This Country Note briefly summarizes information relevant to both climate change and agriculture in Costa Rica, 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>Costa Rica</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>Water usage in agriculture (%)</td>
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<td>Risk of extreme weather events (index)</td>
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<td>Soil degradation (%)</td>
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<td>Gini (as %)</td>
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**Note:** Employment in agriculture (% of total employment)*; Non-irrigated cropland (% of total cropland)**; 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; ****Germanwatch

**Percent of GHG emissions in CO₂ equivalent, by sector (2000)**

- Energy: 30%
- Industrial Processes: 4%
- Land-Use Change & Forestry: 66%
- Other: 3%

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

**Land use (2005)**

- Pasture: 49%
- Arable: 4%
- Forestry: 44%

**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 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.

**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 Costa Rica, with a focus on policy developments (including action plans and programs) and institutional make-up. Like most developing countries, Costa Rica has only submitted one national communication to the United Nations Framework Convention on Climate Change (UNFCCC) with a second one being in the works. Agriculture contributes little, in relative terms, to total GHG emissions and the emission reduction potential is small. Land use change and forestry are responsible for net carbon sequestration in the country.

1. The Climate Context

Baseline map: Current Major Environmental Constraints related to Agricultural Potential

Source: FAO Note: For more maps on Costa Rica and agricultural resources, go to http://www.fao.org/countryprofiles/Maps/CRI/04/ec/index.html

1.1. Country Projections

According to the First National Communication and to climatic models developed for this, the following is to be expected in Costa Rica by the year 2100:

a) Increases in temperature: it is probable that the highest temperature increases of 3.8°C will be registered in Region I (north-west of the country), followed by Region IV (south-east of the country) with 3.5°C and Region II (north-east of the country) with 3.2°C, all during the month of May and June.

b) Decreases in precipitation: the highest precipitation decreases with maximums registered during the month of March (-63%) are registered in region I (north-west of the country), followed by region II (north-east of the country) with up to 49% decreases during the month of April and region IV (south-east of the country) with 46% reduction during the month of March.

c) Increases in sea level: it is estimated that the seal levels will increase by up to 1m under a pessimistic scenario by 2100 leading to high tide flooding (inundacion marea) of the coastal line.

The Global Climate Risk Index constructed for the period between 1997 and 2006 and covering both human and economic impact, ranks Costa Rica 99th out of 177 countries showing the country’s lower vulnerability to climate related events compared to other countries in the region. In recent years (between 2001 and 2008), floods and storms have had the highest human and economic impact in Costa Rica – 106,000 people have been affected by floods (8 events) with the cost of damages reaching US$106 million and 55,000 people have been affected by storms with the cost of damages reaching US$21 million.

1.2. Agriculture-Related Impacts

According to a climate change study in Costa Rica, using general circulation models and assuming a temperature increase of between 1-2°C and a precipitation variation of between +/−10-20%, the result has been a decrease yields in crops. Even if the positive effect of daily increase of precipitation on crop yields were to be isolated, when the effect of temperature increase is added (especially the maximum value of the temperature), a significant decrease in crop yields is observed.
2. The Policy Context

Like most countries in the region, Costa Rica 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 commitments to take future actions within an official international framework. It established the First National GHG Inventory with 1990 as its base year and included an identification of adaptation and mitigation options to climate change for the water sector and coastal areas, as well as agriculture and forestry. A Second national Communication is currently in the works.

2.1. National Climate Change Plans, Strategies and Programs

The National Climate Change Plan, created within the Ministry of Environment and Energy and coordinated by the National Meteorological Institute (IMN, Spanish acronym) and the Costa Rican Office for Joint Implementation (Ocic, Spanish acronym), is in charge of conducting research related to the GHG inventory, vulnerability studies, analysis of mitigation and adaptation measures and of research studies in preparation for the National Communication.

The Costa Rican government marked the creation of the National Strategy for Climate Change (ENCC, Spanish acronym) as a top priority for its 2006-2010 agenda.

2.2. Agricultural Sector Initiatives

3. The Institutional Context

The Ministry of Environment and Energy (MINAE, Spanish acronym) is the country’s environmental authority, it oversees Costa Rica’s commitments to the UNFCCC and other climate change related actions and is the Designated National Authority on climate change and, in particular, on Clean Development Mechanism (CDM) in Costa Rica through the Costa Rican Office for Joint Implementation (OCIC).

