received from the focal points on climate change and agriculture in many of the countries.

1. The Climate Context

The baseline map provides a visual characterization of Uruguay's agricultural potential given current environmental constraints and their regional distribution. Around 85% of Uruguay's land is used for agriculture (77% for pasture and 8% for cultivation), with forestry occupying 9% of the land in the country (WDI, 2005).

Baseline map: Current Major Environmental Constraints related to Agricultural Potential



Source: FAO **Note**: For more maps on Uruguay and agricultural resources, go to http://www.fao.org/countryprofiles/maps.asp?iso3=URY&lang=en

1.1. Country Projections

Based on climate scenarios developed by national researchers for the future 50 years[2], the following climatic changes with relevance to the agricultural sector can be expected for Uruguay:

a) **increases in temperature** – it is probable that the temperature will increase by 0.3-0.5°C by 2020, by 1-2.5°C by 2050 and by 3.4°C by 2100;

b) **increase in precipitation** – the amount of rainfall will increase and precipitations will reach 112mm/month (12% increase) by 2020 and 157 mm/month (57% increase) by 2100;

c) **rising sea levels** – the climate scenarios predict a rising sea level of 5-10cm by 2020, 12-20cm by 2050 and 40-65cm by 2100;

d) **increased frequency and intensity of extreme weather events** – rainfalls, intense winds, storms, intense hail storms will all increase in number and intensity. Fewer days with frost and less severe frosts will be registered which could lead to a higher incidence of pests and diseases[3].

In recent years (between 2000 and 2007), floods, wind storms and extreme temperatures have had the highest human and economic impact in Uruguay, with losses for the period 1997-2006 averaging at 0.17% of GDP – 0.13 million people (around 4% of the country's population) have been affected by floods (4 events) with the cost of the damages per event reaching US$45,000[4].

1.2. Agriculture related impacts

Uruguay has some 85% of the land suitable for agricultural production, one of the highest in the world[5]. Climate change scenarios for Uruguay using general circulation models (GCM) available during 1990 predict yield reductions of 14% and 25% in maize at mean temperature increases of 2°C and 4°C, respectively[6].

[2] http://www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=2374
[3] http://www.inia.org.uy/disciplinas/agroclima/publicaciones/ambiente/evi_cambio_clima2.pdf
[4] http://www.emdat.be/Database/CountryProfile/countryprofile.php
[5] http://www.oecd.org/dataoecd/42/7/32427988.pdf
[6] AIACC, M.I. Travasso, *Adaptation Measures for Maize and Soybean in Southeastern South America*, June 2006

According to a study on the future impact of climate change on agriculture in Uruguay[7], using General Circulation Models (GCMs) for the years 2020, 2060 and 2100, the land productivity measured in US dollars per hectare could fall to a level of 62% below the current level in the case of commercial farms and to 54% below the current level for small family owned farms by 2020 due to weather related events. Furthermore, this study determined that future temperature and precipitation increases will have a direct positive effect on land productivity for commercial and family owned farms only up to a certain level after which further temperature increases will generate an increasingly negative effect on land productivity, particularly during the summer season. Precipitation increases seem to produce a less pronounced effect than temperature increases.

Past studies in the agricultural sector have shown a reduction in crop yields due to temperature increases and a shortening of the growing period, as well as an increased pressure from plagues[8]. In addition, **INIA** has recently completed a vulnerability study on pasturelands and rice fields (financed by GEF and UNDP) with the final aim of delineating adaptation measures in these specific fields. The study is titled "Determining the impact of climate change on the production of natural pastures and rice in Uruguay".

2. The Policy Context

To date, Uruguay has submitted **two National Communications to the United Nations Framework Convention on Climate Change** (**UNFCCC**)[9], laying out the actions that the government has already taken and the analytical basis for its policy response to climate change and its commitment to take future actions within an official international framework. Most countries in Latin America have currently submitted only one National Communication, with the exception of Mexico (with 3), Uruguay (with 2) and Argentina (with 2).

