www.worldbank.org/lacagccnotes

PANAMA

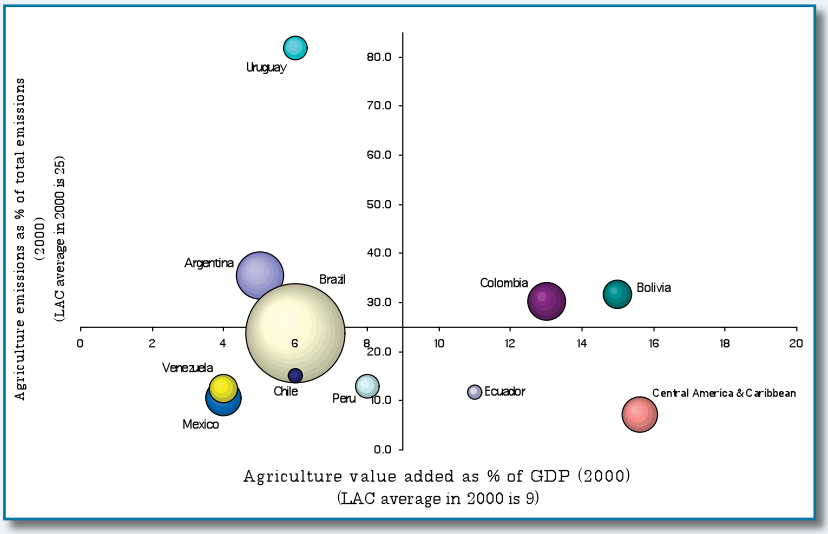
53797

Country Note on Climate Change Aspects in Agriculture

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

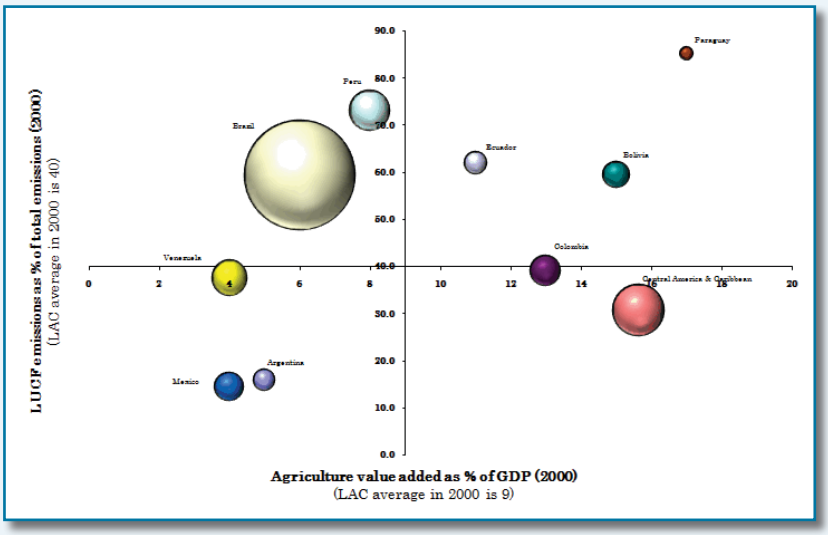
Contribution of agriculture (without LUCF) to the economy and to emissions in LAC countries

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



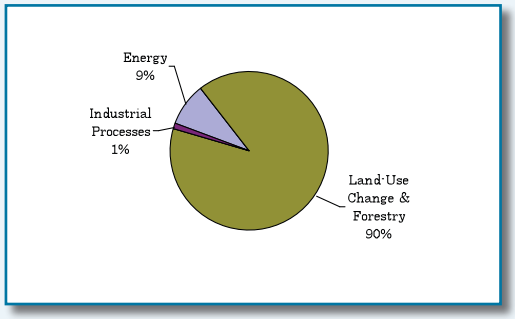
Contribution of agriculture to the economy and of LUCF to emissions in LAC countries

