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

**Vulnerability Indicators**

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<th>Indicator</th>
<th>Latin America</th>
<th>Venezuela</th>
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<td>Employment in agriculture (%)</td>
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<td>Non-insured cropland (%)</td>
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<td>Rainfed cropland (%)</td>
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<td>Soil degradation (%)</td>
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<td>Gini (as %)</td>
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<td>Risk of extreme weather events (index)</td>
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<td>Water usage in agriculture (%)</td>
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**Percent of GHG emissions in CO₂ equivalent, by sector (2000)**

- Agriculture: 13%
- Land Use Change & Forestry: 38%
- Energy: 45%
- Waste Management: 2%
- Industrial Processes: 2%
- Other: 21%
- Forestry: 54%
- Pasture: 22%
- Arable: 3%
- Other: 21%

Source: World Resources Institute [http://cait.wri.org](http://cait.wri.org)

**Land use (2005)**

- Arable: 3%
- Other: 21%
- Forestry: 54%
- Pasture: 22%

Source: World Development Indicators

**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 greenhouse 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.

**Feedback**

For comments and/or suggestions, please contact Svetlana Edmeades (LCSAR) at sedmeades@worldbank.org
Summary
This note summarizes information on climate change aspects in agriculture in Venezuela, with a focus on policy developments (including action plans and programs) and institutional make-up. Agriculture has a relatively small contribution to total GHG emissions and the emission reduction potential in the sector is small, though carbon trading opportunities can be pursued. Agriculture is highly vulnerable to weather extremes, especially to floods, due to the fact that more than 94% of the agriculture is rainfed in Venezuela. Reducing vulnerability to climate change is of utmost importance in the agricultural sector in Venezuela, considering the role the sector plays in food security and livelihoods of rural populations.

1. The Climate Context

**Baseline map:** Current Major Environmental Constraints related to Agricultural Potential

![Baseline map](http://www.ceniap.gov.ve/pbd/RevistasCientificas/Agronomia%20Tropical/at5801/pdf/ovalles_f.pdf)

**Source:** FAO Note: For more maps on Venezuela and agricultural resources, go to [http://www.fao.org/countryprofiles/Maps/VEN/04/6e/index.html](http://www.fao.org/countryprofiles/Maps/VEN/04/6e/index.html)

1.1. Country Projections

According to the First National Communication and to general circulation models, the following climatic changes with relevance for the agricultural sector are to be expected in the future:

a) **increases in temperature** it is probable that temperatures will increase by between 1 and 2°C by 2060 according to an intermediate scenario; this would have a negative impact on the biological functions of plants (photosynthesis) and on water movements and nutrients in the soil.

b) **decreases in precipitations** precipitation decreases will be noticed particularly in the southern state of Bolivar, where, according to an intermediate scenario, there will be a 20% precipitation reduction by 2060 as compared to the base year of 1990 (equivalent to around 800mm less rain annually). A similar situation will be noticed in the area north of the Orinoco River. Other models show intense precipitation decrease to the Andes and the Plains of the Piedmont (Piedmonte Llanero).

c) **increase of areas with dry climate** it is probable that the areas with dry climate, in general more prone to desertification, will increase from 39% of the total territory of Venezuela to 47% by 2060. This could have a strong negative impact for the agricultural sector.

The Global Climate Risk Index, constructed for a period between 1997 and 2006 and covering both human and economic impact, ranks Venezuela 8th in the world, underscoring the country’s very high vulnerability to weather related events. In recent years (between 1999 and 2005), floods have had the highest human and economic impact in Venezuela – 675,180 people have been affected by floods (9 events) with the cost of damages reaching US$ 3.2 billion. The floods of 1999 alone lead to the killing of 30,000 people, due to landslides in areas of illegal human settlements.

1.2. Agriculture-Related Impacts

According to the Undersecretariat for Agriculture, the floods of 1999 lead to the destruction of up to 60% of harvest in some areas, while 35,000 hectares of cropland remained flooded. It was estimated that up to 3,600 rural families have been affected by these floods, with 15% of the total population in shelters being composed of children under 5 years of age and the rest of 85% of women, largely.