- The **First National Communication**[10] (1997) established the National GHG Inventory for 1990 (INGEI 1990) and included an initial identification of mitigation and adaptation options to climate change for the agricultural and coastal sectors.
- The **Second National Communication**[11] (2004) updated the National GHG Inventory (INGEI 2000) for the period 1990, 1994, 1998 and 2000 (agriculture, land use change, waste and forestry emissions are included in this inventory) and included mitigation and adaptation options identified as part of the preparation of the **Program of General Measures on Mitigation and Adaptation to Climate Change** (**PMEGEMA**, Spanish acronym). It also includes a proposal regarding the creation of an entity responsible for the management of actions and response measures to climate change with the co-participation of the public and private sector. The Second National Communication used results from the IPCC TAR models, including HadCM3, ECHAM4, CSIRO, and GFDL, as well as regional climate models, including HadRM3, for future climate scenarios and assessments of vulnerability. So far, Uruguay is the only country in Latin America that used dynamic downscaling in its national communication[12].
- A **Third National Communication** is in the works and it defines clear strategic actions to address climate change. It is scheduled to come out in 2009.

Despite its high methane emissions from the agriculture sector, Uruguay has a small impact on the global climate in terms of total greenhouse gas emissions. Because of it small contribution to global emissions, Uruguay is not included in the **Climate Change Performance Index 2008**[13] of 56 countries responsible for more than 90 percent of global energy related CO_2.

2.1. National Climate Change Plans, Strategies and Programs

The **Program of General Measures on Mitigation and Adaptation to Climate Change**[14] (**PMEGEMA**, Spanish acronym), was prepared by the Climate Change Unit in February 2004 through the inter-sectoral and inter-disciplinary collaboration of various Working Groups comprising professionals from various ministries, private sector and NGOs. The Program proposes a set of mitigation and adaptation response measures to climate change to be applied to the most relevant sectors of the economy, including agriculture, forestry, water resources, fisheries and biodiversity.

[7] *Effects of climate change on the Uruguayan agriculture: implications for public policies*, Miguel Carriquiry, 2006
[8] http://www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=2374
[9] www.unfccc.int
[10] http://unfccc.int/resource/docs/natc/urunc1.pdf
[11] http://unfccc.int/resource/docs/natc/urync2.pdf
[12] http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200609_background_latin_american_wkshp.pdf
[13] http://www.germanwatch.org/klima/ccpi2008.pdf
[14] Unidad de Cambio Climatico, MVOTMA, 2004, *Program of General Mitigation and Adaptation Measures to Climate Change in Uruguay*

The **National Program for Voluntary Net GHG Emission Abatement** (**PRONAVEN**, Spanish acronym) is an important inter-institutional instrument aimed at improving understanding and consideration of climate change issues at national and sectoral levels, as well as achieving the actual implementation of mitigation and adaptation options detailed in the PMEGEMA.

The **Project of Self Assessment of the National Capacity to Meet International Environmental Obligations for Improved Global Environmental Management** (**AECN**, Spanish acronym) provides an assessment of the country's capacity to meet in an integrated manner the commitments delineated under international environmental conventions on climate change, biodiversity and to combat desertification and droughts. The document does not make direct reference to the agricultural sector.

2.2. Agricultural Sector Initiatives

3. The Institutional Context

The **Ministry of Housing, Territorial Planning and Environment**[15] (**MVOTMA**, Spanish acronym) oversees Uruguay's commitments to the UNFCCC and other climate change related actions.

The **National Meteorological Unit**[16] (**DNM**, Spanish acronym) provides a range of information on climate: a) monthly statistics for 12 stations (1961-1990 base period) for mean temperature, maximum absolute temperature, minimum absolute temperature, maximum mean temperature, minimum mean temperature, relative humidity, pressure, wind speed, monthly accumulated precipitation and rainy days; b) previous month maps (precipitation and temperature); c) Uruguay climatological characteristics.

3.1. Inter-Sectoral Coordination

The **Climate Change Unit**[17] (**UCC**, Spanish acronym), created in 1994 within the scope of the **National Environment Directorate**[18] (**DINAMA**, Spanish acronym), is the **Designated National Authority** (DNA) on climate change and in particular on Clean Development Mechanism (CDM) in Uruguay. Among the functions of the Climate Change Unit are i) the elaboration and update of the GHG emission inventory, ii) identification, elaboration and evaluation of response policies and measures to climate change, iii) distribution and promotion of technologies and practices for GHG emission reduction and prevention and iv) promotion and development of training, distribution and public awareness activities on climate change.