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



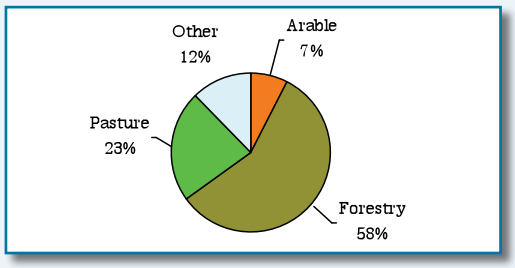
Note: In the first bubble graph, the total emissions for Uruguay do not account for the positive effects of LUCF (i.e. afforestation efforts). If they are considered, agriculture represents 222% of total emissions. Because of afforestation efforts in Uruguay and Chile, land use change and forestry (LUCF) 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)



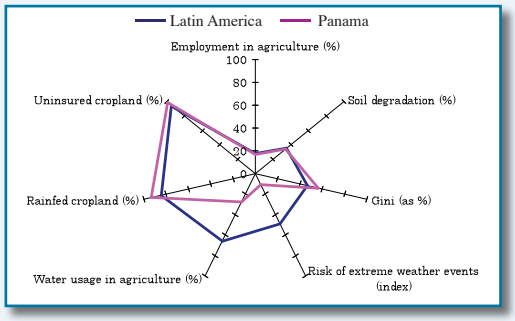
Source: World Resources Institute http://cait.wri.org

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=PAN&search=Display+map+%21

Table of Contents

Summary

Like most countries in Latin America, Panama has submitted one national communication to the United Nations Framework Convention on Climate Change (UNFCCC) with a second one under preparation. Land use change and forestry are by far the largest contributors to GHG emissions in the country. The emission reduction potential of the sector is large, but not sufficiently explored. Panama counts with only 5 CDM projects, none of which are in the agricultural sector. It is estimated that Central America produces less than 0.5% of global carbon emissions, but it is one the most vulnerable regions to climate change related impacts on the planet[2]. Agriculture is highly vulnerable to climate variability and weather extremes, this coupled with problems of land degradation in the country. A greater emphasis on reducing soil degradation, reforestation and developing and applying adequate insurance mechanisms can be placed for better management of public resources in light of natural disasters in the agriculture sector.

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.

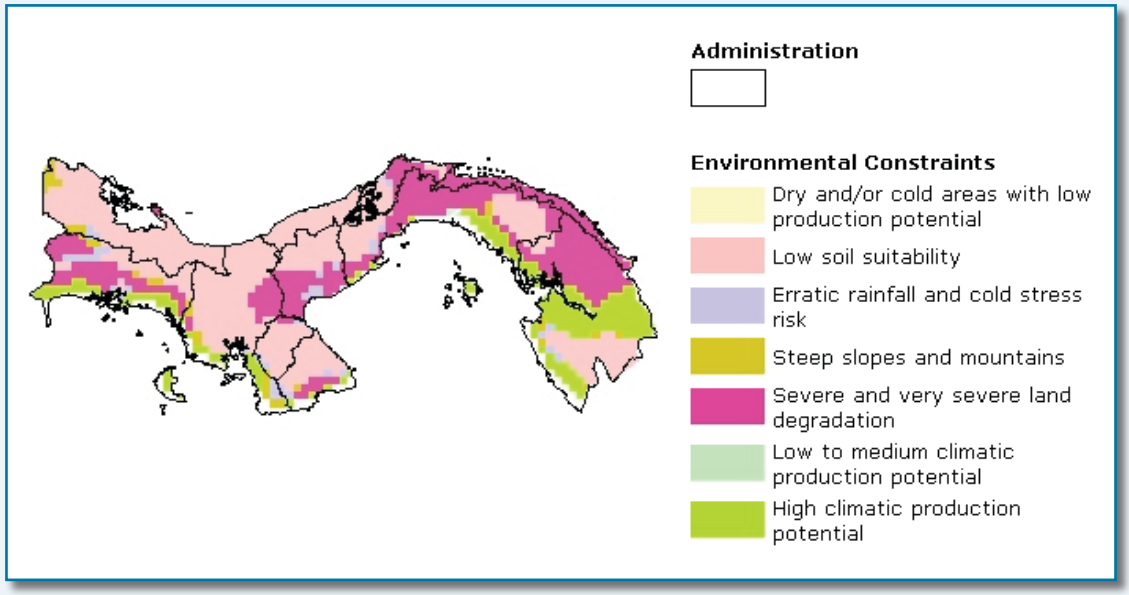
Acknowledgments:
This *Country Note* was produced by a World Bank team of specialists (in agriculture, forestry, social development, risk and knowledge management) from the Latin America and the Caribbean region and other units of the World Bank. The team is very grateful for all the comments and suggestions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

