ove Office of Evaluation and Oversight

Climate Change and IDB: Building Resilience and Reducing Emissions

Sector Study: Agriculture and Natural Resources

IDB
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ACRONYMS AND ABBREVIATIONS

AG	Agriculture sector
AR5	IPCC Fifth Assessment Report
AS	Water and sanitation sector
BAU	Business as usual (scenario)
CAIT	Climate Analysis Indicators Tool of the World Resources Institute
CC	Climate change
CDM	Clean development mechanism
CH_4	Methane
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CO_2	Carbon dioxide
CS	Country strategy
DEFRA	Department for Environment, Food and Rural Affairs, British Government
FAO	UN Food and Agriculture Organization
FIP	Forest Investment Program
FONTAGRO	Regional Fund for Agricultural Technology
GCI-9	Ninth General Capital Increase of IDB
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gases
$GtCO_2e$	Billion tons of carbon dioxide equivalent (GHG emissions)
ha	Hectare
IDB	Inter-American Development Bank
IGR	Investment grant
IIC	Inter-American Investment Corporation
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated water resources management
KP	Knowledge product
LAC	Latin America and the Caribbean
LULUCF	Land use, land use change, and forestry
MASAGRO	Sustainable Modernization of Traditional Agriculture
MIF	Multilateral Investment Fund
$MtCO_2e$	Million tons of carbon dioxide equivalent (GHG emissions)
NAMA	Nationally Appropriate Mitigation Actions
NCs	National Communications
PA	Environment and natural disasters sector
PBL	Policy-Based Loans
PMR	Project Monitoring Report
REDD	Reducing Emissions from Deforestation and forest Degradation
TC	Technical cooperation
UM	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

PREFACE

Climate change (CC) poses important risks to development in Latin America and the Caribbean (LAC). Climate adaptation can limit the negative impacts and is important in achieving sustainable development and equity, including poverty reduction and economic growth. Integrating CC mitigation into development work is also an opportunity to foster and support the design and implementation of sustainable projects, programs and policies. Low-carbon alternatives contribute to more sustainable development. LAC countries are increasingly incorporating CC in their national policy agendas and aim to reduce GHG emissions and build climate resilience and the IDB has supported these efforts in the Region.

In 2013-2014, the Office of Evaluation and Oversight (OVE) carried out an evaluation of IDB's support for CC mitigation and adaptation (RE-459). This is OVE's first evaluation of IDB's interventions and institutional set-up related to CC. The evaluation seeks to document and to draw lessons from the recent IDB experience related to CC (2004-2014). It focuses on IDB-financed operations in important climate-related sectors—agriculture and natural resources, energy, disaster risk management, and transport—that directly support climate resilience-building (adaptation) or GHG emissions reduction (mitigation) or that have these outcomes as co-benefits. A number of background papers were produced for the evaluation and this is paper is one commissioned by OVE to support the overall CC evaluation.

EXECUTIVE SUMMARY

The report reviews the performance of the Inter-American Development Bank (IDB, or the Bank) in fostering mitigation of and adaption to climate change in agriculture, water resources, forestry, and land use in Latin American and the Caribbean (LAC). With 20 million km^2, the Region spans a huge geographic and climatic range. Forests in LAC account for a quarter of the world´s forests, and within the Region, they cover almost half of the land. Agriculture and food processing contribute heavily to the economy in LAC countries, from 20.5% (Venezuela) to 34.8% (Uruguay) of GDP. Among LAC exports, the share of food and agricultural raw materials was 22% in 2012, higher than that in any other region of the world.

Emissions. Greenhouse gas (GHG) emissions from agriculture in LAC represented about 19% of the world's total agricultural emissions, and emissions from land use, land use change, and forestry made up almost half of the world's total in 2011. Land use change and agriculture are still the greatest sources of GHG emissions in LAC, accounting for 50% of the total in 2011. Land use change, mostly deforestation, has been the principal source of GHG emissions. Land in agriculture has increased by 52 million hectares (ha) between 1990 and 2010, while the forest area has shrunk by 93 million ha. Pasture represents 75% of the agricultural area. Brazil stands out as the largest converter of forest area and the largest creator of new agricultural land. However, emissions from forest clearing have declined since 2005 (mostly in Brazil). LAC's cattle herd has grown from 320 million in 1990 to 400 million in 2010, with most of the increase in Brazil. Cattle's ranching is by far the most important source of agricultural emissions—90% is methane from enteric fermentation and manure.

Vulnerability. The main threat to agriculture from climate change in LAC is increased water stress from higher crop-water demands and reduced precipitation, but also more frequent and longer droughts and flood events. Conflicts among water uses and users will be exacerbated. Glacier melt will affect the water supply of the Andean countries. The heat stress of animals will also increase. The growing regions for some crops (sugarcane) may expand, and for others (soybean, coffee) they may shift. Pests and diseases in animals and plants will behave unpredictably and will spread to previously non-endemic areas. Increases in ocean temperature and acidity will cause damage to coral reefs and losses in fish populations and fish catch.

Among LAC's people, the most vulnerable will be the rural poor, who are most dependent on natural resources affected by climate change, and who have scant alternative means of livelihood and little access to technology and credit. The rural poor account for over 60% of the poor in Mexico, Central America, and the Andean countries. One-quarter of the population living in extreme poverty are indigenous people. Indigenous people in the Andes valleys, the rural poor of Northeast Brazil and in the semiarid basins of Argentina and Chile, and the smallholders living from rain fed maize production in Central America and Mexico are deemed to be the most vulnerable to crop water stress, yield reductions, and drought.

Adaptation. The report outlines a number of options to increase resilience to climate change, many of which are already being supported by IDB operations. It emphasizes that good agricultural development is also good adaptation. The IDB's strategic documents on climate and change and the rural sector already stress important lines of action.

The agriculture sector needs to return to significant financing of public goods, with a heightened orientation toward climate change (CC) and climate variability. Improved hydrological monitoring and forecasting of weather and short-term climate are high priorities. In addition, it is important to increase the incomes of family and peasant farms through directed innovation and extension, better access to credit, and improved land tenure. Cash income transfers, when necessary, should be delinked from production parameters. Mitigation should be strengthened through innovation and extension for low-carbon agricultural practices, including agroforestry, conservation tillage, and alternative crop rotations. Forest management and protection of conservation areas should be promoted.

Mitigation. The mitigation actions recommended by IDB's strategy documents are appropriate; however, they focus mainly on avoiding deforestation and to some extent on forest plantations, but they largely omit the large and complex issue of methane emissions from cattle ranching.

Main evaluation findings

IDB engagement. At the country level moderate evidence was found that the IDB is strategically positioned relative to country needs or the activities of other actors, or that it plays a significant role in CC-related policy development and dialogue. IDB country strategies played a limited role in defining CC-related projects among new operations. Countries for which a Climate Change Note had been prepared for strategy formulation showed stronger logical links between country needs, IDB country strategies, and subsequently approved operations. The trend in lending operations with CC relevance does not reveal a response to the GCI-9 climate policy decision. However, there has been a surge in CC-related technical cooperation (TC) and investment grants, with TC largely funding regional knowledge products. The number of TCs doubled between 2012 and 2013, and the approved amount nearly tripled. Some of the TCs may lead to larger CC-related loans in the future.

Portfolio. Climate change mitigation is relatively new in IDB's agriculture portfolio, which predominantly focused on adaptation. The number of mitigation projects has increased sharply in recent years, mainly because of operations under multilateral umbrellas such as the Global Environment Facility and the Forest Investment Program. Most of the agriculture projects are related to providing and strengthening public goods, in particular plant and animal health, crop and animal research, and innovation; to promoting extension services to small- and medium-scale farmers; and to improving well water resource management. These are precisely the most effective areas for adaptation.

IDB value-added. IDB's value-added has been difficult to assess in some cases due to the lack delimitation of the "IDB project". The distinction between IDB project activities and ongoing client agency activities was often unclear and made projects susceptible to "on-the-fly" modifications. It is also difficult for IDB to bring significant value-added where countries have highly qualified government staff and good financial and economic management. Often, IDB loans do not represent additional resources to an implementing ministry, but merely substitute for domestic resources. TCs, especially regional ones and those for knowledge management, have the potential to bring substantial value-added in the area of CC. However, the lack of proper documentation of project progress and results makes an in-depth evaluation of their effectiveness exceedingly difficult.

Mixed results. Project effectiveness of agriculture and natural resources projects has been difficult to measure due to poorly designed results frameworks and limited supervision of projects' institutional dimensions. OVE found that during implementation, policy-related or institutional strengthening components tend to get lower priority than traditional investment components, and IDB supervision does not correct this bias and complete implementation of the "softer" components. Physical elements are being put in place, but too often the institutions required to put them to good use are lacking. In terms of CC adaptation, IDB needs to mainstream Bank staff's CC awareness in the agriculture sector. There appears to be a tendency in the agriculture sector to respond to climate change in terms of mitigation rather than adaptation. This may result in missed opportunities to include climate change adaptation in operations where it is relevant.

Suggestions

IDB is potentially well-placed to develop a comparative advantage (niche) among multilateral banks and donors in the support of mitigation in the agriculture and livestock sector. TCs are one potential source of such comparative advantage and could be used strategically for lesson-learning, project preparation, knowledge generation, and knowledge sharing, and as support for policy design. Regional TCs should be used wherever several countries can and should share the benefits.

Drawing on the findings in this evaluation, OVE offers a number of specific suggestions to IDB management, including the following:

- Continue to strengthen the delivery of agricultural public goods (research, extension, plant and animal health services) to small- and medium-scale farmers.
- Develop mechanisms that allow IDB to remain involved with institutional development over the longer term.
- Provide training, workshops, or retreats for staff concerned with agriculture, forestry, and land use to deepen their understanding of adaptation and the options to promote it.
- Support climate modeling (as opposed to weather modeling) only in a research context.
- Include proper formulation of project development objectives in results frameworks. Results indicators should correspond to, and clearly measure, these objectives. Project monitoring should focus on checking whether good practices are effectively being adopted and whether other results, such as yields, production, incomes, and institutional effectiveness, are achieved.
- Support countries in developing and providing "climate services"—that is, hydrological monitoring, meteorological forecasting, and crop disaster forecasting, with associated infrastructure.

I. CONTEXT

A. Regional context

1. Introduction

1.1 This report covers the 26 borrower countries of the Inter-American Development Bank (IDB) in Latin America and the Caribbean (LAC).[1] These countries have a total land area of 20 million km^2, and a total population of about 579 million (UN, 2010), of which only 21% is rural. The Region spans a huge geographic and climatic range, from temperate and subtropical climate zones in the southern cone to tropics on either side of the equator, to the subtropics of Mexico and temperate climates in the Mexican north, and the tropical island climate and geography of the Caribbean (Figure 1). Accordingly, there are numerous biomes: desert and semiarid regions, dry land forests and savannas, alpine regions, and tropical and temperate rain forests. LAC forests account for a quarter of the world's forests and for almost half of the forest biomass in Africa, Asia, Oceania, and South and Central America.[2] Within LAC, they represent about 47% of the land area.

Figure 1: Principal Climate Zones in Latin America and the Caribbean

2. The importance of agriculture in LAC

1.2 **The agriculture sector is an important contributor to greenhouse gas (GHG) emissions in most developing countries.** In LAC the principal sources of GHG emissions are land use change—the conversion of forests and other natural vegetation to cropland and pasture (carbon dioxide emissions)—and agricultural activities, particularly

[1] For the purpose of this evaluation, LAC countries were grouped into five sub regions: Southern Cone (Argentina, Chile, Uruguay, and Paraguay), Andean countries (Bolivia, Peru, Ecuador, and Colombia), Caribbean (Trinidad and Tobago, Jamaica, Dominican Republic, Barbados, Bahamas, Suriname, Guyana, Haiti, and Venezuela), Central America (Mexico, Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Belize, Guatemala), and Brazil.

[2] S.S. Saatchi et al., Benchmark map of forest carbon stocks in tropical regions across three continents, Proceedings of the National Academy of Sciences of the USA, vol. 108, Nr. 24, 2011. http://www.pnas.org/content/108/24/9899.long

cattle ranching (methane emissions) on converted land and natural grasslands. Although the land use change emissions have diminished over the last decade, together these sources still account for more than half of overall emissions in the Region.

1.3 **The Region's economies are also characterized by a relatively large agriculture sector.** The exposure and vulnerability of this sector—and of the population dependent on it—to climate change (CC) is of particular economic and social significance in the Region. Agriculture and forestry are more significant to the overall economy than might appear from the share of the sector's value-added in GDP, which is generally less than 13% except in Guyana, Honduras, Nicaragua, and Paraguay (Annex 1). This percentage does not reflect the contribution of the industries processing agricultural products and of the effects of income multipliers throughout the economy from changes in agricultural production or exports. A study on the "true contribution of agriculture"[3] found that, in 1997, primary agriculture production and agrifood processing together in nine Latin American countries contributed between 20.5% (Venezuela) and 34.8% (Uruguay) to GDP, or 4-7 times more than primary agriculture alone. The study demonstrated the important forward and backward linkages between agriculture and other sectors.[4] About three-quarters of agricultural output is used as input by other sectors. And inputs from other sectors used by agriculture and agrifood industries amounted to 56% of the total cost of production, while labor cost amounted to about 18%, and other factors 26%. Finally, the growth impact on the economy of a given exogenous shock (e.g., a 10% increase in export demand for food products) was estimated as three to almost six times as large as the direct (first-round) effect. The share of food and agricultural raw materials in merchandise exports in LAC was about 22% in 2012, higher than in any other region of the world. Agriculture's share of overall employment in LAC countries was about 16% in 2009-11. [5]

B. GHG emissions and mitigation

1. Sources of emissions

1.4 **While energy, industry, and waste emissions are increasingly important, land use change and agriculture accounted for 50% of total emissions in 2011.** The Intergovernmental Panel on Climate Change (IPCC) differentiates between agricultural emissions and those from land use, land use change, and forestry (LULUCF, see definition in Annex 2). Figure 2 illustrates the importance of agricultural and LULUCF emissions within total GHG emissions in LAC, and their change from 2000 to 2011.

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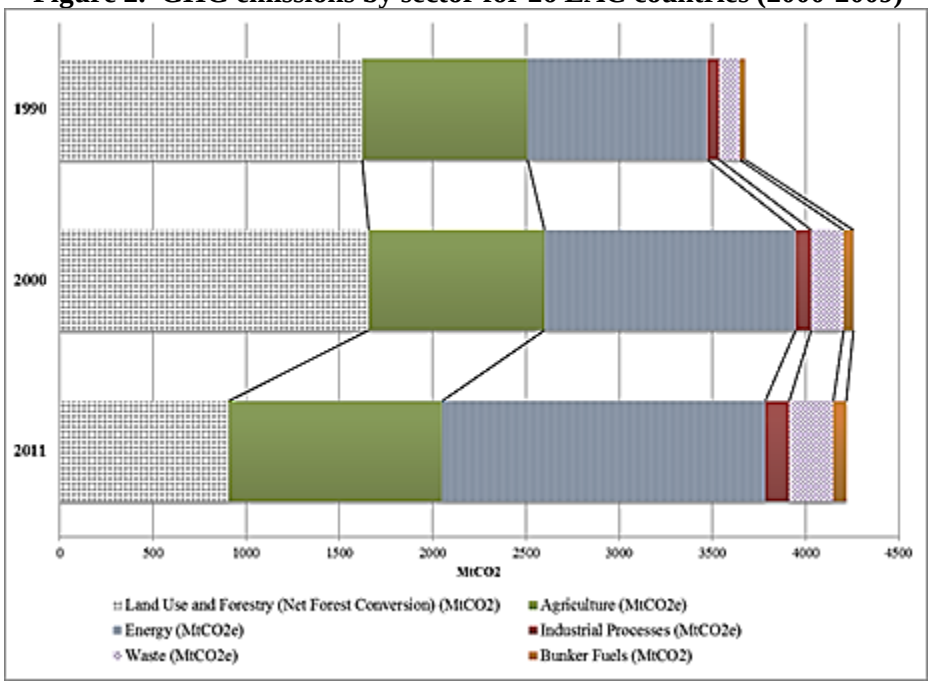
3 R. Trejos, J. Arias, O. Segura, and E. Vargas. IICA - Directorate of Strategic Planning and Institutional Modernization; Area of Trade and Agribusiness, "More than food on the table: Agriculture's true contribution to the economy," San José, Costa Rica, 2004. Data are for 1997.

4 Ibid. The study used an analysis of social accounting matrices. The following figures are based on all 11 countries—9 LAC countries plus the USA and Canada.

5 World Bank, World Development Indicators, 2013. http://data.worldbank.org/topic

Figure 2. GHG emissions by sector for 26 LAC countries (2000-2009)



Source: CAIT 2.0, World Resources Institute

1.5 **Emissions are concentrated in few countries**. Table 1 shows agricultural and net forest emissions (emissions from forest conversion minus CO_2 absorptions from reforestation and forest regrowth) by regions (data by country are in Annex 3).[6] In 2009 just four countries—Argentina, Brazil, Colombia, and Mexico—produced 78% of total agricultural emissions, and six countries were responsible for 84% of emissions from land use change: Brazil, Venezuela, Bolivia, Ecuador, Peru, and Paraguay. Brazil alone was responsible for about half of agricultural emissions and, in 2009, half of land use change emissions (down from two-thirds in 2000).

[6] There are several sources for estimates of agricultural emissions: (i) the countries´ own submissions through National Communications, (ii) the CAIT 2.0 series, which is based on estimates of CH_4 and N_2O emissions by the US Environmental Protection Agency, and (iii) FAO estimates based on FAO's own agricultural activity statistics. These series do not agree. The countries' own estimates are not based on a uniform methodology and are not all available for the same year. CAIT estimates are not available with a breakdown by source of emissions, but are available for all sectors. CAIT country totals for agriculture exceed the totals estimated by FAO.

Table 1: Emissions from Agriculture and Net Forest Conversion (million tons of CO_2 equivalent)

Region	Agriculture				Net Forest Conversion	
	WRI 2000	WRI 2011	FAO 2000	FAO 2011	WRI 2000	WRI 2011
Southern Cone	642.0	815.2	498.5	599.6	1,149.7	395.3
Of which, Brazil	449.3	599.7	341.5	436.9	1,042.9	288.0
Andean	176.5	195.4	137.1	154.7	356.0	400.5
Caribbean & Haiti	10.3	10.5	7.5	7.3	5.5	9.6
Central America & Mexico	115.8	121.1	110.3	126.1	143.9	101.4
Total LAC-26	**944.5**	**1,134.6**	**753.5**	**887.7**	**1,655.0**	**906.8**
Change		+20.1%		+17.8%		-45.2%
World	**5,423.8**	**6,053.3**	**4,657.3**	**5,335.8**	**2,590.2**	**2,096.8**
LAC-26 (% of World)	17.4%	18.9%	16.2%	16.6%	63.9%	43.3%

Source: World Resources Institute (WRI): CAIT 2.0 – Climate Data Explorer - http://cait2.wri.org/
Food and Agriculture Organization (FAO), FAOSTAT, http://faostat3.fao.org/
Note: Southern Cone includes Argentina, Brazil, Chile, Paraguay, and Uruguay; Andean includes Bolivia, Colombia, Ecuador, Peru, and Venezuela; Caribbean and Haiti includes The Bahamas, Barbados, Guyana, Haiti, Jamaica, Suriname, and Trinidad and Tobago; Central America and Mexico include Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Mexico, and Panama.

1.6 **While agricultural emissions were on the rise (18-20% increase in nine years), land use change emissions decreased, except in Bolivia and Peru.** Some 94% of the overall decrease is due to Brazil alone.[7] Depending on the source of data, agricultural emissions are 50-70% of those from forest conversion; but with a rising trend in the former and a declining trend in the latter, they may soon be of equal importance. With regard to world totals, LAC produced 17-19% of emissions from agriculture in 2009, but 62% of emissions from land use change, with Brazil alone accounting for 38% of the world total.

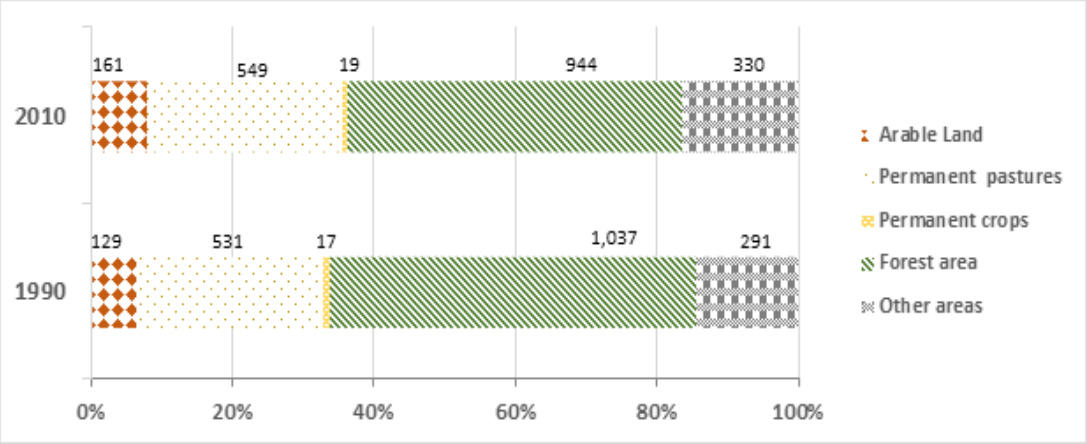
2. Emissions from land use change

1.7 **The measurement of emissions from LULUCF is highly uncertain, much more so than that of emissions from other sources.** These emissions are caused principally by the conversion of forest (and other natural vegetation, such as shrub land) into cropland or pastures, but they are counteracted to some extent by the absorption of CO_2 from reforestation, tree plantations, and forest regrowth. As Figure 3 shows, the profile of land use in LAC has changed from 1990 to 2010: the agricultural area—which includes arable land (annual crops and fallow land), permanent crops, and permanent

[7] FAOSTAT data were used, except for Brazil in 2009 (973.6), where Brazil's own emission estimate for 2009 (613.4) was used, as the FAO estimate clearly does not reflect the reduction in deforestation in Brazil.

grassland/pastures—has increased by 52 million hectares (ha), while the forest area has shrunk by 93 million ha, much more than the gain in agricultural area.[8]

Figure 3: Land Use Change in LAC, 1990-2010 (million ha)



CAIT 2.0, World Resources Institute

1.8 **Within agricultural land, croplands have increased more than pastures.** Part of the loss in forest areas went to "other" land, which includes unmanaged grasslands and savannas, other wooded land, and likely also abandoned agricultural areas regrowing as secondary forest, but not counted as forest by FAO.[9] Both the growth in permanent pastures and the loss in forest land have tended to slow since 2000, whereas the increase in arable land appears to continue strongly, not least because of the expansion of soybean.

1.9 **Land used for grazing livestock represents 75% of the agricultural area.** The growth of LAC's cattle herd has been strong over the last decades, from 320 million in 1990 to 400 million in 2010. Some 77% of the increase occurred in Brazil alone, largely in the Amazon forest. Relating these figures to the pasture area in LAC, a low average stocking rate of only about 0.73 emerges, indicating highly extensive, low-cost range and herd management. The growth of the cattle herd has important consequences for GHG emissions from agriculture in LAC, where enteric fermentation (methane) is by far the largest source.

1.10 **The dynamics of land use vary across subregions** (see Annex 4). In the Southern Cone, both cropland and pastures increased substantially, but not all at the expense of forest land; forest land diminished comparatively less than in other subregions, but at the

[8] The FAOSTAT data, which are largely based on country submissions, suggest that the average annual rate of forest loss was fairly constant during 1990-2005 (4.9 million ha/year), and that it slowed in 2005-2010 to 4 million ha/year. The Remote Sensing Survey 2010 of FAO, however, using a different methodology and sources of data, estimated that the loss of forest in South America (excluding Central America, Mexico, and the Caribbean islands) increased from 2.8 million ha per year between 1990 and 2000 to 4.3 million ha per year between 2000 and 2005, while FAOSTAT data give the increases as 4.2 million ha and 4.4 million ha per year, respectively. The RSS study estimates smaller forest areas in 2010 for South America than FAOSTAT: 800 rather than 859 million ha.

[9] FAO definition: *"Other land is the land not classified as agricultural land and forest area. It includes built-up and related land, barren land, other wooded land, etc."*

expense of "other lands," which are likely the southern natural grasslands (pampas). In the Andean countries, agricultural land shrank somewhat, but less than the forest area. Brazil (taken here as a subregion) stands out as the largest converter of forest area, almost 60% of the total, as well as the largest creator of new agricultural land, also about 60% of the total. The gain in agricultural land consisted of two-thirds crop area and one-third pasture; this is surprising, given the primary destination of cleared rain forest land, which is cattle ranching. The Caribbean subregion, which includes rain forest countries like Venezuela, Guyana, and Suriname, lost some agricultural land as well as forest land, although the Caribbean Islands by themselves show an increase in forest cover. Mexico and Central America had significant losses of forest, with some increase in arable lands and losses in pastures.

1.11 **Causes or drivers of deforestation cannot be reduced to single variables.**[10] The principal "proximate causes" of forest clearing in Latin America include agricultural expansion, whether for crops, livestock, subsistence, commercial purposes, rural settlements, traditional shifting cultivation, logging, mining, or infrastructure. Many causes underlie these activities: economic, demographic, social, and technological factors, along with institutional conditions and country policies.

3. Emissions from agriculture

1.12 **Agricultural emissions, as defined by the IPCC, are largely methane resulting from enteric fermentation in ruminant animals (cattle and sheep), manure deposition in pastures, and manure management.** A much smaller part is due to nitrogen fertilizer application (nitrous oxide, or N_2O) and various other crop-related sources (see Table 2).[11] About 90% of all agricultural emissions stem from animal husbandry (shaded in Table 2), and only 10% from crop agriculture.

Table 2: Emissions from agriculture in LAC (2000 and 2010), by source ($MtCO_2e$)

Source	2000	2010	%
Enteric fermentation	449.5	519.9	61.7%
Manure left on pastures	171.7	200.0	23.8%
Synthetic fertilizers	32.7	47.4	5.6%
Manure management	16.7	20.1	2.4%
Rice cultivation	15.4	16.4	1.9%
Crop residues	12.0	19.1	2.3%
Manure applied to soils	12.6	15.1	1.8%
Burning - crop residues	2.4	2.7	0.3%
Cultivated organic soils	1.5	1.5	0.2%
Total agriculture	**714.5**	**842.2**	**100%**

Source: FAOSTAT

[10] Geist, H.J., and Lambin, E. F., What drives tropical deforestation – A meta-analysis of proximate and underlying causes of deforestation based on subnational case study evidence, LUCC Report Series No.4, LUCC International Project Office 2001, Louvain https://www.pik-potsdam.de/members/cramer/teaching/0607/Geist_2001_LUCC_Report.pdf

[11] See Annex 2 for definitions of emission sources by IPCC.