The **National Committee on Global Change** (**CNCG**, Spanish acronym) was created in May 1992 in response to the need for an adequate inter-institutional coordination and for the development of an integrated national response to global change issues. It has undertaken the responsibility of leading the efforts in climate change vulnerability and adaptation studies for Uruguay.

The **Ecoplata Program**[19] was founded in 1997 and represents a long term initiative aimed at strengthening institutions, the scientific community, managers and the public in general in all issues related to Integrated Coastal Zone Management in Uruguay.

In 2009, the **National Climate Change Response System**[20] was approved in Uruguay, under the jurisdiction of MVOTMA. It is aimed at coordinating and planning the necessary public and private actions and initiatives related to risk prevention, mitigation and adaptation to climate change. As part of this system, there will be a **Coordination Group** consisting of various lines of ministries, including the Ministry of Livestock, Agriculture and Fisheries. This Group will also be presided by MVOTMA.

Furthermore, the Presidency of the country also approved the creation of an **Advisory Commission**[21] comprising technical experts from academia, technical and research institutions named by the **Coordination Group**. Among these and apart from the experts from the Ministries, the Commission should include experts from the University of the Republic, the National Public Education Administration, the National Agency for Research and Innovation, the National Agricultural Research Institute, the National Development Corporation, the Antarctic Uruguayan Institute, NGOs and representatives from the private sector. The Commission can also include local experts that are part of the Intergovernmental Panel on

[15] www.mvotma.gub.uy
[16] http://www.meteorologia.com.uy/
[17] www.cambioclimatico.gub.uy
[18] www.dinama.gub.uy
[19] www.ecoplata.org
[20] http://www.ciu.com.uy/innovaportal/file/Decreto%20238_009.pdf?contentid=29833&version=1&filename=Decreto%20238_009.pdf
[21] http://www.ciu.com.uy/innovaportal/file/Decreto%20238_009.pdf?contentid=29833&version=1&filename=Decreto%20238_009.pdf

Climate Change (IPCC). The Coordination Group is in charge of creating Activity Plans of the System with the approval of the Commission.

3.2. Agricultural Sector Institutions

The **Ministry of Livestock, Agriculture and Fisheries**[22] (**MGAP**, Spanish acronym) is responsible for formulating policies related to the protection of the agricultural sector and fisheries. It counts with a **Forestry and Agricultural Climate Change Projects Unit**[23] (**UPACC**, Spanish acronym) whose mission is to identify, evaluate and promote opportunities for mitigation and adaptation projects in the agricultural sector, including forestry. It also initiates forestry and agricultural projects for Uruguay within the Clean Development Mechanism market.

The **National Institute for Agricultural Research**[24] (**INIA**, Spanish acronym) counts with an **Agro-climate and Information Systems Unit**[25] (**GRAS**, Spanish acronym) that has as main objective the promotion, coordination and execution of research projects and other activities related to climate change and its impact on agriculture and forestry. One of its more recent projects looks at the possible impacts of climate change on natural pastures and rice production in Uruguay as well as possible adaptation measures in this area.

Several institutions regulate water resources in Uruguay: the **MGAP** has among its functions the promotion and regulation of surface water use for agricultural purposes, the **Ministry of Transportation and Public Works**[26] (**MTOP**, Spanish acronym) grants water extraction permits and authorizes water regulation works and the **MVOTMA** is responsible for the execution of the national environmental policy, including water resources.

3.3. Fostering Capacity to Deal with Climate Change

Emissions inventories: Uruguay has made two updates to its **National GHG Inventory**, covering the period 1990-2000, with a third one being in the works, covering a period up to 2002. The inventory includes data on emissions from agriculture, land use change and forestry, providing disaggregated data by type of emission and type of agricultural resource.