[2] http://www2.ohchr.org/english/issues/climatechange/docs/submissions/Guatemala.pdf, pg.6

1. The Climate Context

The baseline map provides a visual characterization of Panama's agricultural potential given current environmental constraints and their regional distribution. Around 30% of Panama's land is used for agriculture (23% for pasture and 7% for cultivation), with forestry occupying 58% 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 Panama and agricultural resources, go to http://www.fao.org/countryprofiles/Maps/PAN/04/ec/index.html

1.1. Country Projections

In recent years (between 2000 and 2006) floods have had the highest human and economic impact in Panama – 62,678 people have been affected by floods (8 events) with the cost of damages reaching US$ 8.8 million[3].

1.2. Agriculture-Related Impacts

The multitude of floods affecting the country in the last decade has lead to significant problems for the agricultural sector in Panama. The floods of October 1995 lead to the destruction of a total of 19,460 hectares of cropland which remained inundated in the provinces of Panama and Los Santos. The total losses were of US$ 700,000.

2. The Policy Context

Like most countries in the region, Panama has submitted only one **National Communication**[4] to the **United Nations Framework Convention on Climate Change**[5] (**UNFCCC**) in 2000 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. The National Communication establishes the National GHG Inventory with 1994 as its base year, it includes vulnerability and adaptation studies to climate change for water resources, coastal area and the agricultural sector and

[3] http://www.emdat.be/Database/CountryProfile/countryprofile.php?disgroup=natural&country=pan&period=1999$2008
[4] http://www.anam.gob.pa/cambio%20climatico/comunicaciones_nacionales.htm
[5] www.unfccc.int

mitigation options for the forestry sector. It concludes by underscoring the necessity of development of a national strategy on climate change.

A **Second National Communication**[6] is under preparation and scheduled to be completed by 2010. It will include an update of the national GHG inventory with 2000 as its base year, as well as renewed vulnerability studies and mitigation measures for the land-use change and forestry sector.

2.1. National Climate Change Plans, Strategies and Programs

The **National Climate Change Program**, created within the **National Environmental Authority** is responsible for the realization of vulnerability studies to climate change for the agricultural sector, coastal and water resources, as well as for possible climate change mitigation scenarios.

Panama is also in the process of developing a **National Climate Change Strategy** which will include the establishment of a program responsible for the periodic update of the national communications, a national climate change mitigation strategy, and adaptation strategy to climate change as well a program fostering national scientific research on climate change.

2.2. Regional initiatives

Institutions:

The **Central American Commission on Environment and Development**[7] (**CCAD**, Spanish acronym) is a regional institution in charge of the environmental agenda of the region. It counts with an information portal -**Ecoportal**[8]- 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**[9] (**RUTA**, Spanish acronym) 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**[10] (**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**[11] (**CCAD**, Spanish acronym) 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**[12] 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

[6] http://www.anam.gob.pa/joomla/images/stories/documentos_CC/Segunda_Comunicacion_Nacional_de_CC.pdf
[7] www.ccad.ws
[8] http://www.ccad.ws/ecoportal/cambio/camnica.html
[9] www.ruta.org
[10] http://www.fao.org/regional/honduras/pbcc/Descripcion.htm
[11] http://www.ccad.ws/
[12] http://www.ccad.ws/forestal/pp_regional.htm

country and for the region. It also includes a regional document presenting the overall situation of the region in the Clean Development Mechanism.

The Project on **Capacity building for Stage II adaptation to climate change** (**Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama**) is funded through the GEF Trust Fund and is implemented by UNDP. Central America, Mexico and Cuba serve as the pilot region for elaborating and applying an Adaptation Policy Framework for preparing adaptation strategies, policies and measures. The application of this framework will demonstrate how policy for adaptation can be integrated into national sustainable development for at least three human systems: water resources, agriculture and human health. This demonstration project builds upon the Stage I vulnerability and adaptation assessments of the Initial National Communications of the eight participating countries of the region and will prepare them to move onto Stage III Adaptation. The outputs of the project, Stage II adaptation strategies may be used for preparing second National Communications[13].