2. The Policy Context

Like most countries in the region, Venezuela has submitted only one National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), 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. The Communication established the First National GHG Inventory with 1999 as its base year, it includes sectoral measures and programs that can be used for the future implementation of the national climate change strategy and includes vulnerability studies as well as mitigation opportunities of GHG emissions by sector. Work is being done toward the Second National Communication that is scheduled to be completed by 2009.

Venezuela is the 4th largest emitter of CO2 emissions per capita in Latin America, after Mexico, Brazil and Argentina.

2.1. National Climate Change Plans, Strategies and Programs

2.2. Agricultural Sector Initiatives

3. The Institutional Context

The Ministry of Environment (MINAMB, Spanish acronym) is the national authority on the environment in the country and it oversees Venezuela’s commitments to UNFCCC and other climate change related actions. To date, Venezuela does not count with a Designated National Authority (DNA) on climate change and, in particular, on Clean Development Mechanism (CDM).

3.1. Inter-Sectoral Coordination

3.2. Agricultural Sector Institutions

The Ministry of Agriculture and Land (MPPAT, Spanish acronym) is in charge of the formulation and coordination of the agricultural policy of the country and of the sustainable rural development.

The General Directorate of Watersheds (DGCH, Spanish acronym) maintains the largest climatic, hydrometric and hydro-geological network in the country and is also the technical focal point of the country to the United Nations Framework Convention for the Fight against Desertification and Drought.

The General Directorate for Forests (DGB, Spanish acronym), assigned to the Ministry of Environment, is in charge of the national forest policy of the country. It is a very important institution for future Clean Development Mechanism projects in the forestry sector.
3.3. Fostering Capacity to Deal with Climate Change

- **Emissions inventory**: To date, Venezuela counts with one National GHG Inventory with 1999 as its base years. The inventory includes information on emissions from agriculture, including land-use change and forestry, providing disaggregated information by type of emission and type of agricultural resource.
- **Studies related to climate change**: a series of vulnerability studies have been prepared in preparation for the First National Communication for the water sector and coastal areas, as well as a study on the climatic variability observed in Venezuela in the 20th century, and a study on vulnerability and current adaptation capacity of the country to climatic variability.

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

Agriculture is responsible for 96.1% of nitrous oxide emissions in the country and 28.3% of methane (CH4) emissions, the majority of these resulting from the enteric fermentation process from farm animals. The land-use change and forestry are responsible for a net absorption of CO2 due to the natural regeneration of vegetation on abandoned land.

4.1. Action Frameworks

4.1.1. Forestry and Land Use Change

Approximately 54% of the total territory of Venezuela is covered by forests, according to the First National Communication. Almost 70% of these are situated south of the Orinoco River, in the Amazon. The land-use change and forestry sector in Venezuela is responsible for the emission of 35,780Gg CO2 (31% of total) in 1999. However, the change of biomass in forests and the regeneration of vegetation on abandoned cropland lead to the absorption of 50,140Gg CO2, resulting in a net absorption by the sector of 14,360Gg CO2.

The average annual deforestation rate in Venezuela for the period 1990-2000 is 0.4% (218,000 hectares/year)^12. Deforestation activities occur mostly illegally and in areas that are not protected. For the period 2000-2005 it is estimated that deforestation activities have decreased due to improved legislation and increased controls. This is reflected in an average deforestation rate of between 0.2% and 0.3% for this period. Most deforestation activities for this period are due to forest fires (affecting a total of 246,241 hectares of forests for the period 2000-2004) and legal agricultural activities as well as illegal wood extraction^13.

The First National Communication identifies the development of new forest plantations as a possible mitigation measure for this sector. The total area dedicated to forest plantations in Venezuela was established by law in 1992 as covering 9.1 million hectares with a potential capturing capacity of carbon of 505.45 million tons over 15-20 years, assuming a carbon capturing capacity of forests of 55 tons carbon/hectare.

**Mision Arbol**^14 is an initiative of the Government created in Jun 2006 aimed at increasing reforestation activities in the country. For the period 2005-2007, around 26,000 hectares of land have been reforested in the entire country under this initiative and the goal for 2007 was to organize 1,900 conservationist committees of volunteers, to create 1,300 greenhouses and to reforest 4,000 hectares with 4 million trees.