Studies related to climate change and agriculture: **UNDP Uruguay** released a complementary material to the "Informe Mundial sobre Desarrollo Humano 2007-2008" in November 2007 titled "Uruguay: Climate change here and now"[27] which gives a general overview on the climate situation in Uruguay and the most vulnerable sectors of the economy. **AIACC**[28] has completed a study related to the agricultural sector, focusing on climate change impacts and vulnerability assessment in Uruguay (among other countries in the region): "Building capacity to assess the impact of climate change/variability and develop adaptive responses for the mixed crop/livestock production systems in the Argentinean and Uruguayan Pampas (LA27)"[29]. A policy note on the development of institutional capacity for agricultural adaptation was developed in 2008 by MGAP[30]. A regional study, financed by START-AIACC and USAID, was finalized in 2006 by the national research organizations of Argentina, Brazil and Uruguay: "Development and implementation of a system for impact assessment of the variability of weather and climate change in the agricultural production systems of Argentina, Brazil and Uruguay, and the identification of potential adaptive responses".

The World Bank published a flagship document for the entire region of Latin America and the Caribbean titled "Low carbon, High Growth: Latin American Responses to Climate Change"[31], encompassing information on climate change impacts in the region, on the potential contribution to mitigation efforts as well as a listing of future low carbon-high growth policies. Another World Bank initiative was the development of a methodology for designing participatory adaptation Action Plans in agriculture (through bottom up prioritization of response options), which was applied in Southwestern Uruguay, among other regions (Peru and Mexico).

[22] www.mgap.gub.uy
[23] http://www.mgap.gub.uy/UPACC/index.html
[24] www.inia.org.uy
[25] http://www.inia.org.uy/gras/
[26] www.mtop.gub.uy
[27] http://www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=2374
[28] http://www.aiaccproject.org/
[29] http://www.aiaccproject.org/aiacc_studies/aiacc_studies.html
[30] http://www.mgap.gub.uy/opypa/ANUARIOS/Anuario08/material/pdf/33.pdf
[31] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/02/27/000334955_20090227082022/Rendered/PDF/476040PUB0Low0101Official0Use0Only1.pdf

4. The Impact of Agriculture on Climate Change - Mitigation Measures

According to the **Second National Communication**, agriculture combined with land-use change and forestry account for 50.2% of GHG emissions in the country in 2000, a large portion of this being the emissions of methane from enteric fermentation from farm animals (91% of the total CH_4 emissions). Rice cultivation accounted for 4 to 6% of the total methane emission from the agricultural sector in 1998[32]. Furthermore, agriculture is responsible for 99% of the total nitrous oxide emissions (mostly from animal manure), 3.6% of total nitrogen oxides emissions (mostly from burning of agricultural waste) and 7% of total carbon monoxide emissions (mostly from burning of agricultural waste). Carbon dioxide emissions for the period 1990-1994 represented more than 80% of all gases emitted in Uruguay while as at present Uruguay registers carbon dioxide absorption.

Uruguay's carbon dioxide emissions per capita in 2004 stand at 1.6t CO_2/capita, compared to the Latin America region of 2.6t CO_2/ capita and the world at 4.5t CO_2/capita[33].

4.1. Action frameworks

4.1.1. Forestry and Land Use Change

The total forested area in Uruguay represents close to 8% of the total land area. Due to the country's good climatic conditions for growing of forests, there is great potential for future forestation. Since the adoption of the Forestry Law in 1987, Uruguay has undertaken a sustainable development of forested areas which lead to the planting of around 600,000 ha of new forest areas between 1990 and 2000. As a result of this, forest plantation areas increased from about 200km^2 in 1987 to over 6599km^2 in 2000 (33 times) and the cumulative net carbon sequestration during the period 1988-2000 was estimated at 27.4 Mt CO_2. The average annual deforestation rate stands at negative 5%, due to reforestation and afforestation activities in the country.

Two very important changes with positive results in carbon sequestration occurred in Uruguay in the forestry sector previous to the generation of the second national GHG inventory included in the Second National Communication. These are:

- Introduction of no-tillage practices in areas with annual crops (15% of the total area with annual crops in 2000)
- Increase of areas with artificial grasslands during the period 1980-2000

These two practices led to an annual CO_2 absorption of 3,300 kton. Furthermore, the total national emissions of CO_2 for the period 1990-2000 decreased by 28% as a result of the CO_2 absorption generated by tree biomass.