Programs:

The **Regional Strategic Program for Management of Forest Ecosystems**[14] (**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**, Spanish acronym), 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**[15] **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**[16] (**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.

2.3 Agricultural Sector Initiatives

3. The Institutional Context

The **National Authority on Environment**[17] (**ANAM**, Spanish acronym), through its **Climate Change and Desertification Unit**, oversees Panama's commitment to the UNFCCC on climate change and other related issues and represents the Designated National Authority (DNA) on climate change and on Clean Development Mechanism in Panama.

3.1. Inter-Sectoral Coordination

The **National Climate Change Committee** (**CONACCP**, Spanish acronym) is composed of several lines of ministries, including the Ministry of Agricultural development, the private

[13] http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200609_background_latin_american_wkshp.pdf
[14] http://www.sica.int/ccad/program.aspx?IdEnt=2
[15] http://www.sica.int/ccad/temporal/LINEAMIENTOS.pdf
[16] http://www.elsalvadorforestal.com/nota.php?id=53
[17] www.anam.gob.pa

sector, NGOs, academia and its responsibility is the facilitation of dialogue on climate change related issues between these organizations.

3.2. Agricultural Sector Institutions

The **Ministry of Agricultural Development**[18] (**MIDA**, Spanish acronym) created in 1997 is responsible for the productivity, competitiveness and sustainability of the agricultural sector. It administers a variety of programs and projects, including irrigation and agriculture in a controlled environment. It counts with a **National Rural Development Department** which supports small producers' initiatives in the fight against soil erosion, sedimentation and other processes leading to soil nutrition depletion.

The **Panama Canal Authority**[19] (**ACP**, Spanish acronym) runs a network of weather stations that collects information related to precipitations and water use which is processed and used as a base for flood control in Panama.

3.3.Fostering Capacity to Deal with Climate Change

Emissions Inventory: To date, Peru counts with one National GHG Inventory with 1994 as its base year. The inventory includes information on emissions from agriculture, land use change and forestry, providing disaggregated information by type of emissions and type of agricultural resource.

Studies related to climate change and agriculture: a number of vulnerability studies and adaptation to climate change have been completed in preparation of the First National Communication for the water sector, coastal area, forestry and agriculture. The **Center for the Humid Tropics of Latin America and the Caribbean** (**CATHALAC**) is one of the places in Latin America where regional modeling is undertaken for climate prediction and climate change projections, running regional models[20].

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"[21], 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.

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

According to the First National Communication, agriculture is responsible for 40% of methane emissions, mainly from enteric fermentation from farm animals, and 94% of nitrous oxide emissions. However, agriculture overall is responsible for merely 0.6% of total GHG emissions in 1994.

4.1. Action Frameworks

4.1.1. Forestry and Land Use Change

According to the First National Communication, land use change and forestry is responsible for 58.61% of CO_2 emissions in 1994, representing 8902.5 Gg CO_2 net emissions. These net

[18] www.mida.gob.pa
[19] www.pancanal.com
[20] http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200609_background_latin_american_wkshp.pdf
[21] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/02/27/000334955_20090227082022/Rendered/PDF/476040PUB0Low0101Official0Use0Only1.pdf

emissions are the result of emissions originating from conversion of forests and pastures (18,131 Gg CO_2) and soil emissions (2,323.26 Gg CO_2) and absorptions resulting from abandoning of cropland and natural regeneration of vegetation (4,757.56 Gg CO_2) and from change of biomass and other wooden vegetation (6,975.14 Gg CO_2).

The average annual deforestation rate for Panama for the period 1990-2000 stands at 1.6%, one of the highest in Latin America and the Caribbean, after Haiti and Central America[22]. Panama is currently processing land-use change data for the period 2000-08, and initial estimates suggest that the rate of deforestation in the country has slowed significantly. The main driver for deforestation is agricultural expansion and grazing of livestock. It is estimated that more than 40% of the national territory has been deforested for inadequate and unsustainable activities which lead to the currently two million existing hectares of land that show high levels of deterioration and are considered semi-abandoned or degraded[23].

