

Climate Change Vulnerability in the Agricultural Sector
TC Document/Appendices
RG-T2239

I. Basic Information for TC

▪ Country/Region:	Latin America and the Caribbean (LAC)	
▪ TC Name:	Climate Change Vulnerability in the Agricultural Sector	
▪ TC Number:	RG-T2239 (Research and Dissemination)	
▪ Associated Loan/Guarantee Name:	N/A	
▪ Associated Loan/Guarantee Number:	N/A	
▪ Team Leader/Members:	Ana Rios (INE/CCS) team leader; Gerard Alleng (INE/CCS) alternate team leaders; Omar Samayoa (CCS/CGU); Alejandro Deeb (INE/CCS); Nancy Jesurun-Clements (INE/RND); Angelo Angel (INE/CCS); Maria Teresa Soto-Aguilar (VPC/FMP) and Javier Bedoya (LEG/SGO).	
▪ Date of TC Abstract authorization:	February 2013	
▪ Beneficiary:	Selected countries in the Latin America and the Caribbean Region.	
▪ Executing Agency and contact name:	Inter-American Development Bank	
▪ Donors providing funding:		
▪ IDB Funding Requested:	US\$650,000 (SCI-ORC) ¹	
▪ Local counterpart funding, if any:	US\$162,500 (in kind)	
▪ Disbursement period (which includes Execution period):	26 months – disbursement 24 months – execution	
▪ Required start date:	June 2013	
▪ Types of consultants (firm or individual consultants):	Firm	
▪ Prepared by Unit:	INE/CCS	
▪ Unit of Disbursement Responsibility:	INE	
▪ TC Included in Country Strategy (y/n):	N/A	
▪ TC included in CPD (y/n):	N/A	
▪ GCI-9 Sector Priority:	Climate change	

II. Objectives and Justification of the TC (estimated length: 1 page)

Agriculture plays an 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).² 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 by Fernandez et al. (2012) 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, the value of lost agricultural exports due to these impacts will range from US\$32 to US\$54

¹ Single Window Procedures deemed that other resources were not available for funding, SECCI Fund Eligibility Minutes are available (IDBDOCS37749538).

² Dawson and Spannagle. 2009. The complete guide to climate change. London and New York: Routledge.

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. However, studies have demonstrated that adaptation activities have the potential to reduce these impacts in a cost-efficient manner (see, for example, World Bank 2010 and Fernandez et al. 2012).

The Ninth General Capital Increase (GCI-9) mandates the Bank to support countries in LAC meeting the challenges of climate change. To address this issue, the IDB is providing technical assistance, grants and lending for mitigation and adaptation activities. Ongoing Bank activities to promote climate change adaptation in the agricultural sector include –among others- loans to support national agricultural research and innovation systems towards strengthening their capacity to develop and disseminate technologies for climate change adaptation; and specific technical cooperations for a better understanding and knowledge of the coffee genome (RG-T1655); selection and development of wheat and potato genotypes resistant to drought and higher temperatures (RG-T1657); and reduction of the vulnerability of agriculture in the Southern Cone (RG-T1654).³

Objective. The proposed technical cooperation, focused on research and dissemination, aims to contribute to a better understanding of the general effect of climate change on production and productivity of key crops in the region to guide decision makers and the Bank in the identification, design and execution of alternatives to adapt to these impacts and minimize vulnerability. Specifically this project will use climate change projections to analyze impacts on key crops, perform field experiments to determine the effect of soil temperature on crop production and disseminate findings as well as the methodology employed. This objective is aligned with the Bank’s GCI-9 sector priority on climate change and environment protection and builds on the Bank’s previous work on adaptation and the agricultural sector.⁴

III. Description of activities/components and budget

Activity 1: Vulnerability. The analysis will focus on the 6 most important crops for the region⁵, based on criteria of economic significance and importance for food security (i.e. coffee, sugar cane, cocoa, maize, yams and beans). The assessment 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 (i.e. DSSAT, GLAM, EcoCrop, etc.);⁶ (iii) economic analysis of impacts using the IMPACT partial-equilibrium model;⁷ and (iv) synthesis of findings to identify key impacts in terms of regions, crops

³ These technical cooperations emerged from a FONTAGRO call for proposals in 2008.