Uruguayan forestry policy has also included prohibition of harvesting of native forests. This resulted in an increase in native forest area from 667,000 ha in 1970 to 810,000 ha in 2004[34].

A study done by the OECD on climate change in Uruguay and the agriculture and forestry sector considered two scenarios, one being the termination of the current afforestation and the other one being the case of carbon finance induced investment flow into new plantations. This determined that plantation forests would have a carbon sequestration capacity of 207 and 280 Mt CO_2 respectively for the period 1990-2030. This would mean the equivalent to offsetting 17% and 23% respectively of total GHG emissions in Uruguay during the same period[35].

The **PMGEMA** identified as a mitigation measure for this sector the plantation of trees for carbon sequestration to the extent of achieving duplication of the present forested area in the next 20 years. Additional to this, other mitigation measures identified in this sector are:

- Revision and improvement of handling and harvesting practices
- Revision and eventual adjustment of present laws
- Promotion of forests and protection "curtains" plantations in other sub-sectors (farming) and in urban areas

[32] http://www.mgap.gub.uy/UPACC/archivos/Diagnostico_Información_Nacional%20MDL.pdf
[33] http://hdrstats.undp.org/countries/country_fact_sheets/cty_fs_URY.html
[34] Agrawala et. al., Environment Directorate, Environment Policy Committee, Working Party on Global and Structural Policies, OECD (2004)
[35] http://www.oecd.org/dataoecd/42/7/32427988.pdf

The changes in land use during the last 20 years resulted in net carbon sequestration rates of 6.6 $MtCO_2$/year. During the same period, most crop yields have increased by 30-80% and sunflower and maize by 100-200%. Some mitigation options that can be applied to this sector would include increasing the no till area and the area under improved pasture which would lead to carbon sequestration in the soil. To this end, a study was conducted in 2001 considering a 2020 scenario where the Uruguayan annual 2000 crop area of 1.06 million ha would double[36]. Among the results are:

- Crop productivity would increase leading to a carbon sequestration capacity of 131,000 tC/year
- Increasing the area under no till would lead to a carbon sequestration of 264,000 tC/year
- Increasing the area under improved pastures would result in a carbon sequestration of 1.6 MtC/year, the largest increase.

4.1.2. Livestock

Of the total methane (CH_4) emissions for the year 2000, more than 92% were generated from enteric fermentation from livestock. Methane emissions differ by animal type as well. Cattle accounts for 88% of the total and sheep for 11%[37]. Regarding N_2O emissions, more than 66% of these resulted from grazing animal manure, while as part of the rest were from indirect N_2O emissions generated by volatilization of this manure.

One of the mitigation measures identified in the PMEGEMA with the final aim of reducing CH_4 emissions is to improve the animal diet by increasing the sown pastureland where animals graze (estimated abatement of 24 $MtCO_2e$ for the future 20 years.

A recent study conducted by the World Bank considers the effects of a 2020 scenario of doubling of improved pastureland as a result of an increase in the livestock production sector caused by future growth in world meat demand. This estimated increase in pastureland would result in net carbon sequestration rates of 5.02 $MtCO_2$/year additional to past estimates of 6.6 $MtCO_2$/year for the period 1980-2000. Improved pasture would lead to a better diet which in turn would result in a 70% increase in livestock production. A better diet also leads to less methane emissions from the new herds, so there would be a double positive effect[38].

4.2. Carbon Trading and Agriculture

Under the Clean Development Mechanism (CDM), developed (also referred to as Annex I) countries can implement project activities that reduce emissions in developing (non-Annex I) countries. Almost a third (29.23%) of all registered CDM projects are in Latin America (LAC). Though the CDM is expected to generate investment in developing countries, especially from the private sector, and promote the transfer of environmentally-friendly technologies in that direction, the global share of agricultural sector projects (including afforestation and reforestation) is very small (5.71% of total registered projects globally as of December 2009)[39] and the potential is country-specific. Latin America, as a region, currently holds the largest share of registered agricultural projects globally, 61% (75 projects).

As of December 2009, the country does not have any registered CDM projects in agriculture, nor under the "afforestation and reforestation" category[40]. This is a shortcoming given the impact of the sector on GHG emissions in the country.