A number of initiatives that have come into place in Panama aimed at reversing the deforestation process, such as the Law no. 24 and 23 of November, 1992 which promotes and regulates reforestation activities in Panama, the Forestry Law of Panama for protection, conservation, improvement and rational use of natural resources and Law no. 58 that created the Certificate for Forestry Incentives (CIF), have lead to the reforestation of more than 38,000 hectares, the majority taking place in the provinces of Veraguas and Panama.

The **Program for Economic Environmental Incentives in the Basin of the Panama Canal 2009-2028**[24] is aimed at conserving and recovering 25,000 hectares of forests through natural regeneration, reforestation of continuous areas, small scale deforestation, agroforestry projects and introduction of silvo-pastoral systems.

Panama is undergoing Readiness Preparation for REDD (Reduced emissions from deforestation and forest degradation), in coordination with the Forest Carbon Partnership Facility (FCPF) of the World Bank and the UN-REDD Program. Panama has officially presented a Readiness Preparation Proposal (FCPF) and National Joint Program Document (UN-REDD), which were assessed by the FCPF Participants' Committee and UN-REDD Policy Board. Financing from both programs would support the development of a measuring, reporting and verification system for emissions from deforestation and forest degradation, a reference emissions scenario, and a national REDD strategy.

4.1.2. Livestock

Livestock is responsible for 90% of total methane emissions from agriculture in 1994. Of these, 96% are due to the enteric fermentation from farm animals, mainly from bovines, and the rest of 4% from handling of farm manure.

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. Though the CDM is expected to generate investment in developing countries,

[22] World Development Indicators, 2005
[23] http://www.anam.gob.pa/cambio%20climatico/comunicaciones_nacionales.htm
[24] http://www.anam.gob.pa/uccd/cambio_climatico/taller_reduccion_de_Emisiones.htm

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)[25] 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, there are 6 registered projects in Panama, representing a very small share of projects (1%) in LAC. Currently, there are no registered CDM projects in agriculture in Panama, nor there are projects registered under the "afforestation and reforestation" category[26]. 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.

5. Impact of Climate Change on Agriculture - Adaptation Measures

5.1. Action Frameworks

5.1.1. Land Management

According to the First National Communication, agriculture is responsible for 94% of total nitrous oxide emissions. Of these, 99% are emissions from agricultural land, be they direct ones from use of land dedicated to animal production of indirect one from nitrogen based fertilizers used in agriculture. The intensity of use of fertilizers in Panama of 51kg per hectare of cropland is lower than the Central America and the Caribbean average of 65kg per hectare of cropland[27]. In terms of methane emissions, rice fields are responsible for 7.6% of total methane emissions and, of these, rice fields which are constantly inundated, are responsible for 40% of emissions.

According to vulnerability studies on corn, prepared for the First National Communication and using different scenarios, the yield for this will show a 8.7% increase yield by 2010 due to climate change compared to current conditions. However, by 2050, the yields in corn will show a decrease of 33% and by 2100 the decrease will be of 21%, compared to current conditions.

The following adaptation measures have been identified in the First National Communication for this sector: i) introduction of new crop varieties more resistant to future climate change conditions in agriculture, ii) improvement of irrigation efficiency and iii) realization of studies aimed at controlling plagues and crop diseases and iv) implementation of agro-ecological zoning of crops taking into account the weather variability produced by climate change.

[25] http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByScopePieChart.html
[26] http://cdm.unfccc.int/Projects/projsearch.html
[27] http://earthtrends.wri.org/pdf_library/country_profiles/agr_cou_591.pdf

5.1.2. Water Use

Agriculture is responsible for 28% of freshwater extraction and use in the country, which is much lower compared to the Latin America and the Caribbean average of 71%. Of the total agricultural land under use in Panama, only 6.2% is currently under irrigation, while the regional average is 11.4%[28].