The National Meteorological Institute linked to MINAE, acts as a focal point at the IPCC for Costa Rica and is currently perfecting an early alert system containing climatic forecasts related to El Nino and La Nina phenomenon and the extreme weather events accompanying them. This will be used for the design of more appropriate adaptation measures and policies, thus contributing to reducing the vulnerability of the country to climate change related events.

3.1. Inter-Sectoral Coordination

The Consultative Commission on Climate Change (CCCC, Spanish acronym) was created in 1994 under the National System for Sustainable Development (SINADES, Spanish acronym) as a national entity for dialogue between all sectors of the Costa Rican society, about adaptation and mitigation policies and measures for climate change.

3.2. Agricultural Sector Institutions

The Ministry of Agriculture and Livestock (MAG, Spanish acronym) has as a main objective the development of the agricultural sector in the country and is responsible, among others, for the adoption of policies, plans and programs aimed at the preservation of natural resources and the general improvement of the environment in the country.

3.3. Fostering Capacity to Deal with Climate Change

- Emission inventory: To date, Costa Rica counts with one National GHG Inventory with 1990 as its base year. It includes data on agriculture and land-use change and forestry, providing disaggregated data by type of emissions and type of agricultural resources. The inventory has been updated for the year 1996.
- Studies related to climate change: In preparation for the First National Communication, four different vulnerability studies were realized for the coastal area, water resources, agriculture (for rice, beans, potato and coffee) and forestry.

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

According to the First National Communication, agriculture accounts for 72% of methane (CH4) emissions, mainly from enteric fermentation of farm animals, and 91% of nitrous oxide emissions.
4.1. Action Frameworks

4.1.1. Forestry and Land Use Change

According to the National GHG Inventory, CO2 is responsible for 88% of total GHG emissions in 1996. The forestry and land-use change sector is responsible for a net CO2 absorption of 971.2Gg. This is a result of change in biomass in forests (absorption of 2318.1Gg CO2), conversion of forests and meadows (emission of 3366.5Gg CO2) and abandonment of cropland followed by regeneration of vegetation (absorption of 2019.6Gg CO2). Deforestation activities have decreased in Costa Rica due to a government policy of conservation and forest improvement adopted in the 1980s leading to an average annual deforestation rate for the period 1990-2005 of 0.4%.

As part of the mitigation potential of the forestry sector, the First National Communication identified the two forestry projects currently active in the country:

The **Protected Areas Project (PAP, Spanish acronym)**: consists of the international commercialization of emission reduction units resulting from diminishing of emissions from deforestation in territory considered national parks or biological reservations. The potential of net emission reduction units of this project by 2015 is 642,738 metric tons of carbon.

The **Private Forestry Project (PFP, Spanish acronym)**: takes place between the government and small owners of forests through Payments for Environmental Services (PSA, Spanish acronym) established in 1996 under a national program fostering conservation and sustainable management of forests, thus avoiding land use change. By the year 2000, there are 230 million hectares contracted under PSA for a period of five years.

4.1.2. Livestock

In 1996, livestock was responsible for 91% of all methane emissions: 98% of these are from enteric fermentation from farm animals and the rest of 2% from handling of farm manure. The rate of emission of methane depends on the animal diet and the physical and chemical characteristic of the food.

One of the mitigation measures for this sector identified in the First National Communication is to introduce a change in the animal diet and to change the frequency of animal grazing in order to reduce methane emissions. These measures were based on a simulation study on two different animal herds (one for meat production and the other for milk production) of 100,000 animals each, whereby two types of animal forages were used and two different frequencies of grazing, along with supplementing the diet with green banana and concentrated food. This resulted in a significant reduction of methane emissions of 168,560 metric tons/year of CO2 equivalent. It was also concluded that by supplementing the diet with legumes, the quantity of methane emissions is reduced and, in the case of the meat producing livestock, the number of days necessary to achieve the market weight is also reduced, thus achieving increased productivity.