The World Bank has mobilized a fund to demonstrate projects that sequester or conserve carbon in forest and agro-ecosystems. The BioCarbon Fund, a public/private initiative administered by the World Bank, aims to deliver cost-effective emission reductions, while promoting biodiversity conservation and poverty alleviation. In principle, the BioCarbon Fund can consider purchasing carbon from a variety of land use and forestry projects; its current portfolio includes Afforestation and Reforestation, Reducing Emissions from Deforestation and Degradation and the Fund is currently exploring innovative approaches to account for agricultural soil carbon.

[36] http://www.oecd.org/dataoecd/42/7/32427988.pdf
[37] http://unfccc.int/resource/docs/natc/urync2.pdf
[38] http://www.oecd.org/dataoecd/42/7/32427988.pdf
[39] http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByScopePieChart.html
[40] http://cdm.unfccc.int/Projects/projsearch.html

5. Impact of Climate Change on Agriculture - Adaptation Measures

Among the general adaptation options and determinants of adaptive capacity for the agricultural sector in Uruguay are: a) Water resources: incorporate climate change variables in hydraulic works, formulate and propose approval of effective national water policy enabling integration of climate change variables; b) Agriculture: promote sustainable soil management, including no-tillage techniques and other measures directed at soil conservation and improved practices; c) Coastal resources: promote management of coastal area in an integrated manner and establishment of a systematic monitoring system for surge and beach profiles[41].

5.1. Action Frameworks

5.1.1. Land Management

Uruguayan soils are vulnerable to water erosion when a wheat crop is cultivated. According to a case study on Uruguay, a severe erosion scenario on land under wheat cultivation estimates that most land units would lose 25 to 50 cm topsoil over 20 years[42]. In 2005, 4.3% of the total arable area was affected by soil degradation to various degrees: 1.03% light, 0.21% moderate and 3.07% severe degradation[43].

One of the policies that Uruguay has undertaken with future climate change benefits was the passing in 1982 of the Soil Management Law that encouraged the use of soil conservation techniques which resulted in the sequestration of 1.8 million ton carbon per year over the last 20 years[44].

The PMEGEMA defines the following adaptation measures in the land use sector:

- Improving the seed bank adapted to probable future climate scenarios: this measure refers to the availability at the national level of seeds whose genetic material allows the preservation or increase of current crop yields when faced with future temperature increases combined with excess and deficit of humidity
  - development of long cycle wheat varieties and barley varieties responsive to photoperiod
  - development of wheat and barley varieties resistant to excess water in soil
  - development of wheat and barley varieties resistant to diseases under future scenarios with high humidity and temperature
  - selection of rice varieties more resistant to high temperature rice blooming
  - seed sodding on natural pastures could reduce negative climate change impacts on grasslands thus reducing the bad effects of water deficiency and rising temperatures on pasture dry matter yields
- Promoting the sustainable management of soil, including no-tillage and other conservation methods and better soil practices: these measures refers to the creation of a working group to oversee the sustainable use of soils with the final aim of improving its qualities and productivity at the same time avoiding its erosion and degradation
- Design and execution of training activities about soil conservation and no-tillage practices
- Facilitation of inter-institutional coordination between research institutions, producer associations and NGOs in this field
- Reinforcement of current soil and water conservation laws
- Monitoring of pests and diseases
- Efficiency in fertilizer use and direct sowing (zero tilling) as this results in less soil erosion

The **Interministerial Commission on Biofuels**[45] was created in 2005 to advise authorities on a future policy framework for the production and use of biofuels. Given Uruguay's high dependency on imported oil and the fact that it is an agricultural country with great potential for the development of agroenergy, a law passed in 2002[46] declared it in the national interest to produce alternative fuels from animal or plant feedstocks as substitutes for petroleum. There are already existing plants producing biofuels (one located in Paysandu producing biodiesel from sunflower oil and two other located in Montevideo using cooking grease and animal fat) and other initiatives underway (one plant in Bella Unión zone that processes sugar and ethanol) as well as future plans for a distillery to produce alcohol with the potential to replace up to 5% of the gasoline consumed in the country by 2010[47].