1.13 **Emissions of animal origin are heavily concentrated in few countries (Table 3).** Low feed digestibility, poor animal husbandry, slow growth rates, and longer lives of animals mean more methane emissions per kilogram of meat. Technologies and practices that help reduce emissions exist—diet manipulation and feed additives, shortening storage duration, ensuring aerobic conditions, or capturing the biogas emitted in anaerobic conditions—but they are not widely used. FAO estimates that the emissions from cattle ranching could be reduced by approximately 30% if all producers in a given system, region, and agro-ecological zone were to apply the practices of the 10% of producers with the lowest emission intensity, while keeping the overall output constant.[12]

Table 3: LAC Emissions from Enteric Fermentation and Manure, 2010

Country	MtCO2e	Share
Brazil	379	49.5%
Argentina	88	11.9%
Mexico	68	9.2%
Colombia	51	6.7%
Venezuela	31	4.1%
Uruguay	22	2.8%
Paraguay	21	2.7%
Peru	20	2.7%
Bolivia	19	2.5%
Remaining 18	56	7.9%
Total	755	100%

Source: FAOSTAT

4. Mitigation policies

1.14 **Climate change mitigation policies and actions in LAC are focused almost entirely on reduction of deforestation, conservation of existing forests (avoided deforestation), and tree plantations.** Low-carbon agriculture is practiced only in Brazil and Mexico (where it is known as conservation agriculture). Little if any attention has been given to emissions of animal origin.

1.15 **For all approaches to mitigation, a legal framework that regulates land use and enhances land tenure security is essential.** Enforcement of pertinent laws can be made more effective through better monitoring of land use through remote sensing. Brazil has developed valuable experience in combining a demanding forest law, modern satellite surveillance methods,[13] strengthened instruments of governance (e.g., geo-referenced rural environmental cadaster), and municipal blacklists with applying economic instruments and incentives, such as access to credit, fining of buyers of cattle from

[12] Tackling climate change through livestock - A global assessment of emissions and mitigation opportunities. FAO, Rome, 2013.

[13] Brazil monitors deforestation in the Legal Amazon (5.1 million km^2) and the Cerrado (2 million km^2) monthly and yearly with satellite imagery, the largest coverage of land use monitoring in the world.

illegally cleared pastures, a voluntary moratorium on soybean purchases from land illegally cleared, and supermarket insistence on "clean" origin of products.

1.16 **In agriculture, mitigation needs to address primarily the methane emissions caused by animal husbandry and, in crop agriculture, the release of N_2O from soils after fertilization.** Animal breeding and animal nutrition approaches, as well as other technologies to reduce methane releases per unit of product (meat or milk), are being researched and evaluated around the world.[14]

1.17 **Agriculture can reduce CO_2 emissions by intensifying crop and pasture systems, reducing the need for clearing of new land, or by increasing carbon stored in soils, as with zero-tilling systems.** Two examples in LAC stand out. Brazil's low-carbon agriculture package of technologies (supported by the Forest Investment Program, or FIP, and by IDB with British funds) promotes adoption of zero-tillage, recovery of degraded pastures, use of integrated crop-livestock-forestry systems, and tree planting, among other things. The MASAGRO strategy promoted by the *Centro Internacional de Mejoramiento de Maíz y Trigo* (CIMMYT) and the Mexican government and funded in part from an IDB loan, promotes "conservation agriculture" for maize and wheat, also involving zero-tillage, non-removal of crop residues, and techniques to rationalize fertilizer use. MASAGRO is promoted more as an adaptation strategy but has a demonstrated mitigation impact as well, by incorporating carbon from crop residues in the soil.

1.18 **Carbon markets help reward farmers or countries for effective mitigation.** These markets are beginning to play a larger role in LAC for forest-related carbon credits, but are very little developed for reducing agricultural emissions and promoting the absorption of carbon into soils (although they are already traded on the Chicago Climate Exchange). The World Bank's World Development Report 2010 pointed to three measures that would promote agricultural carbon offsets and their verification:

a. Carbon monitoring should follow an "activity-based" approach rather than be based on expensive soil analyses. Specific and conservative emission-reduction factors for different agro-ecological and climatic zones are simpler, cheaper, and more predictable for farmers.

b. Transaction costs can be reduced by "aggregators," who combine activities over many smallholder farms. They can build up a permanent buffer and average out occasional reversals in sequestration. Pooling a portfolio of projects can make soil carbon sequestration fully equivalent to CO_2 reduction in other sectors.

c. Help for farmers, especially those who are poor and need assistance in financing up-front costs, must include strengthened extension services to disseminate knowledge about sequestration practices and finance opportunities.[15]

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[14] The regional technical cooperation project funded by IDB and undertaken jointly with New Zealand and the Regional Fund for Agricultural Technology (FONTAGRO) is an example for advancing mitigation.

[15] World Development Report 2010: Development and Climate Change, World Bank, 2009

1.19 **Measures that enhance the economic value of standing forest (sustainable use) seek to make conservation more attractive than clearing for other land uses.** This may include payments for keeping forest intact; promotion of agroforestry; monitoring and effective protection of protected areas; prevention, control, and reduction of forest fires; efficient use of forest products (round wood, firewood, wood for charcoal); low-impact harvesting technologies; and so on. Intensified agriculture and ranching (higher productivity per hectare) should reduce pressure on remaining forests. Reducing the forest area available for clearing by setting aside protected areas (and strengthening their protection) has been shown to be effective for reducing deforestation. And finally, reforestation of native forest and plantations of commercial forest (in non-forest areas) are an obvious mitigation option for absorbing carbon rather than avoiding its emission.

1.20 **Movement to plan and take action for mitigation, particularly with regard to land use change, has begun in many LAC countries.** Some countries have enacted national policies and laws to carry out their commitments for voluntary reduction of emissions. Many countries are preparing for action under the UN Program of Reduction Emissions from Deforestation and forest Degradation (REDD+), although some (Bolivia and Ecuador) reject a market-based "commodity approach" to GHG emissions and natural resources. Few have registered Nationally Appropriate Mitigation Actions (NAMAs) with the United Nations Framework Convention on Climate Change (UNFCCC). There are virtually no NAMAs in LAC regarding agricultural emissions, and very few on land use change,[16] but more can be expected as a result of new policies and planning. Mitigation of agricultural emissions is much rarer in policies and plans than mitigation of land use change. Brazil is a leader in introducing "low-carbon agriculture," but even Brazil has no significant programs to deal with emissions from its huge cattle herd.

1.21 **There are several programs to assist countries in their mitigation and adaptation efforts, such as:**

a. The FIP is a targeted program of the Strategic Climate Fund under the Climate Investment Funds. It supports developing countries' efforts to reduce deforestation and forest degradation (REDD) and promotes sustainable forest management that leads to emission reductions and the protection of carbon reservoirs. It provides financing to developing countries for readiness reforms and public and private investments, identified through national REDD readiness or equivalent strategies. With regard to LAC, FIP funds are programmed to be invested in Brazil, Mexico, and Peru.

b. The Forest Carbon Partnership Facility assists developing countries in their efforts to reduce emissions from deforestation and forest degradation and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks

[16] Chile has registered one NAMA in forestry for the implementation of the national forestry and climate change strategy. Brazil's commitment for emission reductions in 2010 is also considered a NAMA.

(REDD+) by providing value to standing forests. Of the IDB's 26 client countries, 16 are REDD+ country participants; three more are in the process of being approved.[17]

1.22 **The outlook for emission reductions in agriculture and land use in LAC is not promising.** World food demand has been growing substantially over the last decade, and South America has become a major supplier for that growing demand, particularly through production of soybean, beef, and poultry. The Region has some of the world's largest remaining areas for agricultural expansion, so the pressure on remaining forests, savannas, and grasslands is not likely to diminish substantially. Protecting remaining natural sources of carbon stock will require effective laws, policies, and governance, expanded protected areas, efforts to increase buyers' resistance to unsustainably produced food, and measures that make conservation and use of standing forest more economically attractive than deforestation. As policies and protection make new land for expansion increasingly scarce, ranching will likely become more intensive.

1.23 **The ongoing conversion of grasslands to cropland (soybean) or tree plantations in Uruguay, Argentina, Chile, and southern parts of Brazil may continue.** It will have some positive climate impact through increased CO_2 absorption, albeit at the cost of reducing grassland biodiversity. Low-carbon agriculture may become more widespread, but it may not address one of the major sources of GHG from agriculture: methane emissions, which grow with the size of the cattle herd, whether ranching becomes more intensive or not. Emissions per unit of product weight (meat, milk) might be reduced, however, with appropriate animal husbandry and shorter periods to maturity.

C. Vulnerability and adaptation to climate change

1.24 The IPCC has recently issued its 5th Assessment Report, including predictions of climate change globally and by regions (Work Group 1), as well as an assessment of impacts of and vulnerability to climate change (Work Group 2) (see Annex 6 for the executive summary for LAC). The state of the art of climate science and of likely scenarios for LAC has been summarized in Christensen (2014). The climate predictions have different, highly uncertain implications for different parts of LAC, but some general conclusions can already be drawn on the basis of the report of the IPCC Work Group 2: [18]

- As temperatures rise, crops' and grasses' evapotranspiration and water requirements will increase. Crop yields may react positively to higher concentrations of CO_2 in the air, and may react positively or negatively to higher temperatures alone, but they will decrease as a result of water stress.

- Higher temperatures will increase heat stress on animals, particularly cattle.

[17] Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Suriname are country participants. Belize, Jamaica, and Uruguay are candidates.

[18] Final Draft Report of Workgroup 2: Climate Change 2014: Impacts, Adaptation, and Vulnerability, Chapter 27: Central and South America.

- Temperature changes can alter the areas where certain crops grow best. Some crops may shift to cooler areas or higher altitudes, and tropical crops may see their potential growing area expanded in the south with lower incidence of frost. Sugarcane may expand its potential growing area southward, and soybean may benefit from moving back from tropical to more temperate climates.

- Lower rainfall and longer dry periods will reduce the water balance for plants, causing lower yields, lower animal productivity, and an increasing need for irrigation. This is likely to occur almost everywhere, except perhaps in southeastern South America, where rainfall has already increased and may increase further. Increased incidences of floods will reduce crop yields through waterlogging; if prolonged, floods may cause losses of entire crops.
- Lower pasture productivity will increase the pressure on the remaining natural forests.
- Higher rainfall in certain regions will increase the area where crops can be grown and may also increase the pressure on forests (as has already happened in Argentina), leading to deforestation of dry forests for crops.

- In the Andes, long-term water supply will be severely threatened with the melting of the glaciers that supply water for approximately 70 million people.

- Mexico, Brazil, Uruguay, and other countries are already familiar with the effects of droughts—severe losses in yields, losses of entire crops, and losses of animals, with devastating impacts on income, food supply, and poverty. More frequent droughts will also affect aquifer yields, and will reduce the areas where certain crops can be grown with acceptable risk.

- In the humid tropics, longer dry periods and consecutive droughts will augment susceptibility to fires and increase water stress sufficiently that rain forests will die off [19] (a process called *savannization*). Forest die-off in the Amazon would, in turn, likely cause severe reductions in rainfall in central and southeast Brazil, reducing the agricultural potential of Brazil's most productive regions. This could also be the result if deforestation in the Amazon were to increase beyond a certain threshold.

- Overall increased water demand (for human use, irrigation, and animal consumption) and reduced water supply will exacerbate water conflicts.

- Pests and diseases in animals and plants will behave unpredictably and may spread to previously non-endemic areas.
- Increases in ocean temperature and acidity will cause damages to coral reefs and losses in fish populations.

[19] An experiment in the Tapajós National Forest in the Brazilian Amazon simulated a prolonged dry period. It was found that the mortality of trees increased dramatically after three years, when large trees began to die. Measurements of drought sensitivity during the 2005 drought across the Amazon showed large carbon losses in the forest biomass, although photosynthesis continued unabated in the short term. Presentation by Prof. Troy Patrick, Alter do Chao, IDB and climate change workshop, September 2013.

1. Vulnerable populations

1.25 **The people who are most vulnerable to climate change are the rural poor, who have the greatest dependence on resources that are likely to be affected by climate change**. This vulnerable population lives in areas already suffering periodically from droughts and flooding, with few or no alternative means of livelihood, and with scant access to information, technical knowledge (extension), and credit. Poverty levels remain high in Central America (45%) and South America (30%, according to the IPCC report). Poverty is often associated with remoteness and/or cultural distance, making the task of reaching poor people with new and improved technologies difficult: it is difficult to "wholesale" information to remote populations. The rural poor account for over 60% of the poor in Mexico, Central America, and the Andean countries. Approximately two-thirds of the rural population living in poverty are small-scale farmers, and the rest are landless laborers.

1.26 **Half of the rural poor have only limited access to the productive resources they need to generate adequate agricultural incomes,** and projections suggest that this group will grow faster than the rural poor who do have such access. Moreover, there is a strong correlation between poverty and ethnicity: one-quarter of the population living in extreme poverty are indigenous people.[20] The IPCC Fifth Assessment Report (AR5) singles out the indigenous people in the Andes valleys, the rural poor of Northeast Brazil and in the semiarid basins of Argentina and Chile, and the smallholders living from rain fed maize production in Central America and Mexico as the most vulnerable to crop water stress, yield reductions, and drought.

2. Adaptation options

1.27 **Agriculture has always had to deal with drought, excessive heat, or floods and has adjusted to varying degrees through choice of crops and growing sites, agronomic practices, and selection of genetic material.** A first step to adaptation is addressing vulnerability to the present climate variability, as IPCC has already highlighted. Threats from climate change mean simply that the pressure to adapt will increase. Solid agricultural development (with higher yields, more efficient input use, diversification, intensification, higher incomes, etc.) will also reduce agriculture's vulnerability to climate change. The fundamental problem of agriculture remains how to proceed in the face of insufficient information and a high degree of uncertainty about weather and climate.

1.28 **Measures taken to mitigate climate change in agriculture may also be helpful in adapting to climate change,** as several LAC countries have noted in a submission to UNFCCC:

> *Climate change mitigation and adaptation actions related to agriculture should be integrated into broader strategies to help the sector adopt sustainable, climate smart agricultural practices. Mitigation can be one of adaptation's co-benefits in the agricultural sector, given that many strategies*

[20] IADB Agricultural Sector Strategy, 2000, summary, page i.

to reduce GHG emissions from agriculture or enhance carbon storage within or around agricultural land also enhance the overall adaptive capacity of agricultural lands, making them more resilient to climate change (e.g., through the establishment of agroforestry systems on degraded lands, soil conservation techniques, conservation agriculture, diversification, genetic improvement, conservation of remaining natural habitats through REDD+, etc.).[21]

1.29 The following are some general lines of adaptation action emerging from a review of literature, observation of developments, and the recent AR5.

- **Climate services.** Adaptation requires reducing uncertainty and furnishing adequate data and information to support farmers' decision-making. All countries need to improve their knowledge and collect, analyze, and disseminate data about climate, weather, and water resources. This requires investments in meteorological stations, river gauges, and radar stations, as well as institutions to analyze the data and make results available to others. This is part of the concept of "climate services" as a tool for adaptation,[22] for which some groundwork has already been done in IDB; climate services are being implemented in parts of Central America. Increasing quality, quantity, and density of data will also allow the downscaling of global circulation models to smaller regions and areas of countries, but this is more a long-term research objective than a contribution to current decision-making.

- **Assessment of vulnerability and risk.** While the possible negative impacts of climate change may be known in general terms, little is known about the vulnerability of particular regions and populations. The short- and long-term social, economic, and environmental impacts on farmers and landscapes should be assessed as a basis for adaptation strategies. Poverty mapping can be an important part of this process.[23]

- **Agricultural research.** The principal adaptation requirement is to prepare for higher temperatures, changing precipitation patterns, and reduced soil moisture availability. Agricultural research will be of prime importance in breeding/engineering crop strains that are more resistant to heat and moisture stress, and in developing farming models and technologies to make farming more resilient to heat, droughts, and floods. This includes research on efficient water use in irrigation. Research should be increasingly local, and its results validated locally. Pilot projects such as those in Peruvian watersheds serve the purpose of local testing, validating, and adapting. Some of the low-carbon agriculture technologies proposed as mitigation strategies will also help to make agriculture more resilient –for example, "integrated" farming

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21 AILAC countries (Chile, Colombia, Costa Rica, Panama and Peru), Oct. 2013 submission to the UNFCCC Subsidiary Body for Scientific and Technological Advice, http://unfccc.int/resource/docs/2013/sbsta/eng/misc17a01.pdf. This statement is supported by evidence from the MASAGRO initiative in Mexico.

22 F.R. Miralles-Wilhelm and R. Muñoz Castillo, Climate services: A tool for adaptation to climate change in Latin America and the Caribbean, Action Plan and Case Study Applications, IDB, 2011.

23 http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,contentMDK: 20219777 ~menuPK: 462078~pagePK:148956~piPK:216618~theSitePK:430367,00.html

systems that include crops, livestock, and tree cover, and systems with greater crop diversity, rather than monocultures.

- **Landscape approach.** Some of the Andean countries advocate an "*integrated landscape approach*" to adaptation and mitigation, "*designing and managing agricultural plots, farms and landscapes so that they contribute to both climate change mitigation and adaptation while also providing a full suite of benefits to meet food security and other livelihood needs. Agriculture is identified not only as a driver of deforestation, but also as a priority sector for delivering REDD+ goals.*"[24] These countries also advocate recognizing and using traditional indigenous knowledge and practices for adaptation.

- **Technology transfer and extension.** The most excellent research on agricultural adaptation is of no use if it is not applied by farmers. The weak link in LAC countries is the transfer of technology, particularly to small- and medium-scale farmers, through extension and technical assistance. The multilateral banks have neglected these areas over the last 20 years. Only recently have lending and assistance to support provision of public goods and services received more attention. There are promising new ways of transferring technology; for instance, Brazil, Mexico, and Uruguay tend to rely more on the role and interests of farmers' associations in connection with dedicated cadres of technical staff and on a strong link with agricultural research agencies, rather than on traditional, often ineffective, public extension agencies. The Mexican MASAGRO program (partially supported by IDB) deserves particular mention.

- **Pest and disease control.** With a warmer climate, pests and diseases may move into areas where they had not been observed before, and new ones may emerge. Plant and animal health services are essential public goods for agriculture, and will be even more so in the face of uncertain impacts of climate change. Vigilance and monitoring will be important, as will be study of the dynamic of pests and diseases in relation to various altitudes and geographical positions, and integrated management plans based on emerging information concerning crop, varietal, and pest response to varying climatic conditions.

- **Water resources management.** As water becomes scarcer and disputes over its use fiercer, countries will need to develop effective institutions of water management in their watersheds –institutions capable of forecasting the effect of changing climate on water availability at the basin and sub-basin level, setting and enforcing rules of water use, resolving conflicts, promoting informed participatory planning, and responding to changing conditions. Improved and expanded meteorological and hydrological data for planning, monitoring, and decision-making are essential; so are water laws to set the legal basis for water resource management. Where water scarcity becomes chronically severe, people may opt to move out of a region (as many have done in the Brazilian Northeast, for example). Adaptation may then require programs to upgrade skills and make it easier for people to move.

[24] AILAC countries, cited above.

- **Diversification.** Dependence on a single crop or agricultural activity of farms or of entire regions increases the risk of loss of production and income from adverse climatic developments and extreme events. Diversification of products and economic activities reduces the overall risk, as does increased off-farm employment of small-scale farmers and their families.

- **Insurance.** Farmers can contract insurance against such climate hazards as drought and flooding. Mexico has been at the forefront in implementing "parametric" insurance, which is triggered by certain measured climatic variables.

II. EVALUATION METHODOLOGY

A. Evaluation objectives

2.1 The evaluation had the following objectives:

- Review the CC content of Bank strategy and framework documents relevant to CC in the agriculture sector.

- Evaluate the extent to which CC-relevant projects enter the portfolio as a result of a strategic process of project selection.

- Evaluate the responsiveness of the portfolio to the GCI-9 priorities and describe the evolution of the CC-relevant Agriculture-LULUCF portfolio.

- Look at selected projects to identify possible lessons learned, and evaluate IDB performance.

B. Choice of countries and projects

2.2 Eight countries were chosen to achieve a balanced representation of subregions: Argentina, Uruguay, and Brazil from the Southern Cone; Peru and Ecuador from the Andean Countries; Dominican Republic from the Caribbean; and Guatemala and Mexico from Central America and Mexico. These countries include the major IDB clients in the AG-LULUCF sector representing 75% of the IDB's sector portfolio between 2004 and 2013.

2.3 To define the AG-LULUCF portfolio, OVE looked at all operations in three IDB-defined sectors—agriculture (AG), water and sanitation (AS), and environment and natural disasters (PA)—and selected projects with a CC-related theme.[25] This resulted in 222 projects approved between 2004 and 2013, with an approved value of US$3.1 billion.

2.4 From the 222 projects, the team selected 14 –from the eight study countries– for in-depth analysis, using the themes considered to be the most important from the standpoint of CC adaptation and mitigation: water resources management (three projects), agricultural

[25] Projects were selected if their objective or any component is related to CC. They were taken in their entirety, not decomposed by components.

public goods (four projects), vulnerable populations (two projects), forest protection and management (five projects), and low-carbon agriculture (two projects).[26]

C. Methodology

2.5 **Objective 1.** The method was to review the relevant strategy and framework documents and evaluate them for internal consistency and good practice.

2.6 **Objective 2.** The method was as follows:

1. For the eight countries, review the National Communications (NCs) to the UNFCCC and identify the country's CC priorities in the AG-LULUCF sector. This identifies the country's own understanding of climate priorities.

2. Review the post-2010 IDB Country Strategies (CS) for the eight countries and identify the CC-relevant agricultural and land use sector priorities. This identifies the Bank's understanding of the country's climate priorities.

3. Identify the CC-relevant agriculture sector priorities that appear in the results matrix of the IDB Country Strategy. This is a measure of the extent to which the Bank commits to priorities identified in the text.

4. Identify CC-relevant agriculture and forestry projects entering the IDB portfolio after 2010 in the eight countries, including projects still in the pipeline.

5. Finally, evaluate the overall logical process (NC priorities→ CS priorities- →CS results matrix→ Bank operations) to see to what extent (i) the IDB CS reflects the country's priorities as reported to the UNFCCC, (ii) the CS priorities result in commitments in the results matrix, and (iii) this process results in new projects.

2.7 **Objective 3.** OVE looked at the full AG-LULUCF portfolio and compared the post-2010 CC-relevant portfolio with the pre-2010 CC portfolio in terms of (i) numbers of operations, (ii) value of operations, (iii) percentage of CC operations relative to the full AG-LULUCF portfolio, and (iv) composition of the CC portfolio by type of operation and source of financing. We then evaluated the implications in terms of responsiveness to CGI-9 and likely implications for the future.

2.8 **Objective 4.** Using the 14 selected projects as illustrative cases, not a representative sample, OVE gave special attention to areas where CC content is particularly important, or where projects are likely to have innovative CC content. It is noteworthy that two categories that are particularly important for adaptation to climate change –public goods and integrated water resources management (IWRM) – represent over half of the value of CC projects. OVE reviewed the projects for design and implementation issues, and particularly for issues that appear to be recurring or specific to a particular theme. It should be emphasized that the sample of 14 projects does not provide the basis for any inference to the overall population of projects. The review is in the spirit of providing lessons learned, identifying what goes well or wrong with CC projects. When the results

[26] Several of the projects fit into more than one category, so the total sums to 16, not 14.

are consistent with evaluative results of OVE in other contexts, they may be considered mutually supporting.

III. REVIEW OF BANK STRATEGY FOR CC IN AGRICULTURE AND FORESTRY

A. Guiding Bank documents

3.1 The IDB has three documents to guide its CC actions in rural areas, briefly described below.

3.2 **Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy (March 2011).** This strategy, intended to implement the GCI-9 commitment, identifies key sectors, challenges, and areas for intervention. Key economic sectors are identified as agriculture, forestry, water resources management, energy and transport, tourism, health, and urban development. In rural areas, the key challenges are seen to be crop insurance, crop resistance to rising temperatures, water governance frameworks, reduced deforestation and implementation of sound forest management practices, strengthened property rights, and protection of pristine high-ecosystem-services areas. In the agriculture and livestock sector, priority actions include monitoring, control and eradication of pests and diseases, new technology and extension, improved seeds and techniques (rotations, zero-tillage, etc.), improved efficiency in the use of water and fertilizer, improved forecasting and assessment of climate risk and vulnerabilities, reduced carbon-intensity of production, biofuels, and improved water resource management. The strategy highlights the conclusion of the Fourth Assessment Report of the IPCC, which *"recognized that reducing vulnerability to current climatic variability can effectively reduce vulnerability to increased hazard risk associated with climate change (IPCC, 2007)."* In short, good agricultural development policy is good adaptation policy.

3.3 **Climate Change Action Plan (2012-2015).** This document was intended to help the Bank to get up to speed in its internal response to CC. With regard to adaptation, it establishes five priority areas for intervention, all of which are, to a greater or lesser degree, relevant for agriculture: (i) CC data and analysis (models, downscaling), (ii) water supply and water quality, (iii) coastal and marine ecosystems, (iv) forest and fragile ecosystems, and (v) agriculture. With regard to mitigation, LULUCF is the first priority. The action plan focuses on (i) consolidating knowledge capacity, (ii) scaling up climate investments, and (iii) greening the IDB portfolio.

3.4 **Sector Framework Document on Agriculture and Natural Resources Management (May 2013).** This document is intended to guide IDB's intervention in the rural sector, also in response to climate change.[27] The document reflects an extensive review of the empirical evidence on the effectiveness of agricultural development interventions. It

[27] Note that this document replaces Agricultural Sector Policy (OP-721), Forestry Development Policy (OP-723), Rural Development Policy (OP-752), Fisheries Development Policy (OP-724), and Mining Policy (OP-725), as well as the Agricultural Development Strategy (GN-2069) and the Rural Financing Strategy (GN-2022).

defines three dimensions of success, or expected results, to be achieved through development interventions (see Box 1). In general, this is a highly relevant document, especially as it stresses the need for IDB to monitor and learn from its projects. In addition, its emphasis on public goods, IWRM, irrigation, and credit to the poor to permit them to invest in adapted technologies are all extremely important in an adaptation strategy. It could have been strengthened with additional guidance on identifying and targeting at-risk populations and tailoring research and innovation and plant and animal health initiatives towards changing climatic conditions.