⁴ A no-objection letter from a beneficiary country will be obtained in case any activity of this TC is performed in that country.

⁵ Crops relevant for the majority of LAC countries will be considered in the analysis. Government’s agenda on climate change adaptation will be taken into account.

⁶ DSSAT and its crop simulation models have been used for many applications ranging from on-farm and precision management to regional assessments of the impact of climate variability and climate change. DSSAT combines crop, soil, and weather data bases with crop models and application programs to simulate multi-year outcomes of crop management strategies. DSSAT integrates the effects of soil, crop phenotype, weather and management options, and allows users to ask “what if” questions by conducting virtual simulation experiments. The General Large-Area Model for annual crops (GLAM) is a tool for assessing the impacts of climate variability and change on annual crops. It has been designed for use with regional and global climate model output and remotely sensed data. GLAM is able to simulate interannual variability in crop yield, as well as picking out areas where climate extremes are likely to affect crops and assessing how a change in crop variety can be used to adapt to these changes. GLAM is often used with ensemble techniques, to produce seasonal hindcasts of crop yield and to quantify the uncertainty.

⁷ The IMPACT model is designed to examine alternative futures for global food supply, demand, trade, prices, and food security. The IMPACT model allows IFPRI to provide both fundamental, global baseline projections of agricultural commodity supply, demand, trade, prices and malnutrition outcomes along with cutting-edge research results on quickly evolving topics such as bioenergy, climate change, changing diet/food preferences, and many other themes. The model is written in the General Algebraic Modeling System (GAMS) programming language

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.⁸ Climate change impact on crop productivity will be assessed at the regional level, sub-regional level and for selected countries. Criteria for country level evaluations might include –among others- agenda on climate change adaptation, data availability and local counterpart involvement.

A potential second phase to be developed as a follow up to the findings of this operation –not included in this proposal– could then evaluate adaptation options across the region through modeling the possible benefits from generic adaptation options (local production practices, 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, shifts in crop patterns, and country based studies could support evidence-based policy making for targeting adaptation investments nationally and sub-nationally.

Knowledge gaps identified from review of existing relevant knowledge related to temperature stress of seeds due to increasing soil temperatures will be filled by this operation through targeted experimental work on maize and soybeans. Evaluations will be performed to measure the effect of high temperatures on soil warming and on the germination, development and productivity. 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.⁹ Three genotypes from each crop will be evaluated, one tolerant and one susceptible to high temperature, and one commercial variety 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.

Also, resources are allocated for the publication of the study including printed and electronic materials.

Activity 2: Dissemination and outreach. Includes workshops and seminars to present the methodology and results of the study, as well as training exercises in the region to improve capacity in the analysis of climate change vulnerability and adaptation measures in the agricultural sector. These events will be targeted to key stakeholders at the national and regional level. Inputs from participants will be gathered to improve the quality of the assessments and guide the design of a second phase.

and, at its base, is a relatively straightforward partial equilibrium global agricultural sector model. The solution of the system of equations seeks a world market prices for all commodities that satisfies market-clearing conditions for the sum of global net trade to equal zero.

⁸ Shifts in crop patterns including decision making on when and what to plant are beyond the scope of this analysis.

⁹ A second phase of the analysis could test production practices (i.e. mulch, organic cover) as regulatory means to control soil temperature.

Supervision. Considers financing for the supervision from IDB and follow-up of the activities performed under this operation such as consultant hiring and/or mission trips as well as a peer review of the study.

Outputs: (i) comprehensive vulnerability assessment report on agriculture in Latin America and the Caribbean (including, among others, 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 made available online for the research and development community; (ii) data outputs of economic models on expected impacts made available to countries; (iii) identification of agriculture hotspots in LAC due to the impacts of climate change as key information for prioritization of future Bank operations; and (iv) seminars, trainings and workshops.