[41] http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200609_background_latin_american_wkshp.pdf
[42] Terzaghi, A. 1996. *Soil Management and Improvement of soil physical characteristics related to erosion in Uruguay*. PhD Thesis. Wageningen
[43] http://www.fao.org/landandwater/agll/glasod/glasodmaps.jsp?country=URY&search=Display+map+%21National
[44] http://www.oecd.org/dataoecd/42/7/32427988.pdf
[45] http://www.iica.int/Esp/organizacion/LTGC/agroenergia/Documentos%20Agroenerga%20y%20Biocombustibles/Agroenergy%20and%20Biofuels%20Atlas%20of%20the%20Americas.pdf
[46] www.dnetn.gub.uy/documentos/archivos/683_1.pdf
[47] http://www.iica.int/Esp/organizacion/LTGC/agroenergia/Documentos%20Agroenerga%20y%20Biocombustibles/Agroenergy%20and%20Biofuels%20Atlas%20of%20the%20Americas.pdf

Regarding sugarcane and its use for the production of biofuels, the 2005 yield showed an increase of 15% from the previous year (5541 kg/ha) and sugar production for 2005 also showed an increase of 18.6% from the previous year thanks to better agricultural yields. There is further research underway by **INIA** on the growing of sweet sorghum which could be used to produce bioethanol. Ethanol is being produced from other feedstocks in Uruguay such as grains, sweet sorghum, sugar beets, hemp and corn. Corn presented better yields than sorghum in 2005 according to FAO.

5.1.2. Water Use

The following adaptation measures were identified in the PMEGEMA for coastal and water resources:

Coastal resources: the coastal area is the most vulnerable to climate change related events due to a possible increase in the sea level leading to flooding and salinization. The most vulnerable coastal areas identified are the departments of Maldonado, Montevideo and a large part of the departments of Canelones and Rochas. Adaptation measures include:

- Promoting an integrated management of the coastal area, including the establishment of coastal zones and coastal development, the conservation and restoration of coastal ecosystems, the inter-institutional coordination and integration of science and management
- Establishing a coastal monitoring system and beach profiles: it implies the creation of a technical group whose function is to monitor the beach profiles
- Studying of degraded and vulnerable coastal areas and identifying measures to stop or revert the future degradation process
- Protection and reinforcement of littoral dunes
- Development of contingency plans against flooding for more vulnerable zones

Water resources:

- Incorporating the variable "climate change" in future waterworks projects
- Devising environmental educations programs with an informative purpose about the potential impacts of climate change on water resources
- Formulating and proposing for approval a National Water Policy with the variable "climate change" incorporated in it
- Promoting an integrated management of water resources
- Facilitating inter-institutional coordination for the development of actions and plans related to an integrated management of water resources

5.1.3. Fisheries

Based on future climate change scenarios, the fishery sector will suffer a direct economic impact through an alteration in the composition of fishery resources, a reduction in catches and an increase mortality rate in some basin areas. The following adaptation measures were identified in the PMEGEMA with regards to fisheries:

- Monitoring of oceanographic variables, breeding areas, distribution, catching ability and abundance of fishery resources and verification of algal bloom episodes
- Mariculture of affected species: sowing of the lagoons with post shrimp larvae and before harvest in order to compensate the natural reduction of larvae contribution
- Greater pollution control: implementing measures to avoid the dumping of residual waters in the coastal areas

5.2. Social Aspects and Interventions

Many people in rural areas derive their livelihood from agriculture and can be disproportionately affected by changes in climate. Uruguay has the lowest rate of inequality in the LAC region with a GINI coefficient of 0.45, with about 6% of the population living on less than $2 a day[48]. According to Latinobarometro[49], Uruguay has one of the highest rates of social cohesion in the region of 76%, as measured by the number of citizens who perceive a high degree of solidarity in the country. Transparency International ranks Uruguay as the country with the second lowest perception of corruption in the LAC region after Chile[50].

[48] http://hdrstats.undp.org/countries/data_sheets/cty_ds_URY.html
[49] http://www.latinobarometro.org/
[50] http://www.farming-uruguay.com/countryprofile.html

Despite the importance of agriculture in the economy, a very small percentage of the population is employed in agriculture, only 4.6% in 2006[51]. The reason for this is the steady decline of family operated farms and the growing proportion of larger commercial farms. Social indicators for the rural population in Uruguay are worse than for the people who live in urban areas. In 2002, only 85% of rural residents had access to adequate sanitation facilities (compared to 95% in urban areas) and 93% had access to an adequate source of potable water (compared to 98% in urban areas).