4.1.2. Livestock

Livestock is responsible for 27% of total methane emissions in Venezuela in 1999. Of these, 95.8% are attributed to emissions resulting from the enteric fermentation process from cattle, mainly from bovines (92.3% of total) and the rest of 4.2% to handling of farm manure.
4.2. Carbon Trading and Agriculture

5. Impact of Climate Change on Agriculture - Adaptation Measures

Past studies\textsuperscript{15} realized in the agricultural sector have concluded that permanent crops will suffer the greatest impact as result of precipitation reductions and temperature increases, as well as pastures with direct negative impact on livestock. This requires an increase of the adaptive capacity of the production systems in the areas mostly affected by climate change.

5.1. Action Frameworks

The First National Communication identified several possible adaptation measures necessary to be introduced in the future, ranging from an integrated management of watersheds and creation of a “water policy” to development of crop varieties resistant to extreme weather conditions such as drought or high temperatures and development of early warning and prevention systems.

5.1.1. Land Management

According to the First National GHG Inventory for 1999, agricultural land is responsible for 96.5\% of nitrous oxide emissions from the agricultural sector, mainly from direct emissions due to the application of nitrogen based fertilizers, the added manure or from legumes and decomposing of agricultural residues.

According to national statistics on crop yields for future production, the following yield decreases are to be expected by 2020 due to decreased precipitations: 4.4\% decrease for corn, 13.4\% decrease for \textit{caraota} and 4.4\% decrease for rice. The strongest yield decreases will be noticed in the Western (the basins of Lake Maracaibo and Andes), North-Center-Western part, as well as North-east and Eastern part of the countries, all with increased water deficits of various degrees\textsuperscript{16}.

In terms of soil suitability for agriculture, 32\% of national soil has problems of fertility or nutrition for cultivated plants, 18\% has drainage limitations, 4\% has water limitations and aridity and only 2\% of the national territory has high quality lands. This could be increased to 4\% if irrigation projects were expanded.

The First National Communication identified the following adaptation needs in this sector: i) introduction of crop varieties resistant to intense heat given the future expected temperature increases in the country, to drought and soil acidity and salinity; ii) implementation of no-till agriculture; iii) introduction of organic agriculture; iv) adjustment of the agricultural calendar; v) introduction of good agricultural practices.

5.1.2. Water Use

In Venezuela, 94.3\% of agriculture is rainfed and only 5.7\% is under irrigation, making this sector very vulnerable to climate variations. The main irrigated crops are rice, cereal, sugarcane, vegetables and fruit. Of the total area under irrigation, 80\% is done by surface irrigation, 16\% with sprinklers and 4\% using local irrigation.

The First National Communication identified the following adaptation measures needed in the water sector: i) the creation of a Water Policy; ii) introduction of incentives or fines, by case, to guarantee the proper use of water; iii) zoning of areas protected for being sources of water; iv) organization of rural communities to achieve an improved water management.

The National Action Program of the Convention for the Fight against Desertification and Mitigation of Drought\textsuperscript{17} defines a set of objectives and actions where the climate change component could be easily introduced.

The \textit{Program for Soil and Water Conservation} facilitates the participation and environmental education of rural communities in the country, through the implementation of mechanical and cultural practices favoring the conservation of the environment. The educational process includes the adequate handling of chemicals used in agriculture, contributing to an organic agriculture.
5.3. Social Aspects

5.4. Coping with Risk

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**Relevant Reference Material:**

1. General information on the linkages between climate change and agriculture can be found at [http://en.wikipedia.org/wiki/Climate_change_and_agriculture](http://en.wikipedia.org/wiki/Climate_change_and_agriculture), including the references and links provided.


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7. [http://unfccc.int/resource/docs/natc/vennc01.pdf](http://unfccc.int/resource/docs/natc/vennc01.pdf)

8. [www.unfccc.int](http://www.unfccc.int)

9. [www.minamb.gob.ve](http://www.minamb.gob.ve)

10. [www.mat.gob.ve](http://www.mat.gob.ve)


12. World Development Indicators, 2005


16. [http://unfccc.int/resource/docs/natc/vennc01.pdf](http://unfccc.int/resource/docs/natc/vennc01.pdf)