Indicative Results Matrix

Results Indicators	Unit	Baseline		Year 1 2013		Year 2 2014		Year 3 2015		Year 5 2017
Indicator		Value	Year	Planned	Real	Planned	Real	Planned	Real	Planned
Result #1										
Key stakeholders and the Bank have a better understanding of the impact of climate change on agriculture in LAC <i>Indicator</i> # of times knowledge produced has been used for policy advice, operations and/or as an input for programming and strategy documents (within the Bank or among countries in the region)										5
Products										
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)	Report	0	2012					1		
Spatial dataset on projected climate changes, and current and future crop impacts available online for the research and development community	Dataset	0	2012					1		
Data outputs of economic models made available to countries on expected impacts	Dataset	0	2012					1		
Draft report with identification of agriculture hotspots in LAC due to the impacts of climate change as key information for the prioritization of Bank future operations	Draft report	0	2012			1				
Key stakeholders that participated in dissemination, outreach and/or training activities on the methodology, analysis and/or interpretation of the study.	#	0	2012			≥10		≥30		

Indicative Budget

Activity/Component	Description	IDB/Fund (USD)	In-kind counterpart (USD)	Total Funding (USD)
Vulnerability assessment	Climate projections	50,000	69,500	119,500
	Crop modeling	225,000	63,000	288,000
	Economic analysis	200,000	30,000	230,000
	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	30,000	-	30,000
	Supervision	5,000	-	5,000
Total		650,000	162,500	812,500

IV. Executing agency and execution structure

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-resilient, low carbon development”) in addition to ongoing dialogue with relevant sector authorities in the region.

The project team proposes single source selection of the International Center for Tropical Agriculture (CIAT, the Spanish acronym) to carry out the activities previously listed operation given the exceptional capacity of this institution primarily given its unique collection of genetic resources with 65,000 crop samples that in addition to the Center’s solid expertise on this topic and its deep knowledge of LAC’s agriculture sector, will enable the successful execution of activities related to this technical cooperation. This is in agreement with GN-2303-20, paragraph 5.13-A.¹⁰ The activities of this operation will be performed by CIAT’s Decision and Policy Analysis Research Area (DAPA) with the collaboration of CGIAR’s Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the Global Futures Project. According to the commitment letter from CIAT, in-kind counterpart includes technical and administrative staff, equipment, as well as ongoing analysis and activities that would contribute to the quality of the operation.¹¹

CIAT’s Genetic Resources Program hosts the world’s largest and most diverse bean collection and the most important worldwide collection of a cassava genus. CIAT is part of the CGIAR consortium, a global organization comprised by 15 centers. In this consortium, CIAT is the lead center for the Program on Climate Change, Agriculture and Food Security focused on assisting farmers to adapt and mitigate the effects of climate change such as rising temperatures and increasingly unpredictable rains. CIAT has been conducting a broad variety of projects on climate change that will serve as a basis for this operation, these include –among others– coffee responses and adaptation to climate change in Central America, and vulnerability and adaptation to climate change for the agricultural sector.

The procurement policies that will govern this operation are the Corporate Procurement Policy of the Bank (GN-2303-20), individual consultants will be hired following HRD’s Policies.

¹⁰ Following this procedure, a Non-Competitive Procurement Justification Form BCP-0773 will be submitted.

¹¹ IDBDOCS37787317.

V. Major issues

The main risks in the successful and timely execution of the project are the availability and quality of information. To address and minimize these risks, advances have been made in the identification of information sources and existing research and knowledge to be used as departure for the proposed work.

VI. Exceptions to Bank policy

None

VII. Environmental and Social Strategy

This operation is classified as a Category “C”. No negative impact is expected on the environment or in native communities. [IDBDOCS#37689797 \(SPF\)](#) y [IDBDOCS#37689683 \(SSF\)](#)

Required Annexes:

- Terms of Reference for activities/components to be procured [IDBDOCS# 37414340](#)
- Procurement Plan [IDBDOCS# 37689689](#)

TERMS OF REFERENCE
CLIMATE CHANGE VULNERABILITY IN THE AGRICULTURAL SECTOR
RG-T2239

I. BACKGROUND

- 1.1 Agriculture plays an 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.
- 1.2 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. However, studies have demonstrated that adaptation activities have the potential to reduce these impacts in a cost-efficient manner (see, for example, World Bank 2010 and Fernandez et al. 