5.3. Insurance Instruments

Uruguay has a long history of agricultural insurance. Since 1993, only three companies are present in the market (**MAPFRE**, **SUCRO** and **BSE**). The main agricultural policies cover single risks like hail, fire, wind and frost. The government offers a 35% premium subsidy for small farmers. Aside from insurance policies, producers also have access to mutual insurance funds or co-insurance. These are arrangements whereas producers agree to share the costs in the event of hail events, usually within the context of a cooperative. The government also has an emergency policy in place to cover extraordinary losses in the agricultural sector. During 1998-2002 the Ministry of Agriculture spent approximately US$10 million for indemnities of mainly small farmers who suffered large losses due to hail and drought, in particular in the year 2002. According to an IADB-financed study on agricultural insurance in Uruguay for the year 2004 ("Programa de Manejo del Riesgo Agropecuario en Uruguay"), the three insurance companies covered 160,000 ha of land which represented 20.3% of the total cultivated area. There were five risks covered: fire, excess rain, frost, wind and hail. Fifty different crops were covered.

The government of Uruguay has 5 main instruments (programs) in place that directly support the agriculture sector in managing climate risks. All of these instruments require public sector budgetary resources to operate:

a) **Banco de Seguros del Estado**[52] (**BSE**, Spanish acronym): public insurance company which offers subsidies insurance policies as per the agreement signed with the Ministry of Agriculture (MGAP).

b) **Ministry of Agriculture** (**MGAP**): it administers the premium subsidy for agricultural insurances channeled through BSE as well as the fund for reconstruction of small producers.

c) **Vineyard Integral Protection Fund**: it is managed by the **National Viticulture Institute** (**INAVI**, Spanish acronym) and producers get paid only when damages exceed 30% of production.

d) **Fund for the Reconstruction of Small Producers**: it was established to provide catastrophic coverage to small farmers affected by a large climate event in 2002 (hail and drought). This fund provided immediate indemnities to small farmers but also established a contingency fund and a premium subsidy for agricultural insurance for small farmers.

e) **Climate Contingency Emergency Fund**: it has been created to cover excess losses for producers that already have insurance. Since insurance contracts usually have a stop loss, this public fund covers the rest of the value of production lost, which is not covered by the insurance policy.

A number of government entities and donors are involved in initiatives related to climate risk management in agriculture:

- **MGAP**: They administer public funds subsidizing agriculture insurance and financing of climate events.
- **INAVI**: Public institute that administers the funds against climate events to vineyards.
- **BSE**: Public sector insurance company which receives public subsidies for selling agricultural insurance.
- **Asociación de Cultivadores de Arroz**[53] (**ACA**, Spanish acronym): has a co-insurance fund where they provide coverage to their members.
- **The Inter-American Development Bank** (IADB): has undertaken a market study with ENESA on the agricultural insurance market and the potential for developing such instruments.
- **The World Bank**: The Bank recently received a request for undertaking an analysis of the agriculture insurance market in Uruguay

[51] http://data.un.org/CountryProfile.aspx?crName=Uruguay#Social
[52] www.bse.com.uy
[53] www.aca.com.uy

About *Country Notes on Climate Change Aspects in Agriculture...*

The ***Country Notes*** are a series of country briefs on climate change and agriculture for 19 countries in Latin America and the Caribbean region, with focus on policy developments (action plans and programs), institutional make-up, specific adaptation and mitigation strategies, as well as social aspects and insurance mechanisms to address risk in the sector. The ***Country Notes*** provide a snapshot of key vulnerability indicators and establish a baseline of knowledge on climate change and agriculture in each country. The ***Country Notes*** are the beginning of a process of information gathering on climate change and agriculture. The ***Country Notes*** are "live" documents and are periodically updated.

LATIN AMERICA AND THE CARIBBEAN REGION

AGRICULTURE AND RURAL DEVELOPMENT TEAM

Feedback

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