4.2. Carbon Trading and Agriculture

5. Impact of Climate Change on Agriculture - Adaptation Measures

5.1. Action Frameworks

5.1.1. Land Management

The intensity of fertilizer use per hectare of cropland is five times higher in Costa Rica, with 342 kg fertilizer/hectare of cropland, than the Central America and the Caribbean average of 65 kg fertilizer/hectare. According to the First National Communication, Costa Rica has the highest consumption of chemicals in agriculture per cultivated cropland in Central America and one of the highest in developing countries with repercussions on the environment, soil and water. Some of the measures identified to mitigate the effects of climate change in this sector are: i) implementation of no-tillage practices and ii) a better use of fertilizers through improved nitrogen application technologies.

5.1.2. Water Use

In 1999, Costa Rica’s arable land was 9.9% of the total territory and 21.4% of this was irrigated, which is much higher than the Central America and the Caribbean average of 19.1%.

According to a vulnerability study of the water sector realized in the three most important river basins of the country (Reventazon river, Grande de Terraba river and Grande de Tarcoles river) and using climate scenarios whereby the temperatures are estimated to increase by 1-2C and the changes in the precipitation regimes are estimated at +/-15% on the Pacific side and +/-10% on the
Atlantic side, it is expected that important variations in water flow will be noticed in these areas with impact on agriculture, especially during the transition between summer and winter. It is also expected to have an increase in floods with direct impact on irrigation systems and leading to more soil erosion, but also increase in droughts in some parts of the country, leading to less water supply for irrigation.

**Costa Rica Red Cross Flood Preparedness Program**: is a community training program in disaster preparedness and prevention, community first aid and psychological support, initiated in 2002 following the flooding of August 2002. In coordination with local institutions: community emergency committees (established as part of the program), the community development association, Catholic church, Costa Rican institute of electricity, chamber of tourism, public and private schools. The effectiveness of the program was tested in a landslide in May 2003 – communities were able to respond more quickly as all relevant actors were already in communication with one another.

5.3. Social Aspects

With a Human Development Index value of 0.846 (2005), Costa Rica is the highest performing country in Central America in terms of human development. Poverty rates, including rural poverty, are also lower in Costa Rica: 3.3% of the population lives on less than 1$/day, 9.8% on less than 2$/day and 22% live below the national poverty line. Inequality is also lower compared to the average for Central America with a Gini coefficient of 49.8. Yet there is a tendency for growing inequality - in 1988 the per capita income between of the richest 10% was 12 times higher than that of the poorest 10%; in 2004 it was more than 28 times higher. Even though the country has a sizeable rural population (48.3%), rural poverty is the lowest in the region – 23% of the workforce works in agriculture. Rural communities, including low income families, have also organized themselves to provide tourist services (in what became known as Rural Community Tourism in Costa Rica). This is potentially a good adaptation strategy for rural residents to changing climate; however, it does not mitigate the risk to natural disasters.

**ProVention Consortium, Community Risk Assessment and Action Planning Project**: toolkit for disaster preparedness and risk prevention that uses participatory research methods (community interviews and workshops; assignment of community focal points, etc.). Once a community identifies key risks and vulnerabilities, it develops an action plan for prevention and/or mitigation of risks. Risks could be associated with natural disasters (hurricanes, earthquakes, floods, etc.) or other threats e.g., conflict, environmental health hazards and epidemics. Costa Rica participated in this with the project *Vulnerability and Capacity Assessment in Linda Vista (La Unión) and El Meco (Ciudad Quesada)* whose objective is to facilitate the design of a detailed action plan for the community to address the vulnerability of the region to climate change. The project consisted of a series of surveys in the region aimed at a better understanding of the community’s ways of life, their costumes and ways of doing things, as well as an identification of natural threats, risks and vulnerabilities in order to identify adaptation measures to address these.

The program **Superémonos**, part of the National Development Plan of Costa Rica for 2006-2010, under the Ministry of Planning, provides cash transfers to families with school-age children on the condition that children attend school. The coverage of the program however is limited, with only 1.1% of the population being covered in 2006. In addition it prioritizes families with children between fifth and sixth grade and in the first years of secondary school, where drop-out rates are the highest. Hence it does not reach all poor and extremely poor households.

**Instituto Mixto de Bienestar Social (IMAS)** provides social welfare programs in the country. The beneficiaries of all social welfare programs in rural areas are approximately 219,713, compared to 336,652 in urban areas.

