Draft TC ABSTRACT

I. Basic project data

▪ Country/Region:	Latin America and the Caribbean (LAC)
▪ TC Name:	Climate Change Vulnerability in the Agricultural Sector
▪ TC Number:	RG-T2239
▪ Team Leader/Members:	Gerard Alleng, Team Leader (INE/CCS), Ana Rios (INE/CSS); Alejandro Deeb (INE/CCS); Nancy Jesurun-Clements (INE/RND); Alfred Grunwaldt (INE/CCS) y Javier I. Bedoya Denegri (LEG/SGO) Ayatima Hernández-Rojas (INE/CCS).
▪ Indicate if: Operational Support, Client Support, or Research & Dissemination.	Research and Dissemination
▪ Reference to Request[1]: (IDB docs #)	
▪ Date of TC Abstract:	November 2012
▪ Beneficiary:	LAC countries
▪ Executing Agency and contact name:	IDB
▪ IDB Funding Requested:	US$650,000
▪ Local counterpart funding, if any:	
▪ Disbursement period:	36 months
▪ Required start date:	January 2013
▪ Types of consultants:	Firm
▪ Prepared by Unit:	INE/CCS
▪ Unit of Disbursement Responsibility:	INE
▪ Included in Country Strategy (y/n); ▪ TC included in CPD (y/n):	
▪ GCI-9 Sector Priority:	Climate change

II. Objective and Justification

2.1 Agriculture plays and important role in LAC's economy, accounting for approximately 6% of the total regional GDP and 15% of total employment in 2010. Through associated changes in temperature, moisture, and rainfall patterns, climate change is expected to alter crop yields and the distribution of agricultural production (Dawson and Spannagle 2009). Changes in climate variability, such as the intensity and/or frequency of floods, rainfall, drought, and storms, are expected to reduce yields. A recent study concludes that the negative impacts of climate change on key crops could be significant for LAC and are expected to play a major role in the global food supply chain (Fernandez et al. 2012), the value of lost agricultural exports due to these impacts will range from US$32 to US$54 billion per year by 2050. Impacts of this magnitude –particularly in the context of a tight global food supply-demand balance– may also trigger other consequences including speculation in food markets and negative impacts on food security. This study aims to contribute to a better understanding of the effect of climate change on production and productivity of key crops in the region, as well as provide alternatives to adapt to these impacts and minimize vulnerability. This objective is aligned with the Bank's GCI-9 sector priority on climate change and environment protection.

[1] A copy of the Letter of Request, Programming/Portfolio Review Mission Aide Memoire or Report requesting the TC should be submitted with the Abstract.

III. Description of activities and outputs

A. Activity 1: Vulnerability Assessment.

3.1 The analysis will focus on the 6-8 most important crops for the region, based on criteria of economic significance and importance for food security. The vulnerability will consist of: (i) compilation of climate change projections (2020 and 2050) for the region using latest IPCC global climate model outputs (CMIP5); (ii) modeling of climate impacts on crops through most appropriate crop modeling system (DSSAT, GLAM, EcoCrop etc.); (iii) economic analysis of impacts using the IMPACT partial-equilibrium model; and (iv) synthesis of findings to identify key regions, crops and communities most affected by long-term climate change across the region. The analysis will explicitly look at both economic impacts, and social impacts related to food security including information related to the number of people affected by income level when possible. A potential second phase could then evaluate adaptation options across the region through modeling the possible benefits from generic adaptation options (improved varieties, irrigation, crop distribution shifts, shifting of planting dates) including a better preliminary assessment of the number of people negatively impacted by climate change, as well as of those that might benefit from the change, and country based studies could support evidence-based policy making for targeting adaptation investments nationally and sub-nationally.

3.2 Knowledge gaps related to temperature stress of seeds due to increasing soil temperatures will be filled by targeted experimental work on 2 case crops. Evaluations will be performed to measure the effect of high temperatures on soil warming and on the germination, development and productivity of two major crops in economic and food security terms: maize and soybean. Crops will be grown in plastic tunnels under a controlled environment. Temperature treatments include 2, 4 and 6°C above ambient temperature, which will be used to check impacts on crops full cycle. Three genotypes from each crop will be evaluated, one tolerant and one susceptible to high temperature, and one commercial variety that is widely grown in the region. Trials will be replicated three times, within a period of 14 months. The variables to be evaluated include: (i) soil temperature; (ii) mineralization potential and nodulation (as indicators of soil microbial activity); (iii) seed germination and plant emergence; (iv) plant phenological variables: leaf area index, days to flowering and days to maturity; (v) plant physiological variables: leaf chlorophyll content, canopy temperature depression, photosynthetic efficiency, and stomatal conductance; (vi) reproductive variables: number of flowers per plant and number of aborted flowers and (vii) yield and yield components (e.g., number of pods per plant, seeds per pod and dry weight of 100 seeds). These experiments will be run in CIAT Headquarters in Cali, under controlled experimental conditions, and the results will be written up to contribute to the scientific literature on this under-researched topic. Furthermore, these will improve the modeling estimates of climate impacts on crops, feeding back into the vulnerability assessment.

B. Activity 2: Dissemination and outreach.

3.3 This includes workshops and seminars to present the methodology and results of the study as well as training exercises in the region to build capacity in the analysis of climate change vulnerability and adaptation measures in the agricultural sector.

3.4 ***Outputs***: (i) comprehensive vulnerability assessment report on agriculture in Latin America and the Caribbean (including an evaluation of the impacts of higher temperatures on soil and crop variables), spatial datasets on projected climate changes, and current and future crop impacts available online for the research and development community; (ii) data outputs of economic models made available

to countries on expected impacts; (iii) identification of agriculture hotspots in Latin America and the Caribbean due to the impacts of climate change as key information for the prioritization of Bank future operations; and (iv) seminars, trainings and workshops.

IV. Budget

Indicative Budget

Activity/Component	Description	IDB/Fund Funding (USD)	Counterpart Funding (USD)	Total Funding (USD)
Vulnerability assessment	Climate projections	50,000		50,000
	Crop modeling	230,000		230,000
	Economic analysis	205,000		205,000
	Synthesis	50,000		50,000
	Soil temperature experiments	90,000		90,000
Outreach and dissemination	Outreach and dissemination of project results as well as impacts of climate change on the agricultural sector	25,000		25,000
Total		**650,000**		**650,000**

V. Executing agency and execution structure

5.1 This operation will be executed by the IDB given the regional coverage of the activities to be performed (i.e. impact of climate change on agricultural production and productivity in Latin America and the Caribbean), possible synergies and complementarities with current Bank operations/research (i.e. RG-T1654, RG-T1655, RG-T1657, analytical piece "The Climate and Development Challenge for LAC: options for climate-reilient, low carbon development") in addition to ongoing dialogue with relevant Ministries in the region.

VI. Project Risks and issues

6.1 The main risks in the successful and timely execution of the project are the availability and quality of information as well as qualified consultants that might be able to perform the analysis and work required for the study. To address and minimize these risks, advances have been made in the identification of information sources and pool of candidates that might perform the required tasks.

VII. Environmental and Social Classification

7.1 The proposed project is expected to contribute to the reduction of environmental and social vulnerabilities by providing information that could be used in the design, implementation and execution of programs and policies. Therefore, the proposed classification is "C".