Box 1. Three dimensions of success in agriculture and natural resources

Result 1. Agriculture in the region reached high levels of productivity, and climate impacts in the sector are managed	**Result 2. Agricultural earnings for rural families are increasing in a sustained fashion**	**Result 3. Natural resources in the region are exploited in a sustainable fashion and the region's carbon footprint is shrinking**
• Improve efficiency of factor and product markets, encourage private investments, and prioritize the efficiency of agricultural public expenditures • Strengthen rural infrastructure and provision of public goods • Improve risk management by producers in the face of natural threats such as floods and droughts	• Improve access to financial markets for poor and excluded groups • Improve quality of income support to poor, decoupled from production	• Promote sector policy and governance that encourages sustainable use of natural resources, in the context of climate change • Establish clear and secure property rights over critical natural resources including land, water, fisheries and forests.

3.5 Together, these documents can be taken to constitute the following strategy, which is consistent with best practice as discussed in Chapter 1.

1. **Increase financing of agricultural public goods.** The agriculture sector needs to return to significant financing of public goods –pest and disease control; agricultural research, especially on crops and techniques adapted to small-scale farmers under conditions of increased temperatures and moisture stress; integrated water management systems; and crop insurance– with a heightened orientation toward climate change and climate variability.

2. **Orient interventions to increase the incomes and adaptability of the rural poor.** The incomes of family and peasant farms should be increased through improved access to new technologies (directed innovation and extension); improved access to credit; increased organization in credit, marketing, and purchasing associations to achieve economies of size; and, where appropriate, cash income transfers delinked from production parameters. Improved land tenure forms a critical part of this package.

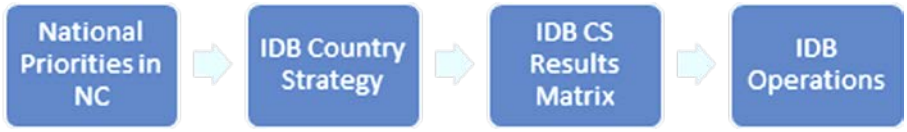
3. **Strengthen hydrological monitoring and weather forecasting.** Improved hydrological monitoring and systems of weather and short-term climate forecasting are of high priority now and will become more so in the future.

4. **Promote low-carbon agricultural practices.** Mitigation should be strengthened through innovation and extension for low-carbon agricultural practices, including agroforestry, conservation tillage, and alternative crop rotations.

5. **Promote forest management and protection of conservation areas.**

B. Country strategies and choice of IDB operations

3.6 CSs establish priorities that generate IDB programs and operations. As mentioned above, the logical chain we are analyzing is as follows:



3.7 **The correspondence of CC activities in CSs to those in NCs is varied and the representation of CC priorities in the CS results matrix varies broadly.** For half of the countries –Argentina, Ecuador, Mexico, and Uruguay– there is good correspondence between IDB priorities and the priorities in the NC; the areas assessed as priorities in the CS have a significant overlap with areas identified as important in the country's NC.[28] Peru has a weak link to the NC, while Guatemala has no overlap in priority areas, Dominican Republic has no specific CC content in its CS, and Brazil's NC does not specify priorities.[29] Furthermore, the appearance of an indicator in the results matrix for a given CS priority area generally signifies a higher degree of accountability than the mere mention in the document. Again, half of the countries –Argentina, Ecuador, Mexico, and Guatemala– exhibit a high correspondence between priority areas identified in the CS and measurable indicators in the results matrix.[30] For Ecuador, correspondence was somewhat less than for the other three countries, but it had indicators for two of the five priorities, as well as an indicator corresponding to an NC priority that was not mentioned in the CS. Peru had only one indicator corresponding to one of the four text priorities; however, it had an additional four indicators corresponding to important CC outcomes not mentioned in the CS (one of which was mentioned in the NC). Finally, Brazil, Dominican Republic, and Uruguay had no result indicators corresponding to the CS

[28] Note that the Bank cannot possibly work in all the areas identified as important in the NC. We are looking here to see if the areas the Bank has chosen to work in are also areas defined as priorities in the NCs.

[29] Since 2012 there is weak correspondence between operations (approved or in the pipeline) and CSs. Of 36 CC operations in the post-2010 portfolio, only 12 are associated with priorities identified in the CS, and 11 have a corresponding indicator in the results matrix. By this criterion, Ecuador, Argentina, and Mexico stand out. By the criterion of percentage of operations with corresponding indicators in the results matrix, Brazil and Argentina lead, followed by Mexico and Peru.

[30] Some of the indicators cannot possibly be the sole result of IDB activities, for example, increases in agriculture total factor productivity as an indicator of extension and/or agricultural research success. However, our interest in this analysis is in whether or not the Bank appears to be willing to be held accountable for the success of a CC priority.

priorities, although the Brazil CS contained one result indicator related to an important CC activity (extension) that was not mentioned in the CS.

3.8 **There is also mixed evidence of strategic analysis preceding IDB CC activities.** Among the eight countries reviewed, Argentina and Mexico showed most evidence of strategic planning, and Peru also rated well. It is important to observe that these three countries were the only countries for which a Climate Thematic Note was prepared before the CS, providing evidence that the Thematic Note improves strategic planning. However, for no country did the CS show evidence of a truly strategic analysis of adaptation/mitigation needs, including what was being done by others and IDB's comparative advantage.[31]

C. The agriculture and LULUCF climate change portfolio

3.9 **This portfolio review evaluates the responsiveness to the GCI-9 lending priorities and describes the evolution of the CC-relevant AG-LULUCF portfolio** (see Annex 8 for more details). Between 2004 and 2013, the Bank approved 222 loan and grant operations, for a total value of US$3.1 billion, as part of the agriculture, forestry and land use change portfolio related to climate change: US$109 million for TCs, US$74 million for investment grants, US$2.5 billion for investment loans, US$367 million for policy-based loans, and US$1.8 million for private sector loans.[32]

3.10 As described above, the projects in the portfolio were identified by sector. Within the three IDB-defined sectors –AG, AS, and PA– projects with CC content were selected and classified in one of the following categories:

- **General agriculture:** projects to strengthen and promote the offer of public goods such as health, research, and innovation services; modernization or strengthening of the land administration system and cadaster information; projects promoting the adoption of new technologies among producers or facilitating their adoption through subsidies or cash transfers programs; and capacity building for the adoption of technical innovations, agriculture risk management mechanisms, or sustainable crop management practices. Projects to increase farmers' access to markets or financial resources were not included.
- **Forest-related projects:** promotion of and guidance in the sustainable use of forest resources; sustainable management of biodiversity in forest areas; forest conservation efforts; protected areas and protection of ecosystem services; programs to reduce deforestation and forest degradation; generation and management of deforestation and climate change impact data; and projects related to promoting sustainable business in forest landscapes.

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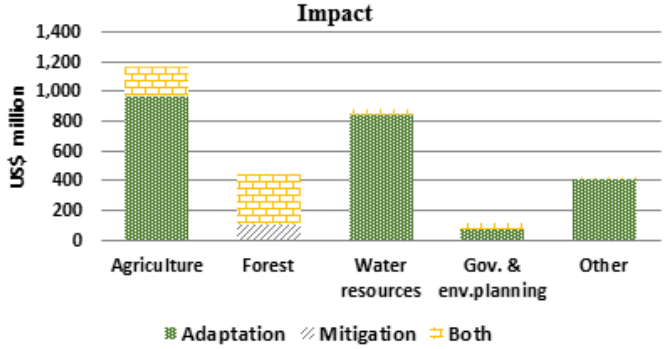
31 It is important to understand the limitations of this analysis with regard to operations, however. For example, Uruguay has no CC projects in the post-2010 portfolio and pipeline, but has two important CC-relevant earlier projects under implementation. Mexico is also implementing an important agricultural research project that does not appear in this post-strategy analysis.

32 Cancelled operations and operations from the Multilateral Investment Fund (MIF) and the Inter-American Investment Corporation (IIC) are not included.

- **Irrigation and water resources management:** protection of rivers or watersheds; increasing the adaptive capacity for water management among communities or producers; creation of or guidance for water funds to promote private sector participation in the conservation of water ecosystems; adaptation or management plans for the water sector; monitoring of glacier dynamics; construction or rehabilitation of rural water infrastructure; establishment or management of water reserves; extension work to improve the management of irrigation systems; promotion of water users associations; institutional strengthening of national water authorities; and development of hydrological models or estimations.
- **Government and environmental planning** to strengthen ministries of agriculture or environment for strategic planning, management, or administration, through human resources, management tools, technology or communications, and infrastructure or equipment.
- **Other projects:** mainly development programs for a particular region with multiple components, each of which might be classified in one of the previous categories.

3.11 **In terms of CC impact, adaptation represented 77% of the total, mitigation 19%, and both 4%.** Of all AG, AS, and PA projects, a total of 18% by value over the period 2004-2013 have objectives or components related to CC. Figure 4 shows the distribution of the CC-relevant projects by theme and impact.

Figure 4: CC Operations 2004-13 by Theme and Impact



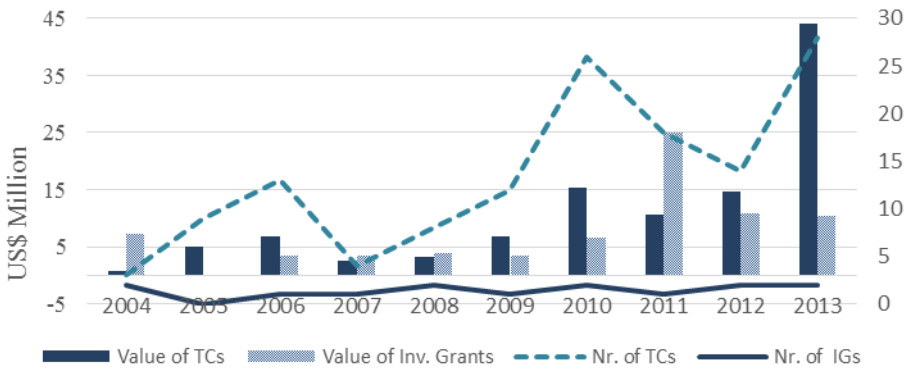
3.12 **There has been a surge in technical cooperation and investment grants.** While investment loans fell by 21% after 2010, policy-based operations (PBL/PBPs) doubled, TCs nearly tripled, and investment grants more than tripled. The increase in the value of PBL/PBPs and TCs following 2010 may be a better indicator of IDB's response to CGI-9 priorities than loans. Relatively few investment loans initiated in response to the GCI-9 could be expected to be approved by end-2013. This significant CC response in TCs shows clearly in Figure 5. Both the numbers and value of TC operations were higher in 2010-2013 than ever before. With regard to the value of investment grants, every post-2010 year exceeds the highest year over the 2004-2010 period; this increase is due to the size of the operations, as the numbers of grants show no clear trend.

Table 5: Annual Average Amount Approved over Three Periods (US$ million)

Period	Loans	PBL/ PBP	Private sector	Technical cooperation	Investment grant
2004-2007	143.9	50.0	0	3.8	3.5
2008-2010	367.0	18.3	0	8.5	4.6
2011-2013	288.8	37.3	0.6	23.1	16.0

Source: OVE calculation using IDB Corporate Database

Figure 5: Trend of CC Technical Cooperation and Investment Grants[IADB1]



Source: OVE calculation using IDB Corporate Database

3.13 **The increase in TCs (see Table 6) is largely due to IDB-financed regional knowledge products (KPs)** which grew from three in 2011 to nine in 2013. Nine of the 2013 TCs are for biodiversity-related operations (of which six are regional KPs), and seven of them support water resources management operations (one is a regional KP). In addition, TCs supported community-based forestry in Brazil, land titling in Peru, and two regional KPs in the area of agricultural research. While the number of TCs doubled between 2012 and 2013, the total approved amount nearly tripled (see Table 7). Major increases in 2013 were in the IDB-financed activities referred to above, a SECCI contribution of US$1 million to the Amazon Region Protected Areas (Brazil) transition fund, and US$17.5 million from the FIP, financing two projects: a forest inventory in the Brazilian Cerrado (US$16.5 million) and support for forest-related micro, small, and medium enterprises in Mexican *ejidos* [33] (US$1.1 million).

[33] An area of communal land used for agriculture, on which community members individually possess and farm a specific parcel.

Table 6: Numbers of TC and SPE Operations by Source of Financing, 2011-2013

Year	IDB	SECCI	GEF	CIF	Other Funds	Total
2011	9	1	2	1	5	18
2012	7	0	3	1	3	14
2013	19	1	0	2	6	28

Source: OVE calculation using IDB Corporate Database

Table 7: Amounts of TCP Operations by Source of Financing, 2011-2013 (US$ million)

Year	IDB	SECCI	GEF	CIF	Other Funds	Total
2011	4.6	0.3	4.1	0.3	1.4	**10.6**
2012	2.5	0.0	4.6	2.0	5.7	**14.7**
2013	13.1	1.0	0.0	17.5	12.4	**44.0**

Source: OVE calculation using IDB Corporate Database

3.14 **Some of the TCs may lead to larger CC-related operations in the future.** The Bolivia Water Resources Sector TC is intended to develop and establish policy reforms to be framed in an upcoming water sector policy loan. The Brazil community forest TC could possibly lead to a forest-economy-related loan in the state of Amapá, building on the experience of the two projects in Acre state. The Biodiversity and Ecosystem regional KPs are explicitly intended to identify potential investments in regional ecosystem protection, and the Indigenous Peoples Regional KPs may also have potential to generate future activities (See Box 2 for further information). Two operations in Peru are for preparation of projects that have possible CC adaptation benefits, one for the terrace program and another for improving the land cadaster. Finally, a Peru Integrated Water Management TC will include pilot watershed projects and has significant potential to develop into a future CC-related operation.

Box 2: Regional TC for agricultural research: missing CC opportunities

The Agricultural Research TC is an interesting initiative, but judging by its TC abstract, it fails to address CC issues directly. The abstract focuses on the role of agricultural research on total factor productivity, the role of the private sector, and the assessment of the shifting orientation of agricultural research in the most advanced countries of the Region. It makes no mention of the need to assess whether CC issues are being adequately addressed in the Region's agricultural research agenda.

3.15 **Numbers and values of operations since 2010 are low. However, there is evidence that the portfolio may be evolving to reflect the GCI-9 CC commitment.** This is especially evident in the large increase in CC-related grants and TCs that have been approved since 2010. Several other more recent changes include the increase in water resources and forestry loans, both areas of significant CC relevance. However, the decline in projects related to providing public goods to agriculture –in particular the development and adoption of CC-adapted crops, animals, and agricultural practices– is an area of concern.

D. The mitigation vs. adaptation balance

3.16 **Mitigation is relatively new in IDB's agriculture-related CC portfolio, which tends to be predominantly adaptation** (Table 8). Adaptation represents over 75% of the CC projects throughout the period, with mitigation increasing sharply post-2010. The tenfold increase in mitigation is due to the increase in the number of TCs and grants discussed

above, as well as to the approval of Brazil's Acre Sustainable Development Program in 2013 for US$72 million. Similarly, the large increase in the approved amount for projects having both adaptation and mitigation benefits in the 2008-2010 period is largely due to one project, the Serra do Mar and Atlantic Forest Mosaics System and Socio-Environmental Recovery Project in Brazil, approved for US$162.5 million in 2010. It promotes the conservation, sustainable use, and socio-environmental recovery of conservation units in Brazil's Atlantic Forest and its surroundings, and resettlement of people from landslide-prone areas.

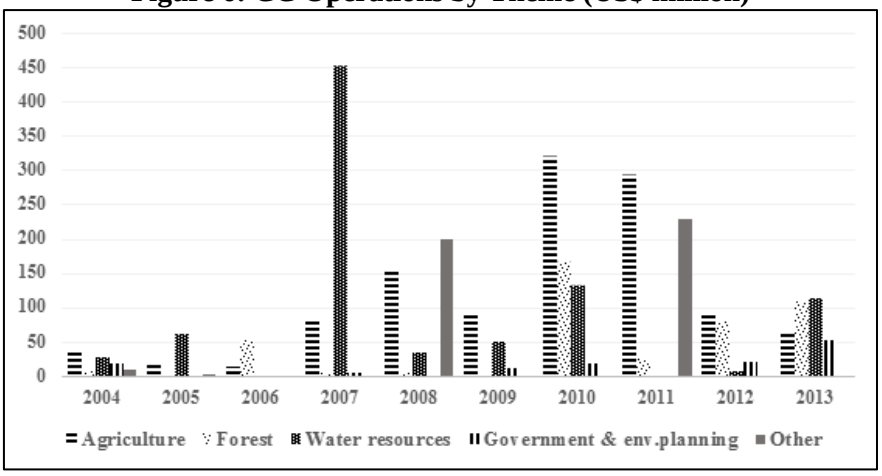
Table 8: Evolution of the Adaptation - Mitigation Mix: Annual Averages 2004-2013

	Average annual approved amount (US$ million)			Average annual number of operations		
Period	**Adaptation**	**Mitigation**	**Both**	**Adaptation**	**Mitigation**	**Both**
2004-2007	158.2	1.9	41.1	6	2	6
2008-2010	301.0	3.0	94.3	18	2	5
2011-2013	275.6	35.3	54.3	15	5	10

Source: OVE calculation using IDB Corporate Database

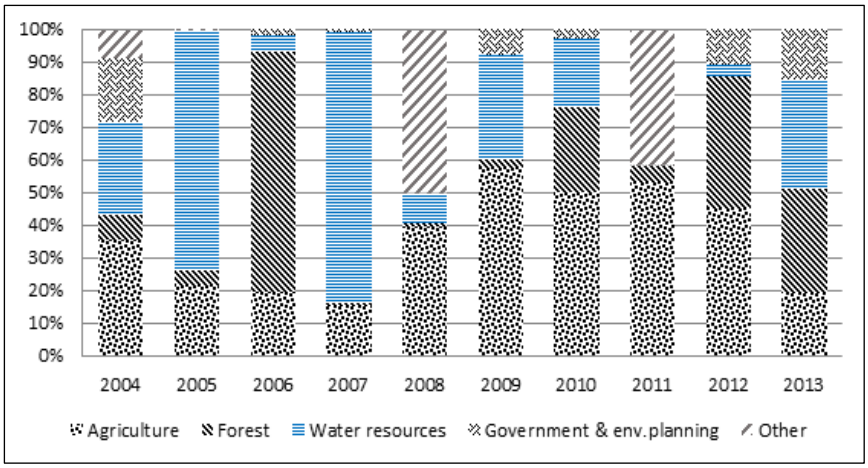
3.17 Figure 6 shows the composition of CC operations by theme and value in 2004-2013, and Figure 7 the percentage share of the four themes during that period in the total of CC operations considered.

Figure 6: CC Operations by Theme (US$ million)



Source: OVE calculation using IDB Corporate Database

Figure 7: Share of Themes in CC Operations

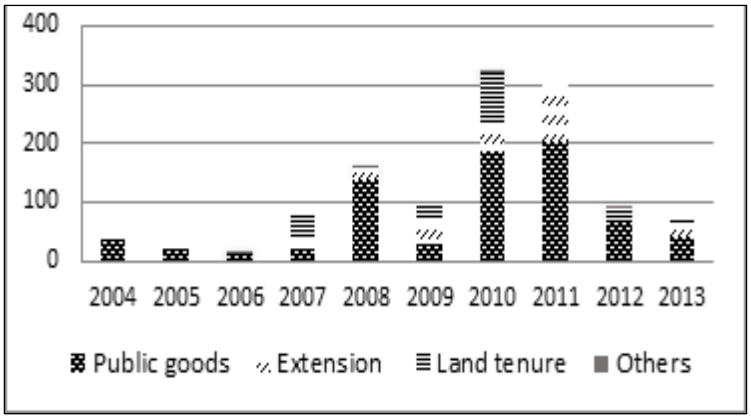


Source: OVE calculation using IDB Corporate Database

3.18 **In absolute terms, operations in the agriculture category reached a peak in 2010 with a total of 13 projects and US$319.9 million approved** (Figure 8). This peak is explained mainly by the approval of two large projects: (i) Strengthening of the Agricultural Innovation System in Argentina (AR-L1064), for US$170 million, intended to support institutional modernization, including technological linkages and international cooperation, and the efforts of generating and transferring technologies to producers; and (ii) the National System for Rural Land Information and Management and Technology Infrastructure in Ecuador (EC-L1071), approved for US$90 million, with the objective of improving the cadastral management and rural property registry system to provide information for land management and land use planning in rural areas.

3.19 **Within agriculture, most of the projects are related to the provision and strengthening of public goods and,** in particular plant and animal health and crop and animal research and innovation (Figure 8). Most of the projects in this category include institutional strengthening and promotion of extension services to small- and medium-scale farmers. The largest program in this subcategory is the Program to Strengthen Rural Public Goods in Mexico (ME-L1045) approved for US$190 million

Figure 8: Types of Agriculture projects over time (US$ million)



Source: OVE calculation using IDB Corporate Database

in 2011. The program includes activities to support plant and animal health; technology generation, innovation, and transfer; and research on fisheries. In addition, 16 projects were financed under the category extension to promote the adoption of cropping technologies among producers. In total, the Bank financed US$238 million with this purpose, including the Rural Productive Development Program for Uruguay (UR-L1064, for US$28.4 million) in 2011.

3.20 **The highest approved amount for projects for water management, irrigation, or conservation of water resources was in 2007.** That year, the Bank approved four projects totaling US$453 million (one for Argentina, one for Haiti, and two for Peru), all now completed. Two large projects supported irrigation and drainage systems works and water regulation systems: the Argentina Water Infrastructure Northern Provinces Development program (AR-L1015) for US$240 million, and the Peru Water Resources Program Phase I (PE-L1024), for US$200 million. In 2010, the Bank approved the second phase of the water resources program for Peru (PE-L1050, for US$25 million) and the Development Program for the Southwest Region of the State of Tocantins in Brazil (BR-L1152, for US$99 million), with the objective of developing infrastructure for rural development, mainly irrigation and drainage systems such as dams, canals, and pumps. In 2013, the Bank approved 14 projects for a total value of US$113 million, of which the program of irrigation with a watersheds approach for Bolivia (BO-L1084, for US$57 million) is the largest, followed by the water management program in the Artibonite Basin in Haiti (HA-L1087, for US$25 million).

3.21 **The Bank approved a total of 73 projects related to forestry, protected areas, or biodiversity, reaching a total of US$461.5 million during 2004-13.** Up to 2009, the average annual value of such operations was generally below US$40 million. Thereafter, the nature of operations changed from mostly biodiversity conservation to mostly production forestry, and loan amounts increased substantially. The peak of approved amounts in the category was 2010, and is explained by the approval of the Brazil Serra do Mar Project (BR-L1241, for US$162.5 million) mentioned above. The peak in 2006 for this subcategory is explained by the Petén Development Program for the Conservation of the Mayan Biosphere Reserve (US$30 million), intended to preserve the natural resources and cultural heritage of the Region through land regularization in the Mayan reserve and the promotion of sustainable tourism initiatives.

3.22 **From 2004 to 2013, the Bank approved 34 projects with the main objective of supporting government capacity in relation to agriculture or forestry-related activities.** The share of this category in overall operations is low (see Figure 8), because it contains only operations for which all components are related to institutional strengthening or support for planning or decision-making. Approved amounts in this category peaked in 2013 with the approval of the Environmental Strengthening Phase I for Guyana (GY-L1039, for US$16.9 million) and the Institutional Strengthening and Reform of the Agricultural Sector Phase II in Haiti (HA-L1082, for US$15 million). Both projects are programmatic policy-based loans designed to help strengthen of environmental governance and overcome institutional constraints to improving agriculture productivity.

3.23 **There are four projects classified as "other" in the CC-related portfolio**. These are all regional development programs with components related to regional infrastructure for irrigation, food and agricultural public goods, and increased capacity of institutions responsible for the management of natural resources and agricultural productivity. The two peaks in 2008 and 2011 are explained by the Provincial Program for Agricultural Services for Argentina, Phases II and III, approved for US$200 and US$230 million, respectively.

3.24 **Outside of this portfolio, during 2004-2013 the Bank approved also 11 operations related to livestock[34]—**four loans for a total of US$279.2 million and seven TCs and grants for a total of US$4.8 million. Most of these interventions have been related to promoting productivity and increase quality of the beef and dairy products, and only one project includes a component "explicitly" related to climate change[35]. More than two thirds of loans and TCs were directed to increasing animal health or promoting innovative practices in the sector. Looked at through a CC lens, these projects are positive from an adaptation viewpoint since they improve productivity, farmers' incomes, and the system's ability to respond to new pest outbreaks. From a mitigation standpoint they might be considered negative, as a larger herd increases methane emissions. However, because healthy and productive animals reach their market weight faster, they tend to emit less methane per kilogram of production.

E. Analysis of illustrative projects

3.25 This study selected eight countries for review—Argentina, Brazil, Dominican Republic, Ecuador, Guatemala, Mexico, Peru, and Uruguay—so that each region and the largest IDB clients would be represented. From the CC-related operations in these eight countries, OVE selected 14 projects as illustrative cases for a closer review, trying to keep a balance among the main "themes" and among regions (Table 9). Annex 9 presents a short description of each project.

3.26 **Project evaluation is hampered by the limitation of their results frameworks.** For instance, stated project objectives do not always define the outcome(s) a project can achieve, but refer sometimes to goals towards which a project merely contributes. Achieving means accountability, whereas contributing does not. Similarly, indicators do not always correspond to the project development objectives. Instead, they sometimes measure mere outputs instead of outcomes. Newer projects have better results frameworks; and if they are combined with stronger supervision, project activities might remain better focused on project objectives.

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34 The livestock subsector was not included in the overall CC-related agriculture portfolio because of the dual (positive-negative) effect on climate change.

35 One loan for cattle ranching aims explicitly at adoption of technologies to reduce emissions by cattle: the Estancias del Lago Project in Uruguay was approved in 2012 with the purpose of developing an improved dairy system, including a biogas plant to capture the methane and generate thermal energy.

Table 9: Illustrative cases

Operation number	Operation name	Instr.	Year	Status	US$ million	Theme
AR-L1015	Water Infrastructure: Northern Provinces Development	LN	2007	COMPL.	240.0	Water resource mgmt., irrigation
AR-L1067	Forest Sustainability and competitiveness			ACTIVE	60.0	Forestry
BR-L1001	Technological Innovation & New Management Approaches in Agricultural Research (AGROFUTURO)	LN	2004	COMPL.	33.0	Agriculture
BR-L0313 BR-L1289	The Acre Sustainable Development Program (2 projects PDSA-I and II)	LN	2002 2013	ACTIVE	72.0	Forest conservation
BR-X1028	Low Carbon Agriculture and Avoided Deforestation for Reducing Poverty	TC	2013	ACTIVE	39.2	Agriculture
DR-L1054	Research and Agricultural Development Program	LN	2012	ACTIVE	22.0	Agriculture
EC-L1121	Chimborazo Rural Development Investment Program	LN	2013	ACTIVE	15.0	Agriculture
GU-L1002	Petén Development Program for the Conservation of the Mayan Biosphere Reserve	LN	2006	ACTIVE	30.0	Forest conservation
ME-L1045	Program to Strengthen Rural Public Goods	LN	2011	ACTIVE	190.0	Agriculture
ME-L1120	Financing Low Carbon Strategies in Forest Landscapes	LN &TC	2012	ACTIVE	10.0	Forestry
PE-L1070	Water Resources Management Modernization Program	LN	2009	ACTIVE	10.0	Water resources mgmt.
UR-L1016	Support for Agricultural Public Management	LN	2009	ACTIVE	10.5	Agriculture, government
UR-L1064	Rural Productive Development Program	LN	2011	ACTIVE	28.4	Agriculture

3.27 OVE interviewed government official and IDB staff and review relevant project documents. The evaluation team rated project by several dimensions (see Annex 10). The salient findings from these rating process are as follows:

- Alignment: Nine projects had excellent alignment with country or IDB strategy objectives, five only marginal alignments.
- Results framework: Five projects had an excellent results and indicator framework, two a satisfactory one, and five an unsatisfactory one.
- Component design was satisfactory for twelve projects, marginally satisfactory in one case, and unsatisfactory in one case.
- Implementation arrangements were satisfactory in twelve cases, marginally satisfactory in one case, and unsatisfactory in one case.
- Implementation progress was unsatisfactory in five cases, marginal in three cases, satisfactory in three cases, and not rated for two cases.
- Results achievements were rated for only seven projects: two had satisfactory achievements, four marginal ones, and one unsatisfactory achievement.

3.28 **The remainder of this section presents the evaluation findings of the illustrative projects by theme.** Under "adaptation" projects in the areas of water resources management, public goods, and vulnerable populations are reviewed. Under "mitigation" projects in the areas of forest protection and management and low-carbon agriculture

were reviewed. Finally, OVE assessed IDB value-added and institutional strengthening support.

1. Adaptation

a) Water resources management

3.29 **Strong institutions, established legal frameworks and sustained political support contribute positively to project effectiveness.** Three water resources management projects were reviewed: the Ecuador Chimborazo Rural Development Investment program, the Peru Water Resources Management Project, and the Argentina Water Infrastructure: Northern Provinces project. Both the Ecuador and Peru projects were designed in close association with the World Bank. The Chimborazo project is a follow-on to a World Bank project, and builds on the lessons learned from it. It supports irrigation user boards, protect micro watersheds, and improve and rehabilitate roads. The Peru Water Resources Project was prepared jointly with the World Bank, with both banks financing national-level activities and parallel pilot watershed projects. While the Ecuador project has the advantage of experienced implementers and a good complementary legal framework contributing to projects' results; the Peru project was implemented in the context of a recent and incomplete consolidation of Peru's water resources institutions.[36] As a result, the project is institutionally complex, deals with multiple levels of government, and suffers from weak commitment from regional governments.[37] While the project is roughly on track for implementation of physical infrastructure, to fully consolidate institutional gains would require sustaining reform efforts well beyond the scheduled date of project termination. The Argentina Water Infrastructure: Northern Provinces project was intended to be predominantly an irrigation project with relatively small water, sewer, and institutional strengthening components. During implementation, however, irrigation and institutional strengthening appear to have been largely abandoned and the project resources dedicated to urban water supply and flood control. While the original project projected the incorporation of 95,000 new irrigated ha, the current Project Monitoring Report (PMR) projects only 4,000. The project proposal highlighted the poor financial condition of the regional water authorities and the critical importance of commitments to increase collection levels, reduce operating costs, and increase water rates.[38] As of November 2013 (nearly seven years after project approval), 100% of the project resources have been disbursed and there has been neither implementation of the institutional strengthening component nor installation of the

[36] Project design and the results matrix are excellent in the case of the Chimborazo project, while the design of the Peru project suffers from excessive complexity, largely because of the underlying complexity of the Peruvian water management framework.

[37] Among other implementation problems in the Peru project has been the need to abandon work in one watershed and move to a different one because of lack of regional political support, and poor progress allocating water rights and implementing the water pricing formula.

[38] The proposal states that *"if current conditions persist, with no changes in operating costs or rates, the companies will continue to have negative cash flow and their financial positions will gradually deteriorate."*

micrometers required for rationalizing water charges.[39] Progress toward meeting these targets was not monitored in the PMRs. No outcome indicators had been measured, and for several outcome indicators no methodology for verification had been established. Despite the significant difference between the proposed project and the final outcome, the project was not formally restructured.

b) Agricultural public goods

3.30 **A common theme in agriculture public goods projects was the lack of government ownership of and commitment to original project objectives. Yet, some positive results were achieved.** Four agricultural public goods projects were reviewed: the Brazil Agricultural Research Project (AGROFUTURO), the Mexico Program to Strengthen Rural Public Goods, the Uruguay Support for Agricultural Public Management, and the Dominican Republic Agricultural Research and Development Program.[40] In Brazil´s AGROFUTURO, the program was innovative[41] but complex; the midterm review made significant changes to the result framework accommodating delayed implementation and changed government priorities. The lack of clear outcomes-based indicators made the effect of these changes on project objectives impossible to monitor. In addition, project resources became part of the ongoing activities of the agency, so IDB attribution is difficult to discern. Although the specific identity of the Mexico and Uruguay IDB projects is much clearer, both countries also appear to be making significant changes to the original design. In the Mexico project, most IDB resources for research activities have not been used.[42] Yet, a positive CC-relevant outcome of this project was its links to CIMMYT (*Instituto de Internacional de Mejoramiento del Maiz y Trigo*) and the MASAGRO program (*Modernizacion Sustentable de la Agriculture Tradicional)*, which appears to have produced CC-relevant research and extension results. The Uruguay project became active at the time of a change in government, and as a result has suffered from weak ownership and from resistance to institutional reforms that have been only weakly implemented.[43] Yet, there has been good implementation of the phytosanitary component, which is particularly important from a climate adaptation standpoint. No significant investment has yet been made in the Dominican Republic Program. The project is well designed, based on identified specific productivity gaps, analysis of institutional weakness, and lessons learned from other projects in LAC. It is expected to benefit primarily small-scale farmers and provides classic public goods (research and technology transfer, including demonstration farms), but it stops short of extension to

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39 OVE have not been able to find a results matrix for this project, nor does the midterm review evaluate performance against program objectives and targets. The project proposal does contain targets for unaccounted-for-water, macro metering, micro metering, collection rates, and coverage of operation and maintenance costs.

40 The Brazil project has closed, the Mexico and Uruguay projects are approximately 20% and 50% disbursed, respectively, and the Dominican Republic project has not yet begun disbursement.

41 The project addresses several areas, the most important being strengthening competitive research and development systems, building capacity in strategic research areas, and developing pilot information and technology management clusters for family agriculture.

42 The government plans to divert project resources from research and innovation to other uses.

43 There has been conflict or confusion with larger administrative reforms undertaken by the incoming government. There has also been confusion with a World Bank loan financing some overlapping content.

farmers. The project has good results indicators and well-defined monitoring arrangements.

3.31 **More thought needs to be given to indicators that can measure the effectiveness of reform efforts.** The Mexico results matrix reflects a good-faith effort to create monitorable indicators that are clear measures of project outcomes and component outputs. The results matrix for the Uruguay project has two results indicators for program objectives/outcomes, one of which is well defined and the other of which is definitely not SMART and will be hard to verify. At the components level, all outcomes except one are expressed in terms of the percentage of the final target achieved –for example *"30% of MPGAP's Strategic Plan implemented."* These results are impossible to define and monitor. With the exception of the components that have numerical values (numbers of government workers trained), these indicators are of very little value, especially since they give no indication of how to measure the results. The PMR has identified more concrete output indicators (plans completed, system installed, study completed, etc.). Unfortunately none of these indicators provides a sense of whether or not the desired reforms are being internalized in the ministry. This is a serious problem in monitoring the effectiveness of institutional reform efforts.

c) Vulnerable populations

3.32 **Three of the reviewed projects aimed at improving small-scale farmers and/or vulnerable populations' capacity to innovate and adapt:** the Ecuador Chimborazo Rural Development Investment Program already discussed above, the Guatemala Petén Development Program, and the Uruguay Rural Productive Development Program. The province of Chimborazo is the second poorest in Ecuador, with a poverty rate of more than 70% and a population that is 65% indigenous. The province is experiencing progressive deterioration of its productive capacity, with low crop yields, soil erosion, and desertification. In Guatemala's Petén province, 57% of the largely indigenous population lives in extreme poverty. The Uruguay Rural Productive Development Program is targeted toward small-scale ranchers. The Ecuador project has good potential to improve the agricultural conditions of the Chimborazo province. The Guatemala project has suffered from lack of government ownership, and essential components targeting the local population have not been implemented. A major problem has been local participation, as planned participatory governance arrangements have been overruled by the executing agency. In March 2014, nearly seven years after approval, the loan was still only 60% disbursed. IDB has recently attempted to find alternative fast-disbursing infrastructure investments to permit the loan to disburse fully and close. The Uruguay Rural Productive Program is intended to improve the transfer of innovative technology to small-scale livestock farmers. It provides technical assistance to help farmers prepare projects in response to a government programs and to help farmers use improved technology. The project was supported by an IDB preparation grant that resulted in sound design. The project enjoys strong political support and has a good implementation record. From a CC standpoint, the project helps improve small-scale farmers' capacity to innovate and adapt.

2. Mitigation

a) Forest protection and management

3.33 **Five of the projects combined mitigation through forest protection and management with economic improvement of the local populations, with different levels of effectiveness.** These projects are the Guatemala Petén project discussed above, two sustainable development projects for the Brazilian state of Acre, in the Amazon, and two forest management projects—a FIP project promoting forest management and forest conservation in *ejidos* in Mexico, and a project promoting smallholder-planted forest production in Argentina. As discussed above, activities intended to strengthen agriculture and reduce pressure on the forest in the Guatemala Petén project were not implemented. Although the project aimed at no new deforestation during the project, over 13,000 ha were lost over the 2010-2011 period (we have not been able to obtain deforestation data for more recent periods).

3.34 **IDB has successfully supported the state of Acre, Brazil, in its efforts to develop a forest-based economy** by strengthening the supply chains for forest-based products, creating productive forest reserves, and intensifying the land use of agricultural areas. The first project created four state parks and four conservation areas for productive use and significantly strengthened the state's capacity to respond to forest fires. Overall the project was a success, especially because of the close correspondence between project objectives and the government's development strategy. Nevertheless, there was uneven implementation by component, with some agencies financing other ongoing activities instead of those activities specifically defined by the project. A particularly serious IDB omission was the enforcement of a critical land tenure covenant, with serious consequences for the effectiveness of the activities related to federal settlement areas. The second recently approved Brazil Acre Sustainable Development Program is intended to help the forest-based state economy move into higher-value activities. It is well designed and appears to fully incorporate lessons from the first Acre project. The results framework is a model of monitoring practice, including randomized sample selection of families participating in value-chain programs to measure impact on household incomes.

3.35 **Both the Argentina Forest Sustainability and Competitiveness Program and the Mexico Financing Low Carbon Strategies in Forest Landscapes recently approved projects are intended to strengthen productive forestry.** The Argentina project is intended to reach some 10,000 small-scale forestry producers and 1,000 micro-, small-, and medium-scale forest-based industries. The project, which is based on thorough analysis of constraining factors, will provide public goods to the forestry sector. It is well aligned with national strategic priorities. The Mexican project, financed by the FIP, is mainly oriented toward mitigation, with the principal objective of maintaining standing forest in ejidos by improving the competitiveness of productive forestry and intensifying agricultural land use. The investments currently identified for financing are indirectly linked to mitigation. The project builds on IDB expertise in rural lending and gives IDB a seat at the table for the first time in the forest sector through the FIP's program. Project preparation included a sound process of stakeholder consultation and good ownership by the Mexican government.

b) Low-carbon agriculture

3.36 **Two projects promoting low-carbon agriculture were highly relevant.** The Brazil Low-Carbon Agriculture and Avoided Deforestation to Reduce Poverty project and the CYMMIT component of the Mexico Program to Strengthen Rural Public Goods both promote the adoption of technologies that reduce carbon emissions by farms and ranches and enhance carbon uptake in vegetation and soils, while also increasing productivity. The Brazil project, funded by a UK grant, provides funding that farmers can access to adopt one of six technologies –to cover the initial costs involved in purchasing machinery, changing to different agricultural inputs, and so on. The CYMMIT component of the Mexico project, MASAGRO, is promoting genetic and technological innovation to sustainably modernize traditional agriculture. Activities include genetic improvement to wheat and maize, with emphasis on increasing drought resistance. In addition, the project partners with innovative Mexican farmers and with private and public agencies involved in input supply and in extension to obtain higher and more stable crop yields. Innovative techniques promoted include conservation and precision agriculture. Both projects are highly relevant for both mitigation and adaptation. Their emission reductions outcomes are identified, but are likely difficult to measure or attribute. The Brazil project includes payments for environmental services to small- and medium-scale farmers.

3.37 **The Brazilian grant presents limitations in terms of project design and implementation arrangements.** Outcome indicators do not correspond to the stated project objectives and implementation arrangements are not clearly defined. The project proposal and grant were processed hastily in 2012 to meet a deadline imposed by the UK Department for Environment, Food and Rural Affairs. The IDB assumed the role of executing agency rather than limiting its role to trustee and supervisor. The selection of farmers' project proposals requires an extraordinary effort on IDB's part to ensure that beneficiaries comply with the grant agreement, as does the selection of the demonstration units. IDB's ability to handle this workload and the project complexity, even with consultants, is a project risk that was acknowledged in the proposal but not fully considered. IDB's experience with the consultants hired so far has not been successful.

3. IDB value-added

3.38 **For a number of projects reviewed, the value added by IDB has been difficult to assess.** The Brazilian project, AGROFUTURO, appears to have financed activities that would have been carried out in the absence of IDB. The Mexico Public Goods Project is carrying out project activities with domestic resources without drawing down IDB loan resources, partly with the intent to use loan resources for a large purchase not included in the project. It is possible that the fact that the government is executing project activities without drawing down project resources reflects government ownership. It is also possible that the project simply financed activities that the government intended to carry out anyway, but the evaluation have not been able to make a clear determination on this critical issue of value-added.

3.39 **Changes in project design also make value added difficult to measure.** Both the Guatemala Petén Development Program and the Argentina Water Infrastructure:

Northern Provinces projects were implemented in a different manner from the original project design. For the Petén project this appears to be due to problems of contracting in the remote area of Petén, as well as to a new government, which apparently rejected the original participatory design of the project. As a result, infrastructure works have been delayed and activities with local farmers abandoned. The Argentina project changed during implementation from an irrigation project to a water supply project, and critical water pricing policies were not implemented. It seems clear that project objectives in both projects have been seriously compromised by deviations from the original design of the project.

3.40 **Some value-added problems are inherent to the middle-income status of the selected countries.** Countries increasingly have high-level technical staff in the federal ministries, and good economic management. As a result, IDB can add little at either the technical or financial level. Indeed, implementing agencies in countries with good macroeconomic management often have weak incentives to implement projects with loan resources. In the implementing ministries, IDB loans substitute for, rather than adding to, domestic resources.[44] This leads to a tendency for loans to be merged into financing ongoing activities rather than gaining a clearly separate identity.

4. Institutional strengthening

3.41 **Project effectiveness has also been limited due to weak supervision of projects' institutional dimensions.** Effective institutions are critical to respond to climate change, in particular in areas such as agricultural research, plant and animal health, agricultural extension, and water resources management. In general, the physical elements of projects are put in place, but too often the institutions required to effectively put them to use are lacking. More attention should be paid to the architecture and incentives required to shape effective institutions. IDB supervision does not appear to strongly insist on carrying out the "soft" components with the same weight as other project components.

[44] This is because under good fiscal accounting, loans enter "below the line" as financing, not "above the line" as receipts. As a result, expenditure financed by the loan increases the size of the deficit. Thus countries that do not want to increase the size of their deficit must decrease an equivalent amount of expenditure on other items if they are to spend the borrowed resources on project activities.

IV. EVALUATIVE CONCLUSIONS

A. IDB strategy and positioning

4.1 **At the country level, moderate evidence was found that the IDB is strategically positioned relative to country needs in regard to CCA in agriculture.** In general, The IDB does not seem to play a significant role in CC-related policy development and dialogue in the agriculture sector. Countries for which a Climate Change Policy Note had been prepared before the CS showed stronger logical links to country needs (as expressed in countries' NCs) and to subsequent operations than those without such note.

4.2 **With regard to adaptation, the Bank's CC strategic guidance documents are generally aligned with best practices.** They emphasize financing public goods, orienting interventions to increase the incomes and adaptability of the rural poor, and strengthening hydrological monitoring, IWRM, and weather forecasting. These are appropriate areas of emphasis as defined in the literature. With respect to promoting climate models and downscaling as recommended in the Climate Change Action Plan, it is worth noting that the development of climate models is an important research endeavor, but in the current state of the art, such models cannot carry the weight of informing operational decisions.

4.3 **Mitigation areas recommended by IDB strategic documents are appropriate but incomplete.** They recommend low-carbon agriculture, forestry and forest management, and protection of conservation areas; however, they largely omit the complex and significant issue of emissions from cattle ranching.

B. IDB engagement

4.4 **IDB's engagement has been largely through loans and TCs.** While there is as yet no evidence of an increase in CC-related loans in this sector in response to the GCI-9, the use of regional KPs has increased significantly since 2011, as has IDB's role in implementing TCs and projects for the Global Environment Facility (GEF) and the FIP. It might be likely that the increase in CC-related TCs leads to an increase in CC loans in the near future.

C. IDB value-added

4.5 **IDB's value-added has been difficult to assess in some cases due to the lack delimitation of the "IDB project".** Value added by IDB may mean supporting something than otherwise would not happen in a country, or adding higher quality to programs and activities already being undertaken by a country. For a number of projects reviewed, the distinction between IDB project activities and ongoing agency activities was unclear. The lack of a clear separate identity of an IDB operation within government made projects susceptible to "on-the-fly" modifications. Often, IDB appears to consent to such changes informally, rather than formalizing them through amendments to legal agreements.

4.6 **The difficulty for IDB to bring significant value-added is somewhat inherent to the middle-income status of most of the selected countries.** Countries increasingly have

high-level technical staff in their ministries and loan funding tends to be merged into financing of ongoing activities. In several cases, it appeared that a country would have implemented a loan-funded program even without the loan—which means that the loan simply substituted for domestic budget resources. The technical and financial support the Bank brings to the preparation of the projects it funds appears to have resulted in better-designed projects, especially where IDB keeps supporting successive projects and insists on learning lessons from earlier projects (example Brazil Acre projects and Uruguay Rural Development projects).

4.7 **TCs can bring substantial value-added in the area of CC.** Regional TCs and regional knowledge generation TCs appear have the potential to bring substantial value-added in the area of CC. However, the lack of documentation on TCs after the initial proposal makes it difficult to evaluate their implementation and results. Given their perceived importance, IDB might wish to strengthen the internal documentation, oversight, and evaluation of TC operations.

D. IDB effectiveness

4.8 **Project effectiveness has been limited by the weak design and supervision of institutional dimensions of projects. In a sample of projects reviewed, results have been mixed.** Effective institutions are critical to respond to climate change, particularly in such areas as agricultural research, plant and animal health, agricultural extension, and water resource management. Often, physical components and elements of projects are implemented, while the institutions required to put them to use are weak or lacking. To effectively address CC mitigation and adaptation, IDB may wish to dedicate more attention to the architecture of effective institutions and to the incentives required to shape them. Newer projects have significantly better results frameworks; if these frameworks are combined with stronger supervision, projects will remain better focused on project objectives.

4.9 **IDB needs to mainstream CC awareness and capacity in the Agricultural and Natural Resource sector.** In recent years, there appears to be a tendency for agriculture staff to think of responses to climate change as mitigation rather than adaptation. This may result in missed opportunities to include climate change in operations where it is relevant.

E. Suggestions

4.10 On the basis of the findings of this evaluation and the expert opinion of the authors of this report, OVE proposes the following suggestions as presented in box 3:

Box 3: Main findings and suggestions	
Main Findings	**Suggestions**
Institutional level	
The Bank´s CSs should be guided and informed by country needs not (or not sufficiently) addressed by other players.	For each CS, prepare a policy paper mapping out country needs and how they are covered (or not) by other donors and

Box 3: Main findings and suggestions	
Main Findings	**Suggestions**
	institutions.
Effective, sustained water management, capable to adapt to CC, will become increasingly urgent in the face of rising irrigation water demands and, in many regions, of reduced surface and groundwater availability. This is an example of complex institutional development taking more years than the duration of a typical Bank loan or TC.	Develop a strategy to address integrated water resource management, start at a small scale to use the lessons learned elsewhere, and mainstream. Develop mechanisms that allow IDB to remain involved with institutional development over the longer term.
CC awareness and capacity of IDB staff in the individual disciplines could be strengthened. There appears to be a tendency for agriculture staff to think of CC as mitigation rather than adaptation, resulting in missed opportunities to include climate change in operations where it is relevant.	Provide training, workshops, or retreats for staff concerned with agriculture, forestry, and land use to deepen their understanding of adaptation and the various options to promote it.
The availability of the relatively more flexible instrument "technical cooperation" gives IDB an advantage over other multilateral development institutions.	Use TCs strategically for lesson-learning, project preparation, and knowledge generation and knowledge sharing, and as support for policy design. Regional TCs should be used wherever several countries can and should share the benefits.
Project level	
The formulation of project objectives suffers at times from confusion between (i) higher objectives that a project merely contributes to, but need not attain, and (ii) "project development objectives" in the form of responses of target groups (farmers) or target systems (yields, income, institutional effectiveness, etc.) that the project must actually achieve, and for which the project is accountable.	Include proper formulation of "project development objectives" in results frameworks to clarify obligations and expectations among all concerned. Results indicators should correspond to, and clearly measure, these objectives, but not the contribution to "higher objectives."
Policy and institutional reforms are essential to development, often more so than the investments financed. This is usually well recognized in project design, but often tends to be ignored during implementation when client priorities change, funding shortages are encountered, or strong interests come into play.	In supervising project implementation, do not favor "hardware over software", and slow down the implementation of works and equipment when agreed institutional improvements and policy reforms are not carried out.

Technical level	
Climate change adaptation	
Adaptation requires knowledge about vulnerable populations, where they are, and what risks they are exposed to. Basic services for agriculture to small- and medium-scale farmers – research, technology transfer, extension, and plant and animal health services – are essential for adaptation and must be provided as public goods. Promoting climate models and downscaling is mentioned in IDB's CC Strategy. This may be an important research endeavor, but such models cannot (yet) carry the weight of informing operational decisions. IDB has already recognized that adaptation to CC under considerable uncertainty requires better quantity, quality, and accessibility of information to support individual and institutional planning and decision-making.	Strengthen assessment of vulnerable populations, perhaps incorporating information gained from past poverty mapping. Seek to integrate CC-related concerns into agricultural research. Continue to strengthen the delivery of agricultural public goods to small- and medium-scale farmers. Support climate modeling (as opposed to weather modeling) only in a research context, not where it could be misused to influence operational decisions. Support countries in developing and providing "climate services"—that is, hydrological monitoring, meteorological forecasting, and crop disaster forecasting, with associated infrastructure.
Climate change mitigation	
Upcoming new multilateral programs support mitigation in the agriculture and forestry sectors. They tend to insist on quantitative monitoring of emission reductions or estimation of avoided emissions. Emission reductions are usually "higher objectives" to contribute to, but should not become development objectives to be achieved by projects. Low-carbon agriculture is emerging as an important contribution not only to CC mitigation, but also to adaptation. The climate impact of cattle and sheep ranching is not yet well covered by low-carbon agriculture technologies.	In agriculture and forestry projects, be concerned with the adoption of land use and farming practices, and do not be burdened with the measurement of actual physical changes in carbon storage or emissions. Project monitoring should focus on checking whether good practices are effectively being adopted and whether other results, such as yields, production, income, and institutional effectiveness are achieved; they should leave the estimation of mitigation benefits to specialized support services. Consider developing a comparative advantage (niche) among multilateral banks and donors in the support of mitigation in the agriculture and livestock sector.

ANNEXES

ANNEX 1. CONTRIBUTION OF AGRICULTURE TO THE ECONOMY

Table 1. Agricultural Value Added as Percent of GDP in 2012

Country	%	Country	%
Argentina	9	Haiti	n/a
Bahamas	2	Honduras	15
Barbados	1	Jamaica	7
Belize	13	Mexico	4
Bolivia	13	Nicaragua	20
Brazil	5	Panama	4
Chile	4	Paraguay	17
Colombia	7	Peru	7
Costa Rica	6	Suriname	9
Dominican Republic	6	Trinidad and Tobago	1
Ecuador	10	Uruguay	8
El Salvador	12	Venezuela	6
Guatemala	12	Uruguay	8
Guyana	21	Venezuela	6

Source: World Bank, World Development Indicators, Table 4.2, 2013

Table 2. Gross Domestic Product and Agricultural Value Added in US$ Thousand Millions and as a Percentage, for 1997

Country	GDP US$ billion	Agriculture GDP[a] US$ billion	Agriculture and Agrifood GDP[b] US$ billion	Agriculture and Agrifood GDP to GDP	Ratio Agricultur and Agrifood GDP to Agriculture GDP
	(1)	(2)	(3)	=(3)/(1)	=(3)/(2)
Argentina	326.0	14.9	104.9	32.2%	7.0
Brazil	789.7	34	206.9	26.2%	6.1
Chile	76.1	4.3	24.4	32.1%	5.7
Colombia	94.6	7.6	30.4	32.1%	4.0
Mexico	388.8	17.9	95.2	24.5%	5.3
Peru	64.9	4.3	20.6	31.8%	4.8
Uruguay	19.1	1.2	6.6	34.8%	5.6
Venezuela	83.7	3.4	17.2	20.5%	5.1
Costa Rica	22.0	2.5	7.2	32.5%	2.9

[a] Includes: agriculture, forestry and fishing (chapters 01 to 04 of the CPC and 05 of the ISIC)

[b] Includes: primary sector plus food and manufactured goods derived from this sector (chapters 21 to 25 of the CPC and 17 to 22 of the ISIC)

Table 3. Effect of a 10% Increase in Agriculture and Agrifood Exports by Country, in US$ Million and Percentage of Growth by Item

Item	Argentina	Brazil	Chile	Colombia	Mexico	Peru	Uruguay	Venezuela	USA	Canada
Initial injection (US$ Million)	1,480	1,978	655	522	1,833	278	229	95	11,585	5,332
% change in GDP (first round) (1)	0.27	0.13	0.48	0.31	0.27	0.26	0.74	0.06	0.08	0.48
% total change in economy (second round) (2)	1.55	0.71	0.02	1.19	0.86	0.94	2.72	0.23	0.34	1.26
Ratio (multiplier) (2)/(1)	*5.7*	*5.4*	*3.4*	*3.9*	*3.2*	*3.7*	*3.7*	*3.7*	*4.2*	*2.6*
Effect on household income (%)	1.51	0.67	1.48	1.17	0.83	0.95	2.52	0.20	0.31	1.13
Effect on factor payment (%)										
Land	2.99	1.54	3.61	3.09	1.86	1.92	4.06	0.57	2.13	4.60
Unskilled Labor	1.55	0.64	1.65	1.26	0.93	0.93	2.76	0.24	0.32	1.22
Skilled labor	1.22	0.52	1.13	0.86	0.60	0.57	2.18	0.18	0.27	1.00
Capital	1.46	0.71	1.37	1.07	0.79	0.97	2.36	0.19	0.32	1.07
Natural Resources	1.07	0.76	2.19	0.65	0.45	1.09	3.70	0.08	0.34	1.11

Source: "More than Food on the Table: Agriculture's True Contribution to the Economy", by Rafael Trejos, Joaquin Arias and Oswaldo Segura,IICA – San José, Costa Rica, 2004
http://ageconsearch.umn.edu/bitstream/20360/1/sp04tr02.pdf

ANNEX 2. IPCC DEFINITION OF EMISSIONS FROM AGRICULTURE AND LULUCF

The IPCC defines six "sectors" for the sake of measuring and reporting GHG emissions: (i) energy, (ii) industrial processes, (iii) agriculture (AGR), (iv) land use, land use change and forestry (LULUCF), (v) waste and (vi) bunker fuels. This report is concerned with AGR and LULUCF. The two "sectors" are separate for purposes of the IPCC, but are closely related in the sense that land use change appears to be largely driven by agriculture, along with minor impacts of mining, infrastructure and expansion of human settlements and that agriculture (crops and livestock) is itself a form, of land use[1]. They are discussed jointly in this report, except for the reporting of emissions by sector.

Land Use, Land Use Change and Forestry Emissions

LULUCF emissions is concerned with man-made **changes in stocks** in "carbon pools": (i) above-ground biomass, (ii) below-ground biomass (live roots), (iii) soil carbon (organic carbon in mineral soils to a specified depth), and (iv) dead organic matter and woody litter biomass above ground and in soils. It is changes in these stocks that are measured through a variety of methods and that are assumed to be equal to greenhouse gas emissions into the atmosphere (sources), or removals from the atmosphere (sinks), principally of CO_2, but also of nitrous oxide and methane.

The current guidelines for estimating emissions and removals for LULUCF distinguishes among six land categories[2]: forest land, cropland, grassland, wetland, settlements and other lands. For each category, managed land may either stay in its category (as it is being used) or land may change to a different category, such as forest becoming pasture, pasture becoming crop land, pasture becoming forest, etc. (land use change), through conversion. Forestry (F) as such is also a form of land use. Only ***key*** source or sink categories need to be included in the inventories. LULUCF includes essentially the following:

Table 1. Main land categories in LULUCF

Main land categories	Subcategories	Examples of Uses or Conversions
Forest land	Forest land remaining forest land	Use of natural forests for timber, fuel wood, charcoal. Management of planted forests. Reforestation, regeneration. Forest burning (wild fires)
	Land converted to forest land	Establishment of forest plantations, afforestation. Abandonment of pastures and cropland.
Cropland	Cropland remaining cropland	Liming of soils, burning of sugarcane. Zero-tilling (sink), other forms of increasing soil carbon.
	Land converted to cropland	Forest clearing for crops
Grassland	Grassland remaining grassland	Co2 changes due to pasture management practices. Pasture degradation.
	Land converted to grassland	Forest clearing for pastures
Wetland	Wetland remaining wetland	Peat extraction
	Land converted to wetland	

[1] The 2006 IPCC Guidelines recognized "that the processes underlying greenhouse gas emissions and removals occur across all types of land" and **integrated the Agriculture and LULUCF sectors into the Agriculture, Forestry and Other Land Use sector**.

[2] Good Practice Guidance for Land Use, Land-Use Change and Forestry, IPCC National Greenhouse Gas Inventories Programme, published by the Institute for Global Environmental Strategies (IGES) for the IPCC, 2003.

Main land categories	Subcategories	Examples of Uses or Conversions
Settlements	Settlement remaining settlement	Planting of trees
	Land converted to settlements	Forest clearing for urban uses

The conversion of forest or other land to water reservoirs for hydroelectricity is not mentioned, but may be another important source of GHG emission (methane).

The "Non-annex I" countries have presented their own estimates of LULUCF emissions and removals, with widely varying methods and precision. These estimates are considered highly uncertain, due to the lack of precision concerning the affected areas and the per-hectare coefficients for emissions and removals. We are using the figures for 2009 provided by the CAIT 2 data base of the World Resources Institute, which are not more precise than others, but are at least comparable across countries, based on FAO´s land use and emissions data[3]. A major difference with the FAO data exists for more recent years in the case of Brazil, and we have used Brazil´s own estimate of "gross emissions" for 2009 and later.

Agricultural emissions

The emissions from agriculture are caused by activities that do not affect carbon stocks in organic matter and soils, but result from crop and livestock management, except for fuel combustion and sewage emissions, which are covered in other sectors. Emissions from agriculture are in the form of methane (CH4) and nitrous oxide (N2O), but not in the form of CO2, which is counted under land use.

- **Enteric fermentation** in cattle and other animals releases CH_4. Both ruminant (cattle, sheep) and non-ruminant animals (e.g. pigs, horses) produce CH4, although ruminants are the largest source (per unit of feed intake).
- **Manure management** releases CH_4 and N_2O from the decomposition of manure under low oxygen or anaerobic conditions, when large numbers of animals are managed in a confined area and where manure is typically stored in large piles or disposed of in lagoons and other types of manure management systems.
- **Flooded rice cultivation** produces CH_4 bubbling up through the water column.
- **Soils**. Crop management causes the release of N_2O from the use of organic and inorganic fertilizers, biological nitrogen fixation, and return of crop residues to the field or to animal production. Emissions of N2O from manure used for fuel are reported under Energy.
- **Burning of Savannas**. Emissions of CH_4, CO, N_2O and NO_X, but not those of CO_2 (which is assumed to be absorbed again by regrowth in the following year) from the burning of savannas are to be counted as agricultural emissions. Savannas are burned to control the growth of vegetation, remove pests and weeds, and encourage the growth of new grass for animal grazing.
- **Field burning of agricultural residues** releases GHGs other than CO_2 from burning (in the field) of crop residues and other agricultural wastes (e.g. coconut shells, rice

[3] Climate Analysis Indicators Tool 2.0, at http://cait2.wri.org/ . . *"CAIT uses data reported by the FAO... The FAO emission data are estimates by FAO and do not coincide with GHG data reported by member countries to UNFCCC. These might therefore differ significantly from other country estimates that for example use geospatial technologies, satellite imagery, and higher-tier IPCC methodologies. The latter is certainly more accurate, but the FAO data set was chosen because it provides estimates for most countries through 2010 and no other data set provides as much coverage at the country-level".*

and wheat straw, maize stalks, groundnut straw, soybean tops, etc.). Again, CO_2 from vegetal or biomass burning is not included, since it is assumed that an equivalent amount is absorbed by re-growth of the next crop.

ANNEX 3. EMISSIONS FROM AGRICULTURE AND LAND USE CHANGE BY COUNTRY, 2000 AND 2009

Table 1. Emissions from agriculture and LUC by country

Country	AGR CAIT 2000	AGR CAIT 2009	AGR FAO 2000	AGR FAO 2009	Net Forest Conv 2000	Net Forest Conv 2009
Argentina	131.2	143.8	95.5	101.6	111.8	91.4
Bahamas, The	0.0	0.0	0.0	0.0		
Barbados	0.1	0.1	0.1	0.1		
Belize	0.2	0.2	0.2	0.3	4.4	
Bolivia	32.3	41.8	16.2	20.5	77.3	88.0
Brazil	449.3	604.5	329.5	411.1	1,282.0	613.4
Chile	13.2	14.0	11.2	12.0	(17.4)	(11.4)
Colombia	73.0	75.5	50.2	56.8	41.5	41.5
Costa Rica	4.7	5.5	3.1	3.1	6.3	(7.6)
Dominican Republic	5.8	8.1	5.1	7.1		
Ecuador	13.5	13.9	11.8	13.8	85.6	85.6
El Salvador	2.8	3.6	2.4	3.0	1.5	1.5
Guatemala	33.4	19.3	5.8	7.3	15.2	15.9
Guyana	2.0	2.1	1.4	2.0		
Haiti	3.9	3.9	3.6	3.6	0.1	0.2
Honduras	4.6	5.8	4.3	5.4	40.9	28.2
Jamaica	2.6	2.7	1.0	0.6	0.2	0.2
Mexico	54.1	60.3	74.4	78.6	41.5	18.2
Nicaragua	7.4	11.0	6.2	7.0	28.7	28.7
Panama	2.8	3.3	2.7	3.3	17.5	4.9
Paraguay	25.9	28.9	17.3	22.6	77.5	77.4
Peru	23.9	21.5	20.2	23.1	43.6	69.3
Suriname	1.5	1.4	0.7	0.7		2.8
Trinidad & Tobago	0.2	0.3	0.3	0.7	0.2	0.2
Uruguay	22.4	23.8	21.7	23.8	(21.3)	(19.4)
Venezuela	33.8	39.3	29.7	34.2	124.6	124.6
Total	**944.5**	**1,134.6**	**714.5**	**842.2**	**1,962.0**	**1,253.6**
Change 2000 - 2009		20%		18%		-36%
World	**5,423.8**	**5,958.7**	**4,227.7**	**4,670.6**	**3,599.1**	**2,585.4**
% of World	17.4%	19.0%	16.9%	18.0%	54.5%	48.5%

ANNEX 4. CHANGE IN LAND USE, 1990-2010, BY REGION

Table 1. Change in Land Use by Region

Region	Category	1990	2000	2010	Δ 1990-2010	Δ %
Southern Cone	Agricultural area	175.4	178.9	197.8	22.4	13%
	Arable Land	32.7	33.8	44.1	11.3	35%
	Meadows & pastures	141.3	143.6	152.1	10.8	8%
	Permanent crops	1.4	1.5	1.6	0.2	13%
	Forest area	72.1	68.5	65.0	-7.2	-10%
	Other land	157.7	157.9	142.5	-15.2	-10%
Brazil	Agricultural area	241.6	261.4	273.4	31.8	13%
	Arable Land	50.7	57.8	70.3	19.6	39%
	Meadows & pastures	184.2	196.2	196.0	11.8	6%
	Permanent crops	6.7	7.4	7.1	0.4	6%
	Forest area	574.8	545.9	519.5	-55.3	-10%
	Other land	29.5	38.6	53.0	23.5	80%
Andean	Agricultural area	110.2	111.1	108.4	-1.8	-2%
	Arable Land	10.5	11.1	10.3	-0.2	-2%
	Meadows & pastures	96.1	96.1	94.1	-2.1	-2%
	Permanent crops	3.6	3.8	4.0	0.4	12%
	Forest area	209.3	202.7	195.6	-13.7	-7%
	Other land	55.5	58.4	68.1	12.7	23%
Caribbean, Venezuela, Guyana & Suriname	Agricultural area	28.4	28.0	27.8	-0.7	-2%
	Arable Land	5.2	5.1	5.0	-0.2	-4%
	Meadows & pastures	21.5	21.2	21.2	-0.3	-1%
	Permanent crops	1.7	1.7	1.5	-0.2	-10%
	Forest area	85.2	82.3	79.4	-5.8	-7%
	Other land	20.1	23.4	26.6	6.5	32%
Central America & Mexico	Agricultural area	121.4	124.0	121.6	0.2	0%
	Arable Land	29.7	31.0	31.3	1.5	5%
	Meadows & pastures	87.9	88.9	85.2	-2.7	-3%
	Permanent crops	3.7	4.2	5.1	1.3	36%
	Forest area	96.0	88.7	84.3	-11.7	-12%
	Other land	28.1	32.5	39.4	11.3	40%
LAC Total	Agricultural area	677.1	703.4	729.0	51.9	8%
	Arable Land	128.9	138.7	161.0	32.2	25%
	Meadows & pastures	531.0	546.0	548.6	17.6	3%
	Permanent crops	17.2	18.7	19.3	2.1	13%
	Forest area	1037.5	988.1	943.7	-93.7	-9%
	Other land	290.8	310.7	329.5	38.7	13%

ANNEX 5. MITIGATION POLICIES IN SELECTED LAC COUNTRIES

1. **Argentina** has a National Strategy for Climate Change and Forests, of 2010. The country proposes two lines of action for LULUCF: expansion of protected areas and of commercial forestry plantations, based on a specific forestry promotion law. There are plans and technologies to reduce gases from enteric fermentation, but no commitment or policies in this regard.

2. **Bolivia** was an early UN-REDD partner country but has opposed REDD+ since 2010 because it represented a mercantilist mechanism and the "commodification of nature", and because it was seen as a way for rich countries to evade their responsibility for climate change and their need to reduce domestic emissions by transferring the burden of action to poorer countries. In 2012, Bolivia announced its alternative to REDD+, the Joint Mitigation and Adaptation Mechanism for Holistic and Sustainable Forest Management ("Sustainable Life of the Forest"), as included in the "Framework Law of Mother Earth". It is based on the dual importance of forests in adaptation and mitigation and on the non-commodification of nature. It will allow territorial units of different sizes to voluntarily register "Holistic Forest and Soil Management Plans" that will include controlling un-planned deforestation in return for a range of conditional financial and non-financial benefits.

3. **Brazil** has committed to reductions of 36-39% by 2020 in several sectors, specifically to reductions of deforestation the Amazon and Cerrado regions, increased use of planted forests for charcoal production, and to a "low-carbon agriculture" plan which includes restoration of grazing land, integrated crop-livestock systems, no-till farming, among other technologies. Brazil has comprehensive programs to address deforestation and degradation in the Amazon and Cerrado (savanna) biomes. It has been highly successful in reducing deforestation in the Amazon from 27,000 km^2 in 2004 to about 5,000 km^2 per year in 2012. Polices and plans do not address, however, the huge methane emissions from its cattle herd, although the issue is being covered by agricultural research. Brazil is one of the pilot countries for the Forest Investment Program, with four projects geared to reduce GHG emissions in the Cerrado Region, promoting low carbon agriculture, forest inventory, environmental cadaster to enforce forest law, early forest fire warning and monitoring of the vegetation cover.

4. **Chile** has a National Strategy for Climate Change of 2006 and a National Action Plan for Climate Change 2008–2012. It has communicated a voluntary commitment to the UNFCCC in 2010, that it will achieve a 20% reduction of emissions relative to business-as-usual (BAU) by 2020. This includes measures related to forests and land use change.

5. **Colombia** will implement four strategies in relation to Climate Change, one of which is the "Colombian Strategy for Low Carbon Development" which has as a subset the "National Strategy for Reducing Emissions from Deforestation (REDD+)". By 2020, net deforestation is to be reduced to zero in the Colombian Amazon forest. A REDD readiness preparation proposal has been prepared.

6. **Costa Rica** has a National Climate Change Strategy (2007) which established the goal of carbon neutrality in 2021. The "C-Neutral Standard" is a first measure of mitigation actions to meet the 2021 deadline. It recognizes the international VCS carbon accounting standard, Gold Standard and CDM offsets, and contains methodologies to generate Costa Rican Carbon Units (UCCs). The standard covers a variety of project types including forestry and land use. Economy-wide transformational effort to enable carbon neutrality with efforts focused on transport, energy, forestry, and waste

management. Costa Rica became the first developing country to introduce a domestic voluntary carbon market (2012). Costa Rica is one of the few LAC countries with net absorptions of CO2 from LULUCF. The National Forestry Development Plan 2011 – 2020 is the key strategy document for the forest sector, and stresses the contribution that forestry will make to Costa Rica's target of becoming carbon neutral by 2021. It also mentions the importance of REDD+ in raising finance and reducing emissions.

7. **Dominican Republic:** According to FAO, the DR now has a near zero deforestation rate, reflecting a recovery from the high rates of deforestation and degradation that the country experienced in the 1980s. Reforestation has been achieved by the creation of plantations where natural forests previously stood. There is no national program or strategy on REDD+ in the DR. However, there is a number of plans, policies and laws that support REDD+ activities. DR was the first country in the Caribbean to develop a National Climate Compatible Development Plan, which identifies a number of abatement options which would result in a reduction of annual emissions by up to 65 % by 2030, compared to BAU. A 2012 law sets out the National Development Strategy and establishes a more moderate, but legally binding, target for reducing emissions: 0.8 metric tons of carbon per capita from 3.6 (the 2010 emissions figure) to 2.8 metric tons per capita by 2030. This development would transform the Dominican Republic's forests into net carbon sinks. The DR participates in the DR-Central America–US Free Trade Agreement (CAFTA-DR) Environmental Cooperation Program, funded by USAID, and the Regional REDD Program in Central America and the DR, funded by Germany.

8. **Ecuador:** Reducing deforestation is a national priority and the National Development Plan (known as the Plan for Good Living, 2009-2013) aims to reduce deforestation in Ecuador by 30% by 2013. The Socio Bosque Program began in 2008 to conserve natural forests by providing financial incentives to private and community forest owners to keep their forests standing. Ecuador has been a participant in the UN-REDD program since Oct 2009 as an observer country. Since the acceptance of its National Joint Program in 2011, Ecuador became a beneficiary country and joined the group of twelve pilot countries that are implementing activities in preparation for REDD. A national framework to regulate REDD activities is under development. All measurement, reporting and verification will be carried out at the national level, whereas the sub-national activities underway are largely feasibility studies for potential REDD+ projects, reforestation projects and include a few REDD projects that are preparing project design documents (PDDs).

9. **El Salvador** has a national climate change strategy since 2013. Part of the Strategy is the National Program for Ecosystem Restoration to reverse environmental degradation and significantly increase plant cover, through the establishment of agricultural production systems resilient to climate and biodiversity friendly, with the expansion of agroforestry, soil and water conservation, reduced use of agrochemicals, improved grassland and the raising of livestock. The focus is on activities that contribute simultaneously to mitigation and adaptation. The program will promote farming practices based on agroforestry, increase carbon stocks, restore ecosystem services, reduce runoff, prevent nutrient loss, and generate greater resilience to extreme weather events, which result in improvements production. The measures will be accompanied by conservation activities and rehabilitation of forest ecosystems, such as gallery forests, secondary forests, coffee plantations and other forest ecosystem dedicated to the protection of critical areas. El Salvador is the first country in the world that adopted a REDD+ approach of "mitigation based on adaptation".

10. **Mexico** has enacted a General Law on Climate Change in 2012, committing itself to a 30% reduction in GHG emissions by 2020, and 50% by 2050, compared to BAU. The law also establishes a Climate Change Fund, from various sources, including certified emissions reductions, to be used for different adaptation and mitigation actions, including REDD+. Mexico has made substantial progress in exploring possibilities for reducing emissions related to land use and forests. It estimates that it has reduced net emissions from LULUCF by 55% between 2000 and 2010. It is in the forefront among developing countries in formulating a strategy for REDD+. In 2010, the document "The Vision of Mexico on REDD+: Towards a National Strategy" was published. Early action REDD programs are already being implemented, including those funded through IDB under FIP. A National Strategy for REDD+ (ENAREDD+) is under elaboration, and a Climate Change Strategy for Natural Protected Areas was published in 2011, with adaptation and mitigation objectives. Mexico participates as pilot country in the Forest Investment Program (FIP), with 4 projects, two of which through IDB/MIF. Under the Forest Carbon Partnership Fund (FCPF), its Readiness Plan Idea Note (R-PIN) was accepted in 2008 and its Readiness Preparation Proposal (R-PP) was evaluated by the FCPF.

11. **Peru**: The goal of preserving a total of 54 million hectares of forest and of reducing its rate of deforestation to zero by 2021 is included in the National Environmental Action Plan 2011-2021 and the Peruvian Bicentennial Plan towards 2021. To date there are no specific norms for climate change mitigation and adaptation, including for REDD+. The country is said to move forward in reforming its institutional and regulatory framework for the agriculture sector with a goal of reducing deforestation and forest degradation. Peru is active in international REDD+ initiatives, such as the FCPF, where it is recognized as a participant country and where its Readiness Preparation Proposal was approved in 2011. It is now in the process of being updated, but only drafts have been developed and continue to be under review institutions in the country. Peru is a pilot country participating in the Forest Investment Program (FIP). Finally, Peru joined the UN-REDD program as a partner country in 2011. Around 30 projects have been directly or indirectly linked with different aspects of REDD+ readiness, funded through international cooperation, the private sector or NGOs. There are many forest carbon projects under development and several REDD+ projects active within the voluntary carbon market.

12. **Uruguay:** Uruguay is a net absorber of CO2 in terms of LULUCF, due to the growth of tree plantations, but an emitter of other GHG from agriculture, essentially from cattle and sheep ranching. Uruguay has a National Plan for Climate Change (2010), but without specific measures to mitigate agricultural emissions. A regional IDB TC addresses the need for research concerning mitigation of methane emissions from cattle and sheep.

ANNEX 6. EXCERPT FROM IPCC FIFTH ASSESSMENT REPORT ON SOUTH AND CENTRAL AMERICA (AR5)

Final Draft Report of Workgroup 2: Climate Change 2014: Impacts, Adaptation, and Vulnerability: Chapter 27. Central and South America[1]

Executive Summary

Significant trends in precipitation and temperature have been observed in Central America (CA) and South America (SA) (high confidence). Besides, changes in climate variability and in extreme events have severely affected the Region (medium confidence). Increasing trends in annual rainfall in Southeastern South America (SESA; 0.6 mm/day/50years during 1950-2008) contrast with decreasing trends in CA and Central-Southern Chile (-1mm/day /50 years during 1950-2008). Warming has been detected throughout CA and SA (near to 0.7-1°C/40 years since the mid-1970s, except for a cooling off the Chilean coast of about -1 C°/40 years. Increases in temperature extremes have been identified in CA and most of tropical and subtropical SA (medium confidence), while more frequent extreme rainfall in SESA has favored the occurrence of landslides and flash floods (medium confidence).

Climate projections suggest increases in temperature, and increases or decreases in precipitation for CA and SA by 2100 (medium confidence). Post-AR4 climate projections, derived from dynamic downscaling forced by CMIP3 models for various SRES scenarios, and to different global climate models from the CMIP5 for various RCPs (4.5 and 8.5), warming varies from +1.6°C to +4.0°C in CA, and +1.7°C to +6.7°C in SA (medium confidence). Rainfall changes for CA range between -22% to +7% by 2100, while in SA rainfall varies geographically, most notably showing a reduction of -22% in Northeast Brazil, and an increase of +25% in SESA (low confidence). By 2100 projections show an increase in dry spells in tropical SA east of the Andes, and in warm days and nights in most of SA (medium confidence).

Changes in stream flow and water availability have been observed and projected to continue in the future in CA and SA, affecting already vulnerable regions (*high confidence*). The Andean cryosphere is retreating affecting the seasonal distribution of streamflows (high confidence). Increasing runoffs in the La Plata River basin and decreasing ones in the Central Andes (Chile, Argentina) and in CA in the second half of the 20th century were associated with changes in precipitation (high confidence). Risk of water supply shortages will increase owing to precipitation reductions and evapotranspiration increases in semi-arid regions (high confidence), thus affecting water supply for cities (high confidence), hydropower generation (high confidence) and agriculture. Current practices to reduce the mismatch between water supply and demand could be used to reduce future vulnerability (medium confidence). Ongoing constitutional and legal reforms towards more efficient and effective water resources management and coordination constitute another adaptation strategy (medium confidence).

Land use change contributes significantly to environmental degradation exacerbating the negative impacts of climate change (high confidence). Deforestation and land degradation are mainly attributed to increased extensive and intensive agriculture. The agricultural expansion, in some regions associated with increases in precipitation, has affected fragile ecosystems, such as the edges of the Amazon forest and the tropical Andes.

[1] Accepted but not approved in detail by the 10th Session of Working Group II and the 38th Session of the IPCC on 29 March 2014 in Yokohama, Japan. http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap27_FGDall.pdf on March 31, 2014

Even though deforestation rates in the Amazon have decreased substantially since 2004 to a value of 4,656 km2/yr in 2012, other regions like the Cerrado still present high levels of deforestation with average rates as high as 14,179 km2/yr for the period 2002-2008.

Conversion of natural ecosystems is the main cause of biodiversity and ecosystem loss in the Region, and is a driver of anthropogenic CC (*high confidence*). CC is expected to increase the rates of species extinction (*medium confidence*). For instance, vertebrate species turnover until 2100 will be as high as 90% in specific areas of CA and the Andes Mountains. In Brazil, distribution of some groups of birds and plants will be dislocated southwards, where there are less natural habitats remaining. However, CA and SA have still large extensions of natural vegetation cover for which the Amazon is the main example. Ecosystem-based adaptation practices are increasingly common across the Region, such as the effective management and establishment of protected areas, conservation agreements and community management of natural areas.

Socioeconomic conditions have improved since AR4; however there is still a high and persistent level of poverty in most countries resulting in high vulnerability and increasing risk to climate variability and change (high confidence). Poverty levels in most countries remain high (45% for CA and 30% for SA for year 2010) in spite of the sustained economic growth observed in the last decade. Human Development Index varies greatly between countries, from Chile and Argentina with the highest values, and Guatemala and Nicaragua with the lowest values in 2007. The economic inequality translates into inequality in access to water, sanitation and adequate housing, particularly for the most vulnerable groups translating into low adaptive capacities to climate change.

Sea-level rise (SLR) and human activities on coastal and marine ecosystems pose threats to fish stocks, corals, mangroves, recreation and tourism, and control of diseases (high confidence). SLR varied from 2 to 7 mm/yr between 1950 and 2008. Frequent coral bleaching events associated to ocean warming and acidification occur in the Mesoamerican Coral Reef. In CA and SA, the main drivers of mangrove loss are deforestation and land conversion to agriculture and shrimp ponds. Brazilian fisheries' co-management (a participatory multi-stakeholder process) is an example of adaptation since it favors a balance between conservation of marine biodiversity, the improvement of livelihoods, and the cultural survival of traditional populations.

Changes in agricultural productivity with consequences for food security associated to CC are expected to exhibit large spatial variability (*medium confidence*). In SESA, where projections indicate more rainfall, average productivity could be sustained or increased until the mid-century (SRES: A2, B2) (medium confidence). In CA, northeast of Brazil and parts of the Andean Region increases in temperature and decreases in rainfall could decrease the productivity in the short-term (by 2030), threatening the food security of the poorest population (medium confidence). Considering that SA will be a key food producing region in the future, one of the challenges will be to increase the food and bioenergy quality and production while maintaining environmental sustainability under CC. Some adaptation measures include crop, risk, and water use management along with genetic improvement (high confidence).

Renewable energy (RE) based on biomass has a potential impact on land use change and deforestation and could be affected by CC (*medium confidence*). Sugarcane and soy are likely to respond positively to CO2 and temperature changes, even with a decrease in water availability, with an increase in productivity and production (high confidence). The expansion of sugarcane, soy and oil palm may have some effect on land use, leading to deforestation in parts of Amazon, CA among other regions, and loss of employment in some

countries (medium confidence). Advances in second-generation bioethanol from sugarcane and other feedstock will be important as a measure of mitigation.

C**hanges in weather and climatic patterns are negatively affecting human health in CA and SA, either by increasing morbidity, mortality, and disabilities (high confidence), and through the emergence of diseases in previously non-endemic areas (high confidence).** With very high confidence climate-related drivers are associated with respiratory and cardiovascular diseases, vector- and water-borne diseases (malaria, dengue, yellow fever, leishmaniasis, cholera, and other diarrheal diseases), Hantaviruses and Rotaviruses, chronic kidney diseases, and psychological trauma. Air pollution is associated with pregnancy-related outcomes and diabetes, among others. Vulnerabilities vary with geography, age, gender, race, ethnicity, and socio-economic status, and are rising in large cities (very high confidence). Climate change will exacerbate current and future risks to health, given the Region's population growth rates and vulnerabilities in existing health, water, sanitation and waste collection systems, nutrition, pollution and food production in poor regions (medium confidence).

In many CA and SA countries, a first step toward adaptation to future climate changes is to reduce the vulnerability to present climate. Long-term planning and the related human and financial resource needs may be seen as conflicting with present social deficit in the welfare of the CA and SA population. Various examples demonstrate possible synergies between development, adaptation and mitigation planning, which can help local communities and governments to allocate efficiently available resources in the design of strategies to reduce vulnerability. However, the generalization of such actions at continental scale requires that both the CA and SA citizens and governments are faced with the challenge of building a new governance model, where imperative development needs, vulnerability reduction and adaptation strategies to climate stresses will be truly intertwined.

ANNEX 7. COUNTRY STRATEGY ANALYSIS

Summary of the relationship between National Communications (NC) to UNFCCC, Country Strategy Text (ST), Country Strategy Results Matrices (SRM) and IDB Operations (OP) - 2012 and pipeline

	Argentina				**Brazil**			
	NC	**ST**	**SRM**	**OP (5)**	**NC**	**ST**	**SRM**	**OP (9)**
IWRM	yes					yes		
Irrigation/drainage	yes	yes	yes					
extension	yes	yes	yes	yes			yes	yes
crop research	yes							
conservation tillage								Yes (LCA)
hydrological monitoring	yes							
subsurface water study	yes							
regional vulnerabilities	yes			Yes (3 projects)				
plantation forestry	yes	yes	yes	yes				
protected areas	yes						yes	Yes (4 projects)
reduce deforestation						yes		Yes (LCA)
reforest						yes		Yes (2 projects)
fishing		yes		yes				
Agroforestry								Yes (LCA)
	Dominican Republic				**Ecuador**			
	NC	ST[1]	SRM	OP (2)	NC	ST	SRM	OP (3)
IWRM					yes	yes		yes
Irrigation/drainage	yes					yes		yes
extension	yes				yes	yes	yes	
ag research	yes			Yes (2)				
plant health	yes					yes		
hydrological monitoring					yes			
surface water study	yes							
regional vulnerabilities								yes
protected areas	yes				yes		yes	
reduce deforestation					yes			
biofuels	yes							
land markets						yes	yes	

[1] Discusses "foster links between rural producers and value chains", higher value markets, etc. Nothing specific to adaptation.

	Guatemala				**Mexico**			
	NC[2]	ST[3]	SRM	OP (2)	NC	ST	SRM	OP (7)
IWRM								
Irrigation/drainage					yes			
extension		yes	yes		yes	yes	yes[4]	yes[5]
Agricultural finance								Yes (2)
nonfarm employment		yes	yes					
agricultural research					yes	yes		yes[6]
conservation tillage					yes			
hydrological monitoring								yes
regional vulnerabilities			yes[7]			yes[8]	yes	yes
plantation/managed forestry	yes				yes			Yes (4)
protected areas	yes				yes	yes		
biofuel/animal waste				yes	yes			
reduce deforestation				yes				
reforest					yes			
fishing								yes
Agroforestry					yes			
	Peru				**Uruguay**			
	NC	ST	SRM	OP (8)	NC	ST	SRM[9]	OP[10] (1)
IWRM			yes	yes	yes			
Irrigation/drainage			yes		yes			
extension		yes	yes[11]	yes	yes	yes		
ag research				yes	yes			
crop insurance					yes			
adaptation institutions			yes	yes	yes	yes		
hydrological monitoring	yes							
surface water study								
regional vulnerabilities	yes[12]							
protected areas	yes		yes		yes			
reduce deforestation		yes						
forest/reforest	yes	yes				yes		
fisheries				yes[13]				
land markets		yes		yes				

2 Discussion of vulnerability of forests, and loss of agricultural yields and soil productivity. Nothing concrete concerning adaptation plans. Some watersheds will suffer floods and others drought.

3 Discusses strengthening "productive clusters", product spaces etc, typical of the "territorial approach" to rural development. There is nothing specific on mitigation.

4 "Increase ag sector total factor productivity". This is much more general than extension, but would necessarily include it.

5 This is not really in the new strategy period. It is a 2011 loan currently under implementation.

6 This is not really in the new strategy period. It is a 2011 loan currently under implementation.

7 Specifically, increase incomes of rural indigenous population.

8 *"Coordinate three levels of government to meet the needs of the most vulnerable"*.

9 There is an indicator to implement a National Environmental System (DINAMA). I was unable to find CC content in this system, although the Strategy text suggests that it has CC relevance.

10 There is a 2013 project to implement the DINAMA.

11 Indicators are increase total factor productivity and increase average rural income.

12 Vulnerable due to poverty.

13 IDB is helping with Peru's FIP. Approval is expected in January, 2015.

Argentina - CC Strategy and Operations 2012-2015

Vulnerabilities and Needs from National Communication

Adaptation

1. Increase in water stress in the north and west of the country
2. Mendoza and San Juan irrigation threatened by intense storms and floods.
3. Strengthen watershed authority to resolve water use conflict.
4. Strengthen water control (structures) for the rivers of the Plata watershed.
5. Improve hydrological monitoring for purposes of flood warning.
6. Develop new crop varieties and alternative better-adapted crops to higher temperature, excess and deficit of water, and insects and plant diseases. (ongoing in INTA and private sector)
7. Need an "ambitions plan of study of subsurface water" for future irrigation along with appropriate regulations based on it.
8. Project of sustainable agriculture in the North.

Mitigation

1. Conserve native forests (under threat due to climate-induced movement of the agricultural frontier northward.
2. Commercial plantation forestry.

2012-2015 Bank Strategy text

Adaptation

1. Innovation and extension in livestock, forestry, and fishing
2. Agricultural health
3. Drainage and irrigation
4. Support for family agriculture to adopt technology
5. Regulate fishing

Mitigation

1. Support forestry

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Increase grain production: Increase in millions of tons
2. Expansion of irrigated area: Rehabilitated hectares
3. Adoption of better technology by small farmers: % total Gross Production Value

Mitigation

1. Increase in planted forest area millions of hectares

2012-Pipeline Operations

Adaptation

1. Program for Rural Development and Family Agriculture (PRODAF): 2012
2. AR-G1003 Adaptation to Climate change consequences on the hydrological cycle in Cuyo: 2013
3. AR-L1159 Sustainable Fishery Development Program: Pipeline

4. AR-T1127 Sustainable Development of El Impenetrable Program: Pipeline

Mitigation

1. AR-L1067 Forest Sustainability and Competitiveness Program: 2012

Results matrix. 3 of 6 text actions are in the results matrix.

Adaptation:

1. Innovation and extension not in results matrix
2. Agricultural health not in results matrix
3. Irrigation is in results matrix
4. Support for family agriculture is in in one (vulnerable) region.
5. Regulation of fishing is not in results matrix.
6. Support forestry is in the results matrix.

Mitigation

Operations

1. Adaptation: 3 regional projects oriented towards adaptation by small farmers (RM 3), no project directly oriented to increase grain production (RM 1) or expand irrigated area (RM 2) Cuyo project supports IWRM, not specifically in strategy but excellent CC adaptation project.
2. PRODAF supports adaptation for family farmers in Chaco and Entre Ríos.
3. El Impenetrable Program supports water management and small farmer service provision in an impoverished region. Excellent adaptation project.
4. Adaptation to Climate change consequences on the hydrological cycle in Cuyo
5. Forestry project reflects text and RM
6. There is a fisheries project which was in text but not RM
7. Fisheries development supports action in text but not in results matrix.
8. No agricultural health, was in text but not RM
9. Agricultural health was a 2008 project.

Overall summary conclusion

Imperfect fit between text, results matrix, and operations. No operations to achieve 2 of 3 agricultural adaptation-related targets (increase in irrigated area, and increase in national grain production Fisheries in text and operations, but not RM.

Strength of program is strong emphasis on family farming in text, RM and especially, operations.

Relative to NC good on IWRM in Cuyo and El Impenetrable projects. Attacking IWRM regionally makes sense.

Vulnerable populations service delivery not in NC but in Bank strategy, text, RM, operation.

Mitigation well represented.

Brazil - CC Strategy and Operations

Vulnerabilities and Needs from National Communication

The Brazilian National communication does not specify and adaptation or mitigation need—only accomplishments.

2012-2014 Bank Strategy text

Mitigation

Reduce deforestation and encourage conservation and restoration of forests through institutional strengthening, incentives, etc

Adaptation

1. IWRM
2. Food security

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Number of farmers with improved service and investment
2. Prevalence of farmers with food insecurity in intervention areas %

Mitigation

Improve management of protected areas; number by 2014[14]

2012-Pipeline Operations

Mitigation/Adaption

1. BR-T1264 Preparation of project Recovery of climate and biodiversity services in Brazil's Southeast AF corridor (2012).
2. BR-L1289 The Acre sustainable development program (2013).
3. BR-T1275 Linking climate change mitigation to community based forest management in Amapá (2030).
4. BR-G1003 Recovery of climate and biodiversity services in Brazil's Southeast AF corridor (pipeline).

Mitigation

1. BR-T1277 Forest information to support public and private sectors in management initiatives (2013).
2. BR-T1284 Assessment of the impacts of climate on the stability of the Amazon rainforest (2013).
3. BR-T1287 Planning and capacity building of the transition fund for ARPA for life (2013).
4. BR-T1293 Planning and capacity building of the transition fund for ARPA for life (2013).
5. BR-G1004 GEF TER Consolidation of SNCU and enhanced Flora and Fauna protection (pipeline).

[14] Note that the corresponding TC is an extremely small player in achieving the target objective indicated in the RM.

Adaptation

BR-X1028 Low carbon agriculture and avoided deforestation for reducing poverty (2013).

Conclusion

Results matrix

Adaptation

1. Nothing on IWRm
2. Includes indicators on food security

Mitigation

Has indicator corresponding to text.

Operations

Adaptation

No operations related to RM target food security.
Good correspondence between text, RM and operations on mitigation. Text, RM and operations are all weak on adaptation. No operation related to food security target in text and RM.

Dominican Republic – CC Strategy and Operations

Vulnerabilities and Needs

Adaptation

1. Need detailed study of the effect of climate change on natural and regulated waters.
2. Need studies of the effect of climate change on agricultural production.
3. Need introduction of varieties resistant to unfavorable climate.
4. Improved agricultural technology and practice.
5. Adaptation to new pest and plant health conditions.
6. Adaptation of planting dates.
7. Irrigation
8. Move agriculture to higher altitudes.
9. Improve hydro climatic modeling and its linkage with crop science.
10. Bring in technologies already adapted to drier climates
11. Explore multi-cropping (especially planting C3 to be in shade of C4.
12. Strengthen monitoring of plant pests and disease.
13. PANA: Training, networks for desertification, natural resources, and biofuels.

Mitigation

1. Develop a management plan/policy for the Parque Nacional Los Haitises.
2. Additional CDM/MDL projects oriented towards biogas from animal waste.

2012-2015 Bank Strategy text

Adaptation

Only discusses "foster links between rural producers and value chains, higher value markets etc. Weak adaptation link, if any.

Mitigation

Nothing in agriculture

Country Strategy CC related Results Matrix Indicators

Adaptation

nothing

Mitigation

nothing

2012-Pipeline Operations

Adaptation

1. DR-T1089 Preparation of the agricultural research and development program (2012).
2. DR-L1054 Agriculture research and development program (2012).

Mitigation

Nothing.

Conclusion

Dominican Republic does not reflect CC in the agriculture sections of its Strategy. It does nevertheless have an operation which is strategically relevant to adaptation in the agricultural sector and responds to several lines of the NC.

Ecuador - CC Strategy and Operations

Vulnerabilities and Needs

Adaptation: generally lacks specifics

1. Manage water.
2. Increase peasant family farmer productivity.
3. Develop Ecuadorean climate monitoring system.

Mitigation

1. Increase territory under conservation or environmental management by 5%
2. Reduce deforestation by 30%
3. CDM forest projects.

2012-2015 Bank Strategy text

Adaptation

1. Promote technological innovation and extension.
2. Improve plant and animal health.

3. Support land markets.
4. Support irrigation expansion and management.
5. Support territorial and land use-planning

Mitigation

Nothing specific

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Train farmers to access new technologies and practices: number of farmers
2. Increase land titling and regularization: number of registered properties

Mitigation

Restoration of degraded ecosystems: % of territory under conservation or management

2012-Pipeline Operations

Adaptation

3. EC-T1266 Support for the Chimborazo rural development investment program (2013)
4. EC-T1276 Support for the Chimborazo rural development investment program (2013)
5. EC-L1121 The Chimborazo rural development investment program (2013)

Mitigation

none

Conclusion

The results matrix does not contain indicators for 3 out of the 5 actions mentioned in the text (1) improved plant and animal health, (2) support irrigation expansion and management, and (3) support territorial land use planning.

Despite the lack of mention in the RM the main lines of action in the Chimborazo are rehabilitation and modernization of irrigation and support for irrigation user boards.

There are no operations to support two of the three RM indicators, (1) land regularization, and (2) restoration of degraded areas. The Chimborazo project should train farmers to access new technologies, but only related to irrigation and in the Chimborazo province.

Guatemala - CC Strategy and Operations 2012-2016

Vulnerabilities and Needs from National Communications

Adaptation

Discussion of vulnerability of forests, and loss of agricultural yields and soil productivity. Nothing concrete concerning adaptation plans. Some watersheds will suffer floods and others drought.

Mitigation

1. Protection and conservation of forests, including commercial.
2. Reforestation, agroforestry.
3. Improved commercial forest management.

4. Fire protection

2012-2016 Bank Strategy text

Adaptation: place-based, multiproductive, and multisector approach.

1. Increase rural incomes
2. Diversify sources of incomes
3. Identify productive cluster and product spaces and work to strengthen them
4. Identify economies of conglomeration and scale
5. Promote business through training
6. Support access to and disseminating of technology
7. Expand and improve rural roads
8. Improve coordination of the various levels of government and other actors

Mitigation

Nothing specific.

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Increase productive incomes of rural poor: %
2. Increase productive incomes of rural indigenous: %
3. Increase nonfarm income of rural poor %
4. Expand rural roads: km
5. Improve rural roads: km

Mitigation

2012-Pipeline Operations

Adaptation/Mitigation

GU-L1080 Supporting Low-carbon fuels in Guatemala: Jatropha oil and ni0omass production (pipeline)

Mitigation

1. GU-T1194 National Strategy for reducing emissions through avoided deforestation and forest degradation in Guatemala (2013).

Conclusion:

Results matrix.

Adaptation : Reflects text. Very weak on specifics of how to achieve these goals.

Mitigation.

Nothing

Operations

Jatropha operation contributes weakly towards specified adaptation goals, and perhaps more strongly to mitigation, which was not a goal in text of RM. Overall, good link between text and RM, except very weak on specific actions to achieve the targets. Almost no link exists between strategy and actual operations.

Mexico - CC Strategy and Operations 2013-2018

Vulnerabilities and Needs from the National Communication

Adaptation

1. Adapt crops with lower water needs.
2. Increase use of perennial crops, conservation tillage, and agroforestry systems.
3. Improve the crop rotation including less intensive cycles with more cover crops.
4. Reduce pasture stocking rate
5. Modernize irrigation.
6. MasAgro (CIMMYT)
7. Conservation tillage and soil management program.
8. Recovery of degraded land.
9. Agroforestry program Progan.

Mitigation

1. Prodefor: Program of sustainable management of forests.
2. Program of temperate forest cultivation
3. UMA: wildlife conservation units.
4. Other projects in the Proárbol program.
5. Other projects in the temperate action program (REDD+)
6. Manage animal waste.
7. SIL/FIP projects.
8. Green harvest of sugar cane (no burning)
9. Project for the use of bioenergy in agribusiness. (includes IDB ethanol plant)

2013-2018 Bank Strategy text

Adaptation

1. Raise agricultural productivity
2. Coordinate 3 levels of government to meet the needs of the most vulnerable.
3. Develop research and innovation programs.

Mitigation

Conserve and sustainably use ecosystems

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Increase agriculture sector total factor productivity. TFP
2. Number of highly vulnerable municipios covered by Bank financing instruments 18

Mitigation

Nothing

2012-Pipeline Operations

Adaptation

ME-L1082 Agricultural and fishery sector adaptation to climate change (pipeline)

Adaptation/mitigation

1. ME-T1217 Support for forest related MSMEs in Ejidos-implementation of forest investment (2013)

2. ME-L1139 Support for forest related MSMEs in Ejidos-implementation of forest investment (2013)
3. ME-L1145 FIRA: Financing of Green Lines (pipeline)
4. ME-X1021 FIRA: supporting access to finance for investments in the rural sector (pipeline)
5. ME-T1178 Support to the development of the climate change state actions plans.(2013)

Mitigation

1. ME-G1002 Financing low carbon strategies in forest landscapes (2012).
2. ME-L1120 Financing low carbon strategies in forest landscapes (2012).

Conclusion:

Results matrix

1. Increase agricultural productivity in text and RM
2. Coordinate 3 levels of government to meet the needs of most vulnerable in text and RM

Operations

1. Operations to meet the 2 targets in RM
2. No 2012-pipeline operation to meet innovation objective. However (ME-L1045) Mexico Program to Strengthen Rural Public Goods (2011) has this objective.
3. FIRA credit lines may contribute to increasing ag productivity, weakly.

Overall summary conclusion.

Ejido projects do not really fit in the strategy. They were added to obtain IDB's participation in FIP. No or weak new instruments to increase ag productivity in the strategy period. A 2011 loan to agricultual public goods has this purpose but it appears that resources may be diverted from this loan for other purposes. State plans to reduce vulnerability are in the text, and a 2013 TC exists to help. This is a relatively weak response, but it may develop into an interesting loan.

Peru - CC Strategy and Operations 2012-2016

Vulnerabilities and Needs from National Communications

Adaptation

1. Vulnerable due to poverty.
2. No national adaptation plan.
3. Proposal for a national climate observatory, climate, hydro meteorological monitory.

Mitigation

1. Numerous small forestation and reforestation projects.
2. National system of protected areas (SINANPE), indigenous areas, forest concessions.
3. National program for conservation of forests for mitigation of climate change to conserve 80% of national forest through payments for environmental services.
4. RED+ (readiness preparation proposal underway)
5. MDL

2012-2015 Bank Strategy text

Adaptation

1. Improve delivery of key service to increase competitiveness

2. Improve public management of forests
3. Form agglomeration economies (clusters)
4. Regularize land ownership
5. Build capacity among the various stakeholders to mainstream adaptation
6. Support adaptation measures in environmental services and public investment channels.

Mitigation

Reduce emissions from deforestation, mostly from garimpos and ranching.

Country Strategy CC related Results Matrix Indicators

Adaptation

1. Increase total agricultural productivity. TFP
2. Increase average rural income US$
3. Increase access to improved services % of farmers before and after national intervention
4. % of disaster risk management groups incorporating CC adaptation
5. Improve the efficiency of water use in irrigation projects increase water use efficiency in 3 watersheds
6. Make irrigation systems sustainable Rate charged for water use

Mitigation

1. Percentage of territory in protected areas %
2. Hectares of forest protected to offset loss of environmental services from Madre de Dios highway ha

2012-Pipeline Operations

Adaptation

1. PE-L1125 Project for the improvement of the national agricultural innovation program. (2013)
2. PE-L1126 Agricultural competitiveness program (Policy 2013) (supports watershed management)
3. PE-T1287 Support terrace program (2013)
4. PE-T1297 Adaptation to climate change of the fishery sector and marine-coastal ecosystem. (2013)
5. PE-G1001 Adaptation to climate change of the fishery sector and marine-coastal ecosystem. (2013)
6. PE-L1122 Agrian Information for rural development (pipeline)

Adaptation/Mitigation

1. PE-T1285 Support for the preparation of the land titling program. (2013)
2. PE-L1026 Land titling and registration program III (pipeline)

Conclusion:

Results matrix

Adaptation

1. Productivity related actions have indicator

2. Agglomeration clusters mention in text has no indicator and lacks specificity.
3. Regularize land ownership has no indicator.
4. Build capacity for adaptation has indicator
5. Irrigation sector improvements are in RM but not in text.

Mitigation

Mitigation has indicators in RM

Operations

1. Operations exist to support all the RM indicators. policy loan.
2. Fisheries operations do not appear in text or RM
3. Land titling operation does not appear in text or RM

Overall summary conclusion.

Good match between strategy, RM and operations.

NC is mostly mitigation. Bank is helping through the FIP (in preparation)

Uruguay - CC Strategy and Operations 2012-2015

Vulnerabilities and Needs from National Communication

Adaptation

1. Crop insurance
2. IWRM
3. Sustainable land management
4. Use of adapted species.
5. Cross cutting public policy tools (institutional strengthening, data management, technological R&D, international agenda, education and communication)
6. Irrigation
7. Strengthen modeling and forecasting system (for coastal zone management?)
8. Improve crop sequences (rotations), grazing systems.
9. Adapted species, animal breeding.

Mitigation

1. CDM (almost all energy)
2. Strengthen National Protected Area System.

2012-2015 Bank Strategy text

Adaptation

1. Adoption of technology by small producers, supported by financial institutions
2. Reduction of climate vulnerability by strengthening the regulatory framework.

Adaptation/mitigation

Sustainable use of natural resources in agriculture and forestry

Country Strategy CC related Results Matrix Indicators

Adaptation/mitigation

Implement a National Environmental System (DINAMA): System implemented.

2012-Pipeline Operations

Adaptation/Mitigation

UR-L1083 Program to support DINAMA (Dirección Nacional de Medio Ambiente).

Mitigation

Nothing

Conclusion:

Results matrix

Adaptation

1. Nothing on adoption of technology by small producers.
2. Has indicator for DINAMA which is of extremely low relevance for adaptation.

Operations

1. Has operation to implement (DINAMA)
2. No new operations within the new strategy period to address small farmer productivity. However, in fairness, UR-L10645 Rural productive development program, and UR-L1016, Support for agricultural management both address adaptation issues and are both under implementation.

Overall summary conclusion.

Virtually no CC content in pipeline. The DINAMA project, from what can be learned from web documents, has no CC content.

Adaptation is addressed through two ongoing projects that precede this strategy period. There is nothing new in the strategy period.

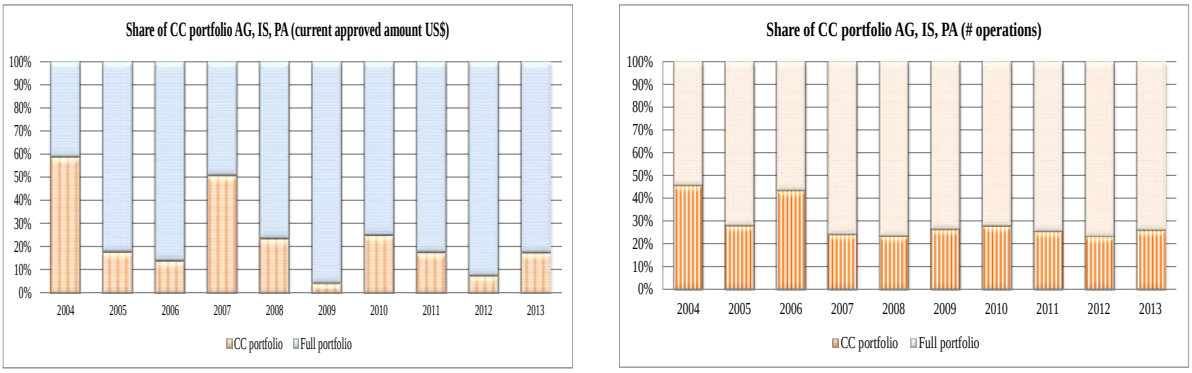
ANNEX 8. OVERALL SECTOR PORTFOLIO - DETAILED DESCRIPTION

This section describes and analyzes the projects labelled as Climate Change in the agriculture, forestry and land use change sector during the period 2004-2013. OVE looks at the number of climate change related projects and their approval values and compares them with the total number and value of all projects in the sector's portfolio. Between 2004 and 2013, the Bank approved US$3.1 billion between loans and grants as part of the agriculture, forestry and land use change portfolio related to climate change (US$109 million for TCs, US$76 million for investment grants, US$2.5 billion for investment loans, US$367 million for policy based loans and US$1.8 million for private sector loans) for a total of 223 operations.[1]

The projects in the portfolio were identified on a sector basis. To start, three sectors were selected: agriculture (AG), Water and sanitation (AS) and environment and natural disasters (PA). Within these three sectors, the projects with a thematic link between agriculture-forestry and climate change were chosen and classified in one category, intending to describe the general topic of the operation: (i) Agricultural General, (ii) Forestry, (iii) Water Resources; (iv) Government and Environmental Planning; and (v) Others.

CC as % of total portfolio. As is shown in the Figures 1 and 2, over the period the CC related portfolio for the sector has a flat trend, when compared with the full portfolio for the sectors AG, AS and PA. However the trend in the approved amount shows a higher peak in 2004 and 2007.

Figures 1 and 2: Share of AG-climate change related Loans and Grants over the period 2004-2013

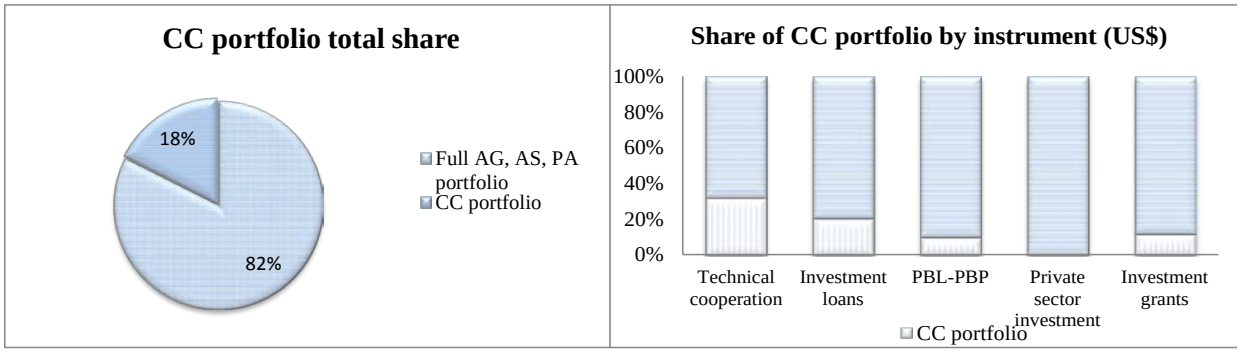


Source: OVE calculation using IDB Corporate Database

CC as % Total instrument. Out of the total of this three sectors, the climate change related TCs were 32% of the total amount for the sectors (US$343 million), the Investment loans were 21% out of US$12 billion, the Policy Based loans were 10% out of US$3.6 billion, the private sector loans were only 0.3% out of US$653 million approved in this three sectors together and the investment grants were 12% out of US$634 million.

[1] Excluding cancelled operations, as well as operations from the Multilateral Investment Fund (MIF) and the Interamerican Investment Corporation (IIC).

Figures 3 and 4: Share of AG-climate change related Loans and Grants over the period 2004-2013, by instrument

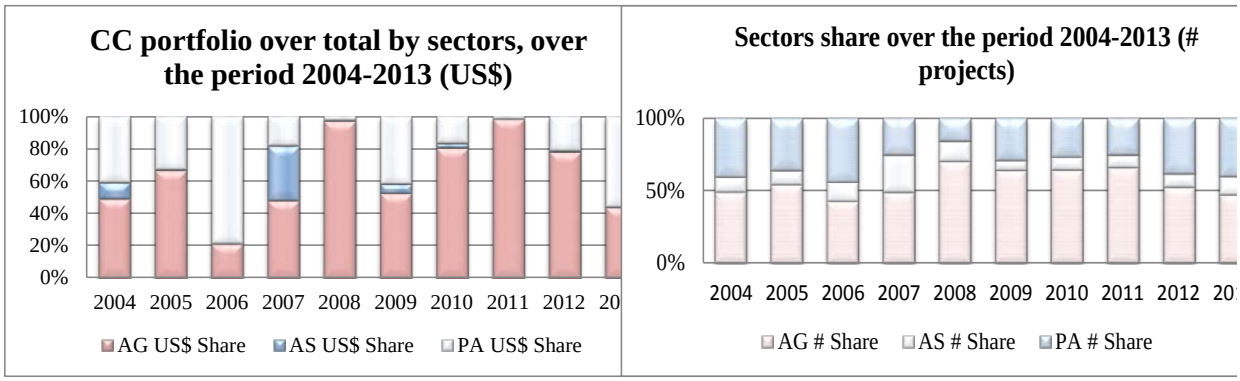


Source: OVE calculation using IDB Corporate Database

Figure 3 shows that in general 18% of the Agriculture and Forestry sector projects have objectives or components related to climate change. Out of those, the CC related technical cooperation has the biggest share out of the total amount of technical cooperation in the AG, AS and PA portfolios, followed by 21% of investment grants with a CC related purpose.

The projects from AG have the highest share over the total approved amount and number of the projects in the sector, except in 2006 when the PA has the biggest value in the portfolio, mainly due to the approval of the Peten Development program for the Conservation of the Mayan Biosphere Reserve (GU-L1002, for US$30 million). In the case of Water & Sanitation sector, the share of the identified climate change related projects is very low during all the period of analysis, mainly because we are only including water related to irrigation and conservation of water sources. The peak of 2007 (See Figures 5 and 6) is caused by two big programs of water infrastructure in Argentina (Water infrastructure in Northern provinces development for US$240 billion) and the first phase of the Policy Based loan (Water Resources Program) for Peru, of US$200 billion.

Figures 5 and 6: Share of CC portfolio by sector, approved amount and number of projects



Source: OVE calculation using IDB Corporate Database

Climate change strategy and CC agriculture Portfolio. In 2010 the IDB obtained the Ninth General Capital Increase (GCI-9) and identified as one of its priority areas to protect the environment, respond to climate change, promote renewable energy, and ensure food security. Table 1 shows an increasing tendency both in the number of projects and the approved amount along the period of analysis when comparing with the first 4 years (2004-2007), as well as the average value approved. However, there is a decrease of 8.3% in the

approvals of the projects related to climate change and agriculture after 2010, during the period 2011-13.

Tables 1 and 2. Evolution of CC related operations

	Total (US$ million)	Total (# operations)
2004-2007	804,959,240	55
2008-2010	1,195,024,523	78
2011-2013	1,097,377,649	90

Source: OVE calculation using IDB Corporate Database

	Average (US$ million)	Average (# operations)
2004-2007	201,239,810	14
2008-2010	398,341,508	26
2011-2013	365,792,550	30

Source: OVE calculation using IDB Corporate Database

In particular, table 3 shows that the decrease of 8% in the total approved amount in 2011-2013, (compared to 2008-2010) is explained by a decrease of 21% in the approval of investment loans.

Table 3. Evolution of CC related operations by instrument

	Average (US$ million)				
	Loan	PBL /PBP	Private sector	Technical cooperation	IGR
2004-2007	143,924,881	50,000,000	0	3,771,114	3,543,815
2008-2010	366,901,333	18,333,333	0	8,468,023	4,638,818
2011-2013	288,800,000	37,306,667	600,000	23,105,883	15,980,000

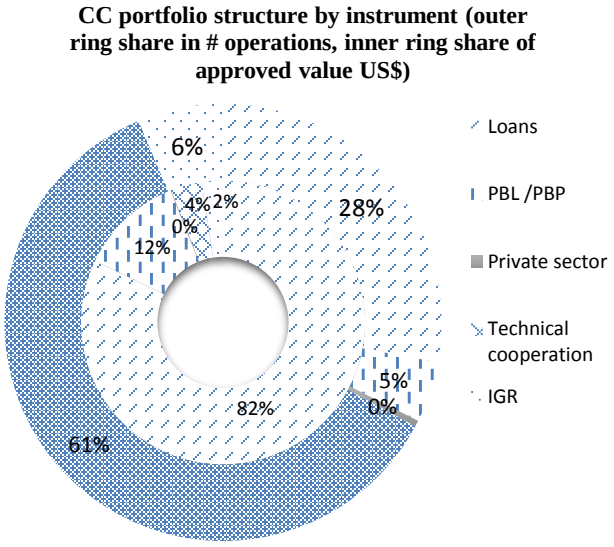
Source: OVE calculation using IDB Corporate Database

There are private sector investments related to climate change in this sector only in the last sub-period of analysis and the policy based loans have a decrease in the period 2008-10 compared to the initial period, with a subsequent increase of more than 100% in the last part of the series. The technical cooperation and investment grants have had a strong increasing tendency, mainly after 2010.

Climate Change Portfolio by Instrument

Out of the US$3,1 billion approved for the climate change related agriculture and forestry sector portfolio, 4% were TCs, 2% were investment grants, 12% was designated for Policy Based Loans, 0.1% were private sector loans and 82% were Investment loans, which were mainly operations of specific investments such as the Program to strengthen rural public goods in Mexico (ME-L1045, approved in 2001 for US$190 million). As is seen in Figure 7, most of the portfolio (61%) is technical cooperation, although it represents only 4% of the total amount approved during 2004-2013. The loans represent 28% of the number of projects, but the biggest share of the value of the portfolio.

Figure 7: Share of CC portfolio by sector, approved amount and number of projects



Source: OVE calculation using IDB Corporate Database

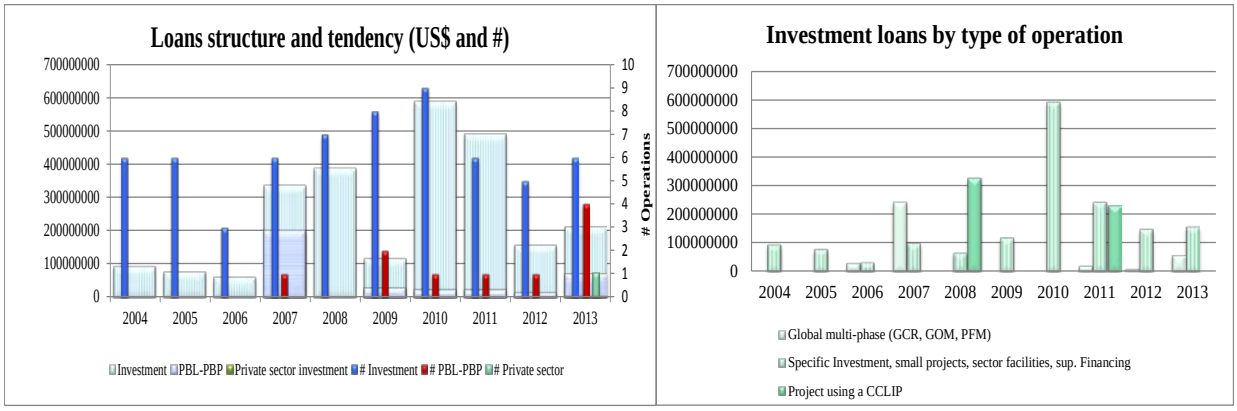
This section describes in detail the evolution and structure of the sector's portfolio by instrument.

Loans

During the period of analysis the Bank approved 62 investment loans for US$2.5 million, 10 PBLs for US$367 million and 1 private sector loan for US$1.8 million for projects from agriculture, water or forestry with a climate change impact.

As is shown in Figures 8 and 9, the biggest share of the portfolio is investment loans, in particular, specific investment operations which highest peak in 2010 is explained by two main programs approved in this year: The program to Strengthen the agricultural innovation system for Argentina (AR-L1064, approved for US$170 million) with the purpose of support technological transfer and extension for farmers and the promotion of international cooperation as a support for agricultural research and the program Serra do Mar and Atlantic Forest Mosaic System socio-environmental recovery for Brazil (BR-L1241, approved for US$162,5 million) with the purpose of promote the conservation and recovery of the Serra do Mar mountain range to preserve the biodiversity and natural water sources of the Region.

Figures 8 and 9: Loans tendency and structure



Source: OVE calculation using IDB Corporate Database

There are four projects using a conditional credit line in 2008 and 2011, one set for Argentina (Food and Agriculture Health and Quality Management Program, AR-L1032; Provincial Agriculture Services PROSAP II, AR-L1030 and PROSAP III, AR-L1120) and one project for Peru (Agricultural Health and Agrifood safety development program, PE-L1023) with the objective of strengthen the national system for prevention and control of pests and diseases and general agricultural health and food safety services.

On the other hand, the peak on the number of operations and approved amount of investment loans in 2007 is mainly explained by Global or multi-phase loans[2], which include only five operations throughout the series, being the Water and Infrastructure Northern Provinces Development for Argentina, the largest one in 2007 (US$240 million).

The Policy Based Loans share of the portfolio remains very low during 2004-13, being 2007 the year with the highest value in the approved amount due to the Water resources reform program phase I for Peru, approved for US$200 million.

TCs and Grants

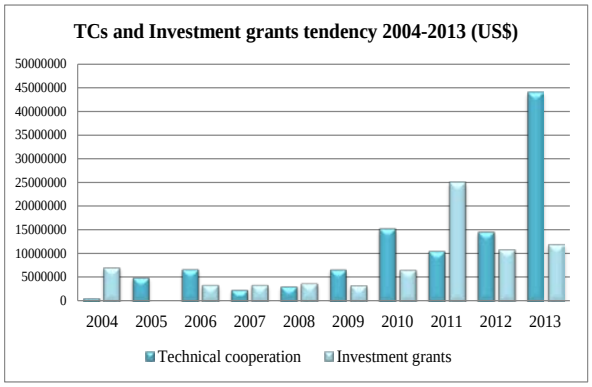
The total approved amount of technical cooperation during 2004-13, was US109.8 million (135 operations) and US$76.03 million for investment grants (15 operations). As is shown in Figure 10, the biggest peak on the approvals for technical cooperation was in 2013, with US$43.9 million (28 operations) destined mainly for knowledge generation (US$28.6 million and 15 operations), and in particular, the support and promotion of knowledge related to the assessment of environmental regional assets and climate change impact on forestry, biodiversity and water resources (10 regional projects of US$5.9 million). The biggest project in this category for 2013 was the Forest information to support public and private sector in management initiatives for Brazil (US$16.5 million), with the objective of carry out the National Forest Inventory in the Cerrado biome and strengthen the National Forest Information system.

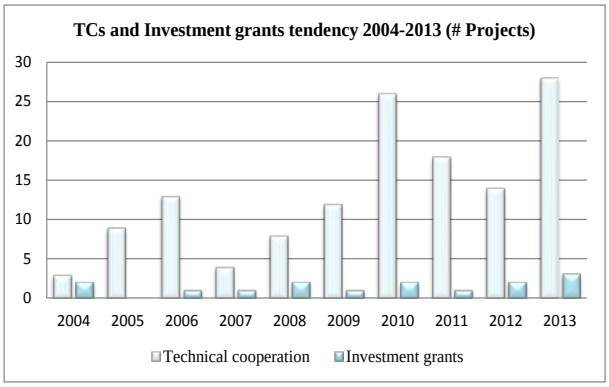
Out of the fifteen operations classified in the category of knowledge generation for 2013 (3 in Brazil, 1 in Paraguay and 11 regional) three of the most relevant besides the Support for the National Forest Inventory in Brazil (BR-T1277); are the program for tropical Andean Glaciers monitoring (RG-61006) for US$1,5 million; the support for the creation of formal and informal training programs for the effective management of water resources in Latin America (RG-T2390) for US$1,5 million, and the support for Planning and Capacity building of the Transition Fund for ARPA for live in Brazil (BR-T1287) for US$3.5 million, with the objective of supporting studies about the provision of long term compensation for bio climate services and evaluation for climate resilience.

As is shown in the Figures below, the number of investment grants have remain very low during the entire period, while both the number and approved amount of technical cooperation have a general increasing tendency.

[2] The Global of multiple works operation and Multi-phase lending projects were developed in order to finance a series of small independent subprojects, rather than apprising each of the small independent subprojects before approval by the Board of Executive Directors.

Figures 10 and 11: TCs and investment grants trend over 2004-2013

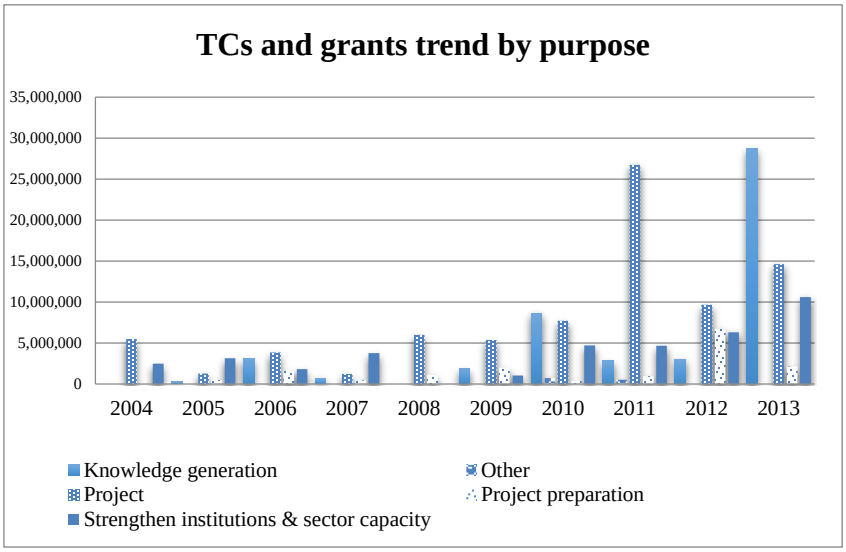




Source: OVE calculation using IDB Corporate Database

The distribution of TCs and grants by its purpose, shows a general flat tendency over most of the trend, with the peak in knowledge generation projects described above and an additional peak in the amount of standing alone projects in 2011, explained by the approval of the program of Technology transfer to small farmers in Haiti (HA-G1025) for US$25 million, which as was shown in Figures 10 and 11, corresponds to an investment grant. The program includes non-reimbursable financial support for farmers who agree to adopt technological packages as well as a component to support the control and regulation of seeds by strengthening the National seeds service of the MARNDR.

Figure 12: Evolution of CC related TCs and Grants over 2004-2013



Source: OVE calculation using IDB Corporate Database

On the other hand, out of the projects classified as having the main purpose of strengthen institutions and increasing the sector capacity, the main two operations causing the increase on the approved value for 2012 and 2013, are: the project to enhance the national institutional capacity to address the impact of climate change and support for the low carbon development strategies in Guyana (GY-G1002, approved in 2012 for US$5.9 million), and the project to support the preparation and implementation of the REDD+ strategy in Guatemala (GU-T1194, approved in 2013 for US$3.8 million).

Portfolio structure by theme

Methodology

The portfolio was classified on a thematic base in order to better identify the link between climate change and agriculture, forestry and water, as well as the main purpose of the operations. Each project was classified in one of the following categories: (i) Agricultural General, (ii) Forestry, (iii) Water Resources; (iv) Government and Environmental Planning; and (v) Others (Box 1). It is important to note that most of the projects in this sector include activities within the different topics, for example one single project may include investments in infrastructure for irrigation and also research and plant health activities. However for the purpose of this evaluation each operation was classified only in one category according to its ulterior objective based on loan documents, project visits and discussion with Bank specialists and government officials. We have only 4 multiple operations that couldn't be define as belonging to a single category and were classified as other.

Box 1: Classification of the projects

General Agriculture, which comprises projects to strengthen and promote the offer of public goods such as health, research and innovation services, projects related to the modernization or strengthening of the land administration system and cadaster information, projects with the objective of promote the adoption of new technologies among producers or facilitate the adoption of it through subsidies or cash transfers programs, capacity building for the adoption of technical innovations or agriculture risk management mechanisms as well as sustainable crop management practices. Projects with the objective of increasing the farmer's access to markets or financial resources were not included in the portfolio due to their low climate change impact.

Forest related projects comprises the promotion and guidance for the sustainable use of forest resources, programs for the sustainable management of biodiversity or endemic species living in forest areas, promotion and improvement of conservation efforts and protected areas to promote the protection of ecosystem services, promotion and support for programs to reduce deforestation and forest degradation, support for the generation and management of deforestation data and climate change impact on it and projects related to promote environmental-sustainable business in forest landscapes.

Water resources, which includes mainly water for irrigation or the protection and management of water sources. In particular, includes projects related to the protection of rivers or watersheds, programs to increase the adaptive capacity for water management in communities or producers, projects related to the creation or guidance for water funds to promote private sector participation in the conservation of water ecosystems, adaptation or management plans for the water sector, programs to monitor the glaciers dynamic, construction or rehabilitation of water infrastructure such as dams or canals, establishment or management of water reserves, extension work to improve the management of irrigation systems, promotion of water users associations and institutional strengthening of the National water authorities as well as development of hydrological models or estimations.

Government and environmental planning, includes the projects with the objective of strengthen the Ministry of Agriculture or Environment3 on their process of strategic planning, management or administrative capabilities through human resources, management tools, technology or communications and infrastructure or equipment.

Other projects are mainly development programs for a particular region including multiple components were each one might be classified in one of the previous categories in equal way.

In addition of classifying the portfolio by topics, each project was also classified by its climate change impact (Mitigation, Adaptation or Both) and each technical cooperation or grant was also classified by its purpose i) Knowledge generation, ii) project preparation or direct support, iii) stand-alone projects or pilot programs and iv) strengthening institutions or sector response capacity.

[3] And their related secretaries or divisions.

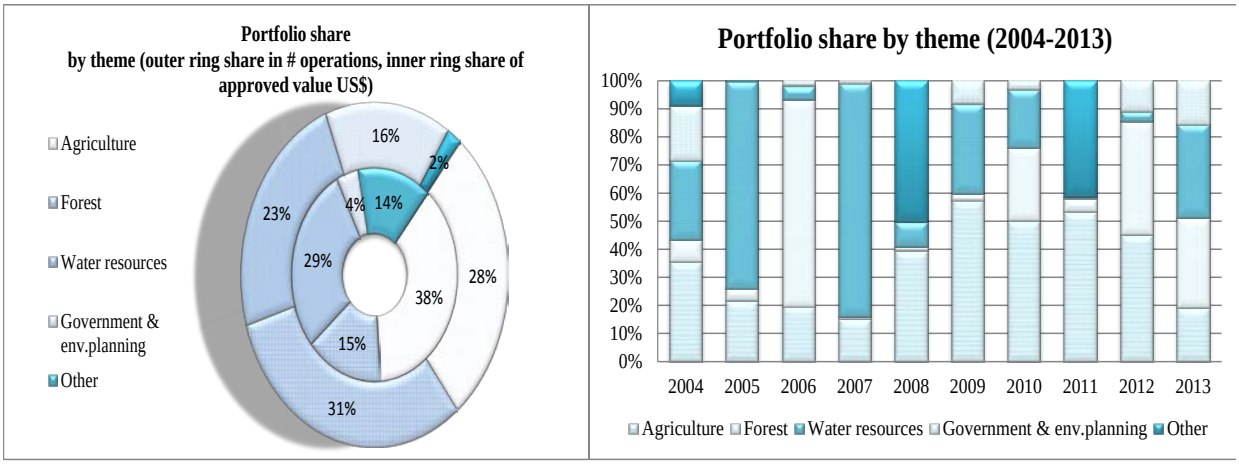
Addressing climate change in this sector, either through mitigation or adaptation mechanisms was not an explicit objective before the establishment of the Sustainable Energy and Climate Change IDB Special Program -SECCI fund – (GN-2435-1, 2007) and in particular after the publication of the IDB Climate Change strategy (OP-508-1, 2010), however many of the activities related to climate change such as irrigation works, or capacity building for the adoption of technologies among producers existed before.

Mitigation projects are mainly related to the conservation of forest and promotion of sustainable practices to avoid deforestation, with the climate benefit of reducing the concentration of GHG in the atmosphere. In addition, some agriculture projects also include mitigation benefits by promoting the adoption of technologies that reduce the emission of greenhouse gas while increasing the productivity. On the other hand, adaptation projects in agriculture intend to increase the resilience of producers or communities by reducing the risk faced by weather inclemency over the crops, through the development, promotion and adoption of resilient seeds, cropping technologies or irrigation practices. In this sense, most agricultural investments are equally important for meeting current development needs as for helping to prepare for a changing climate.

Portfolio by Themes

During 2004-13, the Bank approved 63 projects classified within the Agriculture category (US$1.2 billion), 69 projects related to Forestry (US$461 million), 52 related to water for irrigation or hydric sources (US$890 million), 34 projects in the Government & environmental planning category (US$136 million) and 4 classified as other (US$439 million). As is shown in Figure 13, the projects related to forestry constitute the biggest share of the total number of projects in the CC related portfolio for the sector, however the biggest share of the total approved amount was destined for the projects classified as general agriculture (38% of the portfolio). Apart from the projects in the "other" category, the lower share of the portfolio both in number of projects and approved amount is government and environmental planning, including projects intending to promote the strengthen of the Ministry of Agriculture or Environment on their process of strategic planning, management or administrative capabilities through human resources, management tools, technology or communications and infrastructure or equipment.

Figures 13 and 14: Portfolio structure by theme and trend

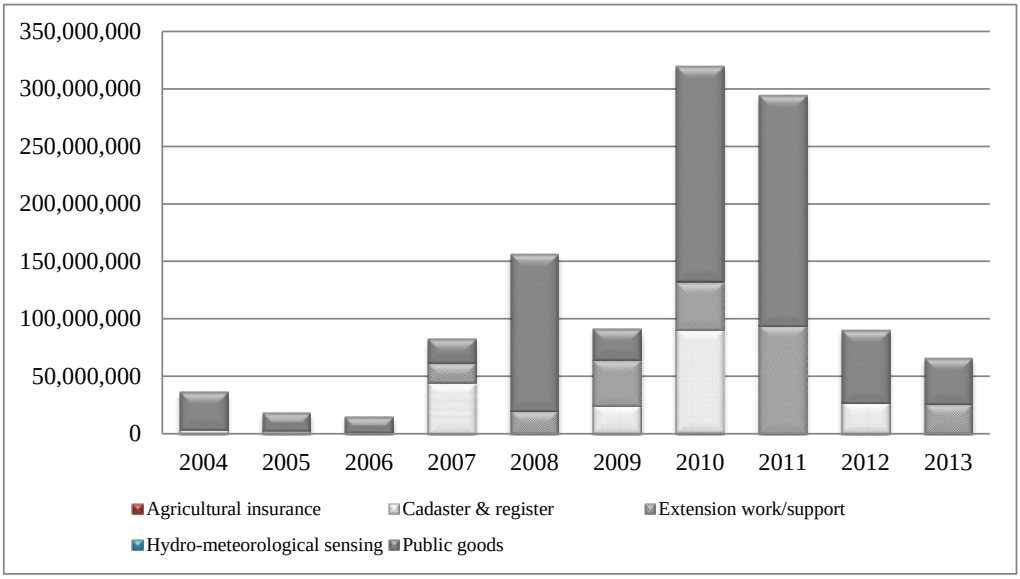


Source: OVE calculation using IDB Corporate Database

During most of the period, the share of the categories in the portfolio is very heterogeneous, in particular in the last three years; whereas for 2005-2010, one or two categories have most of the share for each year.

Agriculture. As is shown in Figure 15, the projects in the Agriculture category have the higher peak in 2010, with a total of 13 projects and US$319.9 million approved. This peak is explained mainly by the approval of two big programs: i) The strengthening for the Agricultural Innovation system in Argentina (AR-L1064), for US$170 million intended to support the institutional modernization, including technological linkages and international cooperation, as well as support to the efforts of generating and transferring technologies to producers; and, the ii) National System for rural land information and management and technology infrastructure in Ecuador (EC-L1071), approved for US$90 million with the objective of improving the cadastral management and rural property registry system to provide information for land management and land use planning in rural areas.

Figure 15. Agriculture project trend US$



Source: OVE calculation using IDB Corporate Database

Within this category, (as is shown in Figure 15), most of the projects throughout the period are related to the provision and strengthening of public goods in the Region, in particular projects with the objective of promote and support the services of plant and animal health, research and innovation for the control of pests and diseases in plants and animals. Most of the projects in this category include activities of institutional strengthening for the department in charge of developing this activities, but also extension works for the promotion of pest's management or control and capacity building for farmers. The biggest program in this sub-category is the Program to strengthen rural public goods in Mexico (ME-L1045, approved for US$190 million), which explains the second highest peak for this category, in 2011. The program includes activities to support the animal's health and food safety, technology generation and transfer and scientific research for fisheries resources.

In addition, 16 projects were financed as part of the category extension work, including mainly activities to promote the use of cropping technologies among producers; in total the Bank financed US$238 million with this purpose, being the Rural Productive Development Program for Uruguay (UR-L1064, for US$28.4 million) the largest contributor of the peak in 2011, with the objective of increasing medium-scale farmers' productivity through the adoption of new technologies. In particular, the program seeks to finance 50% of the cost of

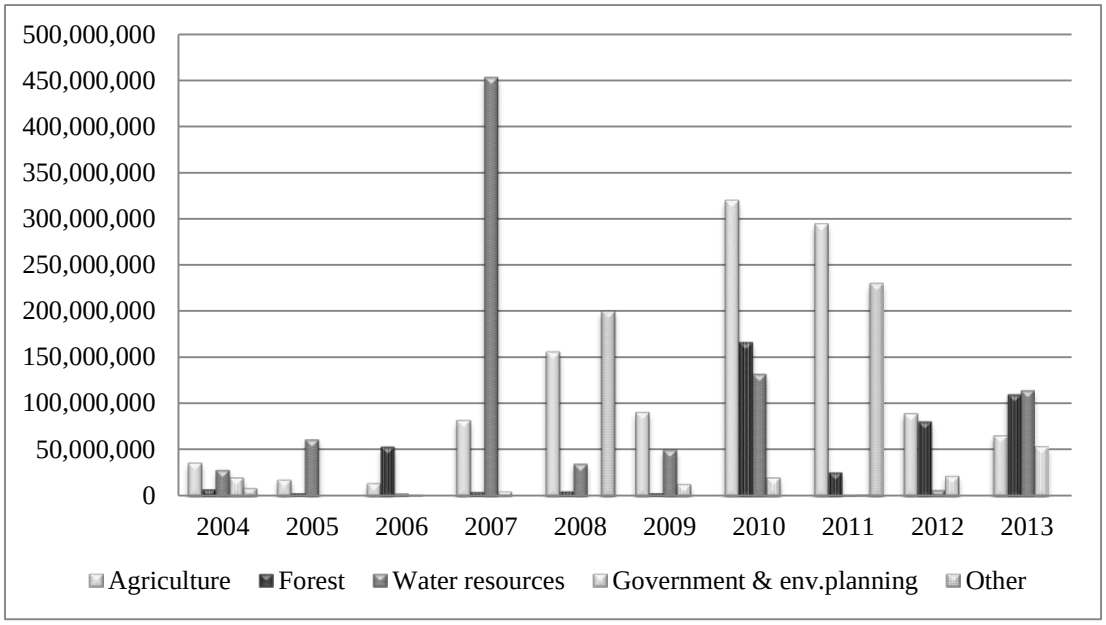
these technologies for selected farmers and promote the farmer's capacity building through the certification of professional/private technicians to support the producers in the formulation of management plans for the adopted technologies, producers associations, commercial promotion, natural resources sustainable management and adaptation to climate change.

Water resources. As is shown in Figure 16, the highest peak in the approved amount of projects destined to water for irrigation or conservation of hydric sources was in 2007, when the Bank approved four projects of US$453 million, (one for Argentina, one for Haiti and two for Peru), all completed by now. Two of the projects exceeded approvals of US$200 million destined for irrigation and drainage systems works and water regulation systems. These two projects were the Water infrastructure Northern Provinces Development program (AR-L1015) for US$240 million, and the Water resources program phase I (PE-L1024) for US$200 million.

During the rest of the series the amount destined for this category of projects remains very low, with two moderate peaks in 2010 and 2013. The first, explained mainly by the second phase of the water resources program for Peru (PE-L1050, for US$25 million) and the Development program for the Southwest Region of the State of Tocantins in Brazil (BR-L1152, for US$99 million), with the objective of develop infrastructure for rural development, mainly irrigation and drainage systems such as dams, canals, pumps, etc.

In 2013, the Bank approved 14 projects for a total value of US$114 million, out of which the program of Irrigation with a watersheds approach for Bolivia (BO-L1084, for US$57 million) is the biggest one, followed by the Water management Program in the Artibonite Basin in Haiti (HA-L1087, for US$25 million).

Figure 16: Portfolio trend by theme



Government and environmental planning. During 2003-13 the Bank approved 34 projects with the main objective of supporting the Governments capacity in relation to agriculture or forestry climate change related activities. As is shown in Figure 14, the share of this category over the portfolio throughout the series remains very low, because the category contains

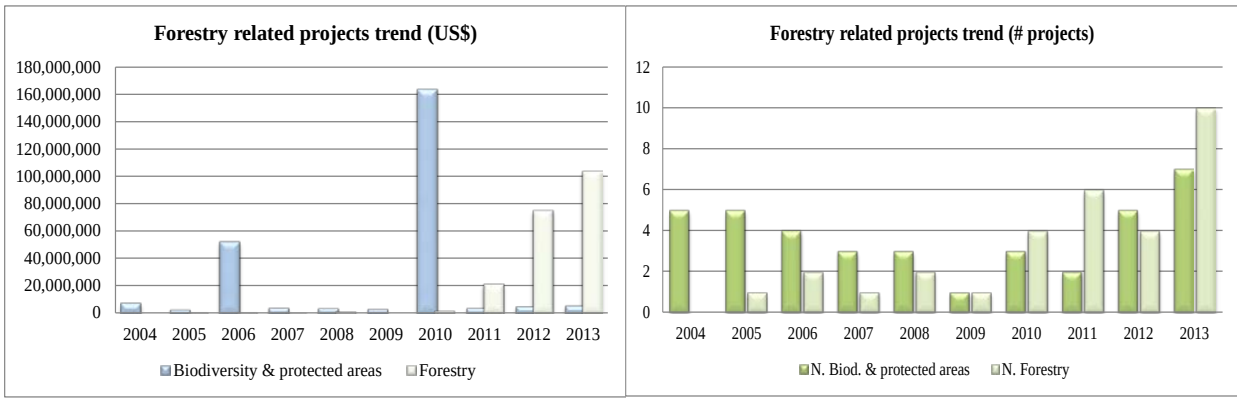
operations for which all its components are mainly related to institutional strengthen or support for planning or decision making, although it is important to note that other programs including similar activities could have been classified in any of the other categories if its ulterior objective was the development of objectives related to agriculture, forestry or water for irrigation. The highest peak on the approved amount in this category was in 2013 due to the approval of two programs: the Environmental strengthen phase I for Guyana (GY-L1039, for US$16.9 million), and the Institutional strengthening and reform of the agricultural sector phase II in Haiti (HA-L1082, for US$15 million). Both programs are programmatic policy based loans seeking to support the strengthening of environmental governance overcoming institutional constrains to develop agriculture productivity.

Forestry. On the other hand, the Bank approved a total of 69 projects related to forestry, protected areas or biodiversity, reaching a total of US$461.5 million approved during 2004-2013. However, as is shown in Figure 17 the value of these operations exceeded the US$40 million only in a few years, in particular after 2009, when the number of operations changes from a higher participation of biodiversity and protected areas, to a higher participation of specific forest related activities after 2010.

The highest peak on the approved amount of the biodiversity and protected areas category for 2010, is explained by the approval of the Serra do Mar and Atlantic Forest Mosaic System Socio-environmental Recovery for Brazil (BR-L1241, for US$162.5 million), which seeks to promote the appropriate management of natural resources, the sustainable development of the Region and the conservation and recuperation of the Serra do Mar area as well as the Jureia-Itatins Mosaic and the marine conservation of its surrounding areas.

The peak on 2006 for this sub-category is explained mainly by the Petén Development Program for the conservation of the Mayan Biosphere Reserve (US$30 million), with the objective of preserve the natural resources and cultural heritage of the Region through land regularization in the Mayan reserve and the promotion of sustainable tourism initiatives.

Figures 17 and 18: Forestry related projects trend



Source: OVE calculation using IDB Corporate Database

Among the US$103.6 million approved in 2013 for specific forestry projects, the biggest one is the second phase of the Acre Sustainable Development Program (BR-L1289, for US$72 million), which has the main objective of reducing deforestation and forest degradation through a system of forest concessions and the establishment of economically and environmentally viable forest plantations exploitable for rubber and natural medicines. This program is one of the selected projects for in depth evaluation, whose results are described later on this document.

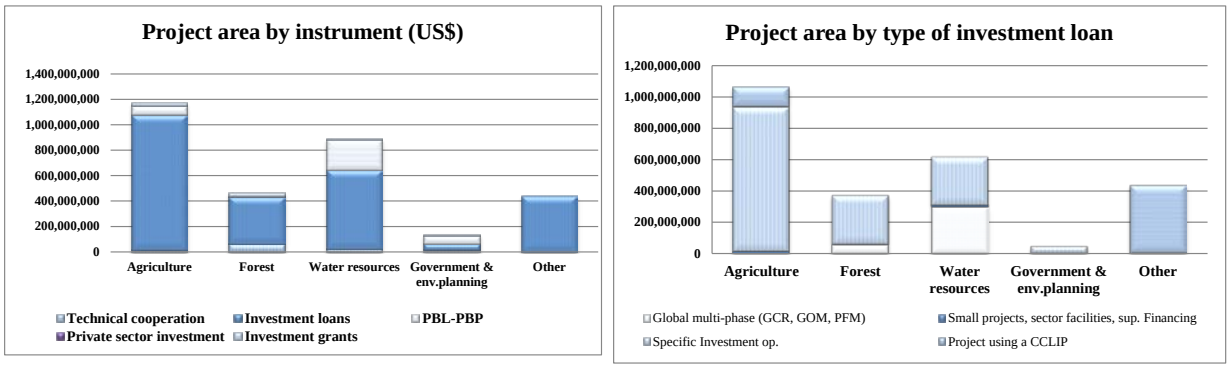
Other. There are four projects classified as "other" in the CC related portfolio, all regional development programs including components related to regional infrastructure for irrigation, food and agricultural public goods and increase the capacity of institutions responsible for the management of natural resources and agricultural productivity. As is shown in Figure 14, the category has two peaks in 2008 and 2011, explained by the Provincial Program for agricultural services (PROSAP) for Argentina, phase II and III, approved for US$200 and US$230 million respectively.

CC portfolio by theme and instrument

During the period of analysis, the Bank approved t10 agriculture – CC related PBLs, with the higher number of policy based loans approved in 2013, but the highest amount approved in 2007 for the Water resources program for Peru (US$200 million). In general, it is possible to say that the policy based loans have not been the most important instrument to support climate change activities in the Region´s agriculture and forestry investments. As is shown in Figures 19 and 20, the investment loans constitute the highest share of the portfolio during all the period among the different thematic categories.

However, the share of policy based loans is higher for the projects related to water resources management, being the largest one the Water resources reform program phase I for Peru, approved for US$200 million. On the other hand, the share of technical cooperation is higher for the forestry projects, being the main one the support to forest information for public or private management initiatives (BR-1277, for US$16.4 million). Within the investment loans, the projects related to water resources are also divided into specific investment operations and global or multi-phase programs, while the Bank has approved only US$30 million in multi-phase lending and global credit operations for forestry.

Figure 19 and 20: Portfolio by instrument and by type of investment loan, 2004-2013



Source: OVE calculation using IDB Corporate Database

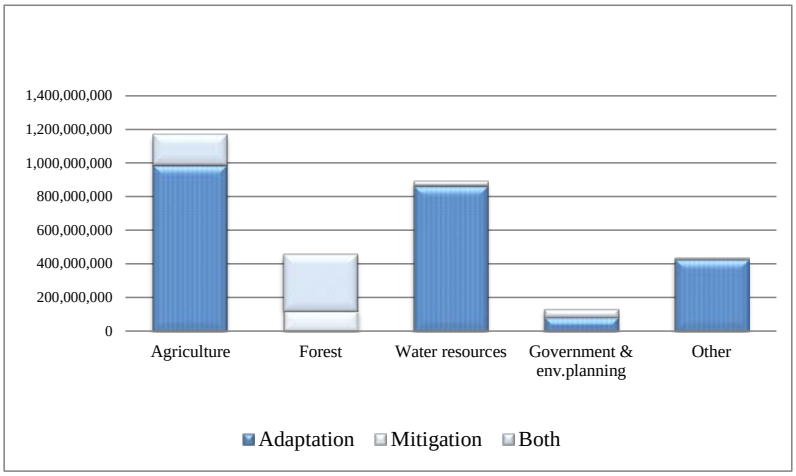
CC impact. During 2004-13 the Bank has approved operations with adaptation impact for US$2.4 billion (76.3% of the entire CC related portfolio for the sector), US$122.8 million for mitigation and US$610 million for both. Out of the adaptation efforts, the 37% of the total adaptation investment is directed to water resources management (US$860 million), including infrastructure works for irrigation and development of water management strategies for water users associations and specific regions. Out of the total approved amount for water management, the 97% is adaptation and only 3% includes the conservation of water sources generating both mitigation and adaptation impacts.

In the case of the agriculture projects, 16% of the portfolio's sub sector is destined to both mitigation and adaptation mainly through land management or regularization programs, while

the 84% (US$985,8 million) is invested in adaptation aiming to support technology transference, capacity building among farmers and provision of agricultural public goods.

In the case of the forestry projects, 27% of the approved amount (US$122.4 million – 29 operations) had a mitigation impact, while 73% (US$338 million – 39 operations) had both mitigation and adaptation impact.

Figure 21: Portfolio by theme and CC impact, 2004-2013



Source: OVE calculation using IDB Corporate Database

As is shown in table 4, the Bank increased in more than 90% the average approved value for the adaptation efforts both in number of operations and approved amount when comparing 2008-10 with 2004-07, and 40% increase in the total amount. However after the establishment of the IDB's climate change strategy in 2010, there is a decrease of 8% in the average and total amount of the operations, when comparing the last three years of the series with the period 2008-10. In the case of projects with adaptation and mitigation impact, the portfolio has a significant increase on the average and total approved amount, as well as the total number of operations approved during the last three years of the series. Most of the projects classified in this category are programs for the sustainable use of forest resources or sustainable use of ecosystem services, seeking both to protect the forest and develop adaptation mechanisms for the landscape use.

Finally, projects with a mitigation impact for climate change showed an increase close to 100% in the average and total approved amount comparing 2008-10 with 2004-07, but during the last three years, the approved value decreases around 40%, while the number of operations is larger.

Table 4: Evolution of the portfolio's CC impact, average 2004-2013

	Average approved amount US$ million			**Average number of operations**		
	Adaptation	**Mitigation**	**Both**	**Adaptation**	**Mitigation**	**Both**
2004-2007	158,2	41,1	1,9	7	6	2
2008-2010	301	94,3	3,0	18	5	2
2011-2013	276,1	54,3	35,3	15	10	5

Source: OVE calculation using IDB Corporate Database

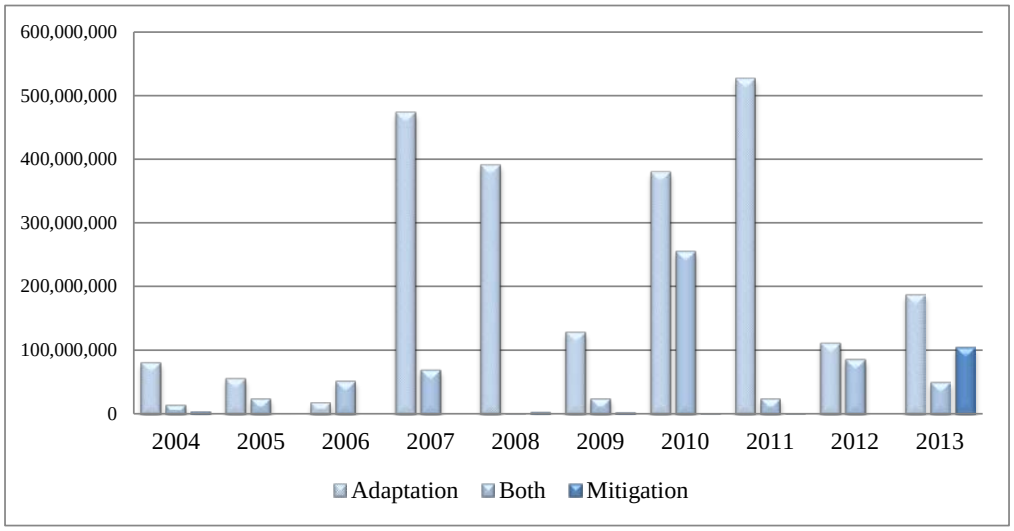
Table 5: Evolution of the portfolio's CC impact, total 2004-2013

	Total approved amount US$ million			Total number of operations		
	Adaptation	**Mitigation**	**Both**	**Adaptation**	**Mitigation**	**Both**
2004-2007	632,9	164,4	7,8	26	22	7
2008-2010	903,1	282,9	9,1	55	16	7
2011-2013	828,4	163,1	105,9	45	29	16

Source: OVE calculation using IDB Corporate Database

In general, as is shown in Figure 22, the biggest share of the portfolio is destined to adaptation efforts, with an increasing tendency during 2007-11 and a subsequent decrease for the last years of analysis. The mitigation share in the portfolio has remained low during 2004-12, having its higher peak in 2013. The projects with mitigation and adaptation impact increased its approvals in 2010, mainly due to the program for Serra do Mar and Atlantic Forest Mosaics System Socioenvironmental recovery in Brazil (BR-L1241, for US$162.5 million) with the objective of promote the conservation, sustainable use, and socio-environmental recovery of the Serra do Mar mountain range, the Juréia-Itatins Mosaic territory, and the marine conservation units and their surroundings, in the state of São Paulo.

Figure 22: Portfolio's CC impact trend, 2004-2013



Source: OVE calculation using IDB Corporate Database

Table 6: Approved amount – CC impact trend, total and average approved amount

Total approved amount (US$)	2004-2007	2008-2010	2011-2013	Average approved amount (US$)	2004-2007	2008-2010	2011-2013
Adaptation				**Adaptation**			
Loans	624,945,080	877,500,000	779,400,000	Loans	124,989,016	292,500,000	259,800,000
TCs	8,046,156	18,907,247	20,978,628	TCs	2,682,052	4,726,812	3,496,438
Investment grants	0	6,650,000	28,000,000	Investment grants	0	0	14,000,000
Mitigation				**Mitigation**			
Loans	0	0	72,000,000	Loans	0	0	72,000,000
TCs	2,791,574	1,800,500	33,980,743	TCs	697,893	600,167	10,892,458
Investment grants	4,972,198	7,266,454	0	Investment grants	4,972,198	3,633,227	0
Both				**Both**			
Loans	150,754,443	278,204,000	128,720,000	Loans	37,688,611	92,734,667	42,906,667
TCs	4,246,726	4,696,321	14,358,278	TCs	1,061,682	1,565,440	4,786,093
Investment grants	9,203,063	0	19,940,000	Investment grants	3,067,688	0	9,970,000

Table 7: Number of operations– CC impact trend, total and average approved amount

Total approved amount (US$)	2004-2007	2008-2010	2011-2013	Average approved amount (US$)	2004-2007	2008-2010	2011-2013
Adaptation				**Adaptation**			
Loans	13	22	16	Loans	3	7	5
TCs	12	31	26	TCs	4	8	4
Investment grants	0	2	3	Investment grants	0	0	2
Mitigation				**Mitigation**			
Loans	0	0	1	Loans	0	0	1
TCs	6	4	15	TCs	2	1	4
Investment grants	1	3	0	Investment grants	1	2	0
Both				**Both**			
Loans	9	5	7	Loans	2	2	2
TCs	11	11	19	TCs	3	4	6
Investment grants	3	0	3	Investment grants	1	0	2

ANNEX 9. ILLUSTRATIVE PROJECTS SELECTED FOR REVIEW

Table 1: Illustrative projects selected

Op. Nr.	Operation	Description	Type	Approval Year	Status	Approved Amount $ M	Source
AR-L1015	Water Infrastructure: Northern Provinces Development	Contribute to the development of the northern provinces through the efficient utilization of water resources by regulating its availability for expanding both the agricultural and industrial sectors. Additionally the program will provide clean water and better sewage systems for low income populations and control flooding	Loan	2007	COMP.	240.0	IDB
AR-L1067	Forest Sustainability and competitiveness	Promote a sustainable development of the forestry sector in the Norte Grande provinces, on the basis of three strategic lines of action: (i) increased value and income generation with direct benefits to local communities; (ii) environmental sustainability, with reference to the challenges of climate change; and (iii) long term financial sustainability			ACTIVE	60.0	IDB
BR-L1001	Technological Innovation & New Mgmt. Approaches in Agricultural Research (AGROFUTURO)	Establish the following components: competitive research and development system, capacity building in strategic areas, pilot information and technology management cluster for family agriculture and support for regional and international integration.	Loan	2004	COMP.	33.0	IDB
BR-L1289	The Acre Sustainable Development Program (2 projects PDSA-I and II)	IDB has supported the forest-based sustainable development of the Amazonian State of Acre with two loans: for the Acre Sustainable Development Program (BR-L0313, 2002), and the Acre Sustainable Development Program PDSA – Phase II (BR-L1289, 2013). Their principal objective has been to develop a sustainable forest-based economy capable of bringing a high quality of life to Acre's population. They have strengthened institutions to control deforestation and provided incentives to economic activities that do not involve deforestation.	Loan	2013	ACTIVE	72.0	IDB

Op. Nr.	Operation	Description	Type	Approval Year	Status	Approved Amount $ M	Source
BR-X1028	Low Carbon Agriculture and Avoided Deforestation for Reducing Poverty	Reduce 10 million tons of CO2 over 20 years; avoid the emission of 6 million tons of CO2 emissions from deforestation over the same period; and improve income and reduce poverty in rural areas. It is also expected to result in multiple benefits for biodiversity and ecosystem services conservation, as well as improved climate resilience.	TC	2013	ACTIVE	39.2	UK-DEFRA
DR-L1054	Research and Agricultural Development Program	Strengthen the public capacity to provide and integrate animal and plant health and food safety services.	Loan	2012	ACTIVE	22.0	IDB
EC-L1121	Chimborazo Rural Development Investment Program	Increase sustainable agriculture production, value-added generation and market access to rural families of the Chimborazo Province through investments in irrigation, rural roads, and productivity strengthening for these families.	Loan	2013	ACTIVE	15.0	IDB
GU-L1002	Petén Development Program for the Conservation of the Mayan Biosphere Reserve	Promote de conservation of the Mayan biosphere reserve through sustainable management of the natural resources, cultural heritage, tourism and environmental management. Improve the life quality of the Petén local population.	Loan	2006	ACTIVE	30.0	IDB
ME-L1045	Program to Strengthen Rural Public Goods	Strengthen SAGARPA's (i) capacity to protect and improve food health and safety; (ii) capacity to generate and transfer technological innovations in agriculture and forestry; (iii) efficiency, quality of service, and transparency in the delivery of assistance and services to producers; and (iv) scientific research capacity to provide a reliable basis for the sustainable management of fisheries resources.	Loan	2011	ACTIVE	190.0	IDB
ME-L1120	Financing Low Carbon Strategies in Forest Landscapes	Establish dedicated financing lines accessible by communities and ejidos to finance low carbon activities in forest landscapes and provide associated technical assistance.	Loan and TC	2012	ACTIVE	10.0	IDB/FIP
PE-L1070	Water Resources Management Modernization Program	Implement the recently created National Water Resources System through strengthening its institutions such as the	Loan	2009	ACTIVE	10.0	IDB

Op. Nr.	Operation	Description	Type	Approval Year	Status	Approved Amount $ M	Source
		National Water Authority (ANA), at the national level, the Water management Authorities, at regional level, and the Watersheds Councils at the local or watershed level. The institutional strengthening includes capacity building, development of operational and technical instruments for water resources management and the preparation of watershed management plans for three priority watersheds of the Peruvian pacific coast.					
UR-L1016	Support for Agricultural Public Management	Support the Ministry of Livestock, Agriculture and Fisheries by i) strengthening the design, the observation and evaluation of policies, programs and projects, and decentralizing the responsibilities of the Administration at the local and regional levels; and ii) improves the agricultural sanitary and quality services, -through more agile and efficient procedures, and by modernizing the institutional structure in care of animal and vegetal sanitary concerns.	Loan	2009	ACTIVE	10.5	IDB
UR-L1064	Rural Productive Development Program	Improve the incomes of small- and medium-scale farmers, by increasing their productivity through the adoption of new technologies. The program focuses on production support; and institutional strengthening.	Loan	2011	ACTIVE	28.4	IDB

ANNEX 10. RATINGS OF 14 PROJECTS REVIEWED

Table 1: Ratings of project reviewed

	Mexico: Program to Strengthen Rural Public Goods	Mexico: Financing Low Carbon Strategies in Forest Landscapes	Ecuador: Chimborazo Rural Development Investment Program for	Brazil: Technical Innovation and New Mgmt. Approaches in Agricultural Research	Argentina: Water Infrastructure: Northern Provinces Development	Brazil: Acre Sustainable Dev. Project I	Brazil: Acre Sustainable Dev. Project II
Alignment with strategy and country goals/policies	M	V	V	V	M	V	V
Results framework (Objectives, indicators, congruence, SMART)	V	S	V	U	U	S	V
Component design	S	S	S	U	S	S	S
Implementation arrangements	S	S	S	U	S	S	S
Implementation progress	U	M	-	SU		S	S
Results achieved	-	-		M	M	S	

Ratings:
V = very good
S = satisfactory
M = marginal
U = unsatisfactory

	Argentina: Forest Sustainability and Competitive-ness Project	**Brazil: Low Carbon Agriculture and Avoided Deforestation**	**Dom. Republic: Research and Agricultural Development Program**	**Guatemala: Petén Dev. Program for Conservation of Maya Biosphere**	**Peru: Water Resources mgmt.. Modernization Program**	**Uruguay: Rural Productive Development Program**	**Uruguay: Support for Agricultural Public Management**
Alignment with strategy and country goals/policies	V	V	V	M	M	V	M
Results framework (Objectives, indicators, congruence, SMART)	V	S	V	U	U	S	U
Component design	S	S	S	S	M	S	S
Implementation arrangements	S	U	S	S	M	S	M
Implementation progress	M	U	U	U	M	S	M
Results achieved	-	-	-	U	M	S	M

Ratings:
V = very good
S = satisfactory
M = marginal
U = unsatisfactory