The following adaptation measures have been identified in the First National Communication as a result of a vulnerability study for the water sector on the Chagres and la Villa Rivers showing a reduction in the water flow of 1-4% by 2010, 6.26% by 2050 and 2-245 by 2100 depending on the climate scenario: i) strengthening of water and weather station network to better predict future changes in the water regime (floods, droughts); ii) development of new irrigation technologies; iii) promoting conservation and rational use of water resources.

The **Rehabilitation of the Irrigation System in Remigio Rojas Project**[29] consists of government funds dedicated to the construction of a drop irrigation system to incorporate 3200 hectares of cropland. This will benefit 188 producers and their families and it is expected to increase agricultural production, both in terms of crops and livestock.

5.2. Social Aspects and Interventions

Many people in rural areas derive their livelihoods from agriculture and can be disproportionately affected by changes in climate.

Only 7.4% of the population lives on less than 1$/day, 18% - on less than 2$/day and 37.3% live below the national poverty line[30]. However, Panama exhibits the highest inequality rate in the Central America region with a Gini coefficient of 56.1. Poverty is concentrated in rural areas (home to 29.2% of the population). According to 1999 estimates, close to two thirds of rural economy residents (including urban farmers) live below the poverty line. Rural poverty is the highest in indigenous areas (95%) and lowest among urban farmers (8%). Similar to the rest of the region, households engaged in non-farm activities are less likely to be poor than those engaged in agriculture[31]. Emigration and transition to non-farm employment are some of the most widespread livelihood coping strategies for rural populations. Yet, the scope of both these coping strategies is limited for the most vulnerable groups, which include the rural poor, women, children and youth, and indigenous people.

ProVention Consortium, Community Risk Assessment and Action Planning Project[32]: 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.

Central American Indigenous and Peasant Coordination Association[33] (**ACICAFOC**, Spanish acronym): 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

[28] World Development Indicators, 2006
[29] http://www.mida.gob.pa/
[30] HDR 2005 and ftp://ftp.fao.org/es/esn/nutrition/ncp/panmap.pdf, pg.6
[31] http://www.ruralpovertyportal.org/english/regions/americas/index.htm and World Bank. 2000. *Panama Poverty Assessment: Priorities and Strategies for Poverty Reduction*. Annex 5, pg.1
[32] http://www.proventionconsortium.org/?pageid=43
[33] http://en.acicafoc.org/

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.

Opportunity Network (Red de Oportunidades): includes a food security transfer administered by the National Secretariat for the Food and Nutrition Plan (**SENAPAN**) and a conditional cash transfer administered by the Ministry of Social Development. Currently, the program covers 88% of the population living in poverty[34].

5.3. Insurance Instruments

Agricultural insurance was first introduced in Panama in 1978 to protect corn, rice and sorghum. In 1996, the Government incorporated livestock and forestry insurance. There are three companies offering agriculture insurance, and one of them is a public company **Institute for Agricultural Insurance** (**ISA**, Spanish acronym). Although the Government does not provide subsidy for premiums, it does support the market development through ISA. There are a total of three private and public agricultural insurance companies in the country, covering a total of 12,000 ha of cropland, representing 0.3% of total cropland. A total of 4 risk are covered (hail, fire, theft and plant life) and the coverage extends to 8 different crops (oilseeds, cereal, tobacco, forages, citrus, olives, vid and vegetables.

The Government of Panama has one instrument in place that supports the agriculture sector in managing climate risks - **ISA** is a public company which offers most of the agriculture insurance policies, however the development of the agriculture insurance market has been declining in recent years, while the private sector has been inching slowly in capturing some of the most profitable clients.

Of the entities involved in initiatives relating to climate risk management for agriculture in Panama, the public sector, through ISA is the public agricultural insurance company that offers crop, livestock and forestry insurance.

[34] http://www.mides.gob.pa/index.php?option=com_content&task=blogcategory&id=48&Itemid=75 and http://www.mides.gob.pa/red_oportunidades/avance_agosto_2008.pdf and http://panama.nutrinet.org/content/view/245/119/lang,es/

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

For comments and/or suggestions, please contact Svetlana Edmeades at sedmeades@worldbank.org