5.4. Coping with Risk

6. Regional initiatives

It is estimated that Central America produced less than 0.5% of global carbon, but it is one the most vulnerable regions to climate change related impacts on the planet.

**Institutions**

The **Central American Commission on Environment and Development (CCAD)** is a regional institution in charge of the environmental agenda of the region. It counts with an information portal- Ecoportal - which includes information on various environmental issues from the region, including information on climate change issues (programs, plans, initiatives) in all the Central American countries.

The **Regional Technical Assistance Unit (RUTA)** is a common initiative of the governments of the seven Central American countries and seven international development agencies aimed at fostering the sustainable development and
reduction of poverty in rural areas of Central America. Amongst its working areas are the environment and natural resources and the Central American agricultural policy.

Projects:
The Project Forests and Climate Change in Latin America\textsuperscript{30} (PBCC, Spanish acronym) financed by the Food and Agriculture Organization (FAO) and the government of the Netherlands with the headquarters in Honduras and realized in coordination with the Central American Commission on Environment and Development (CCAD) was developed with the purpose of helping Central American countries develop the mitigation potential of forests to climate change and to take advantage of the opportunities offered by the Clean Development Mechanism. As part of this, it launched a Central American Series on Forests and Climate Change\textsuperscript{31} for Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama and a regional one. These eight publications describe the mitigation potential of forests and the legal and institutional framework for each Central American country and for the region. It also includes a regional document presenting the overall situation of the region in the Clean Development Mechanism.

Programs:
The Regional Strategic Program for Management of Forest Ecosystems\textsuperscript{32} (PERFOR, Spanish acronym) designed for the period 2008-2012 has as a main objective the improvement of forest management in Central America and the Dominican Republic. Among others, it aims to position the forest agenda in the inter-sectoral agenda of the Regional Agro-environmental Strategy (ERA), thus contributing to poverty reduction, reduction of vulnerability to climate change events and to mitigation and adaptation to climate change.

A Regional Climate Change Strategy\textsuperscript{33} for Central America is currently in preparation and will include five areas: i) vulnerability and adaptation; ii) mitigation; iii) institutional and capacity development; iv) education, public awareness and v) international management. The initial guidelines for this strategy have been approved in April 25, 2008, an action plan should be completed within six months from the approval of the guidelines and the strategy should be finished within one year. The strategy will represent a key instrument for future climate change adaptation and mitigation actions in the region.

The Central American Forest Program\textsuperscript{34} (PROCAFOR, Spanish acronym), is a program financed by the Finnish Cooperation, aimed at improving the well-being of rural communities through sustainable forest management in the region.

Social:
Central American Indigenous and Peasant Coordination Association\textsuperscript{35} (ACICAFOC, Spanish acronym)\textsuperscript{1} - a community-based organization working with rural communities across Central America to exchange information and promote the sustainable use of natural and cultural resources. It works in the following areas: Community forest management; Community management of water and environmental services; Local eco-tourism and agro-ecotourism; Sustainable production and commercialization. Its Sustainable Watch project created a network of NGOs and CSOs in Asia, Africa to promote consistent qualitative monitoring of sustainable development within countries and raise emerging issues to national and international attention. Focal points for this project in Central America so far are Guatemala, Nicaragua and El Salvador.

Relevant Reference Material:
\textsuperscript{1} General information on the linkages between climate change and agriculture can be found at http://en.wikipedia.org/wiki/Climate_change_and_agriculture, including the references and links provided.
\textsuperscript{2} http://www.fao.org/landandwater/agll/glod/glodmaps.jsp?country=CRI&search=Display+map+%21

Relevant Reference Material:
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\textsuperscript{4} http://www.germanwatch.org/klima/cr/2008.pdf
\textsuperscript{6} http://www.mncc.go.cr/publicaciones/Programa%20nacional.pdf
\textsuperscript{7} www.imn.ac.cr
\textsuperscript{8} www.encc.go.cr
\textsuperscript{9} www.minae.go.cr
\textsuperscript{10} http://www.pgr.go.cr/scij//busqueda/normativa/Normas/nrm_articulo.asp?nValor1=1&nValor2=30397&nValor3=32098&nValor4=&nValor5=214660&nValor6
\textsuperscript{11} http://www.mideplan.go.cr/sinades/

\textsuperscript{1} http://en.acicafoc.org/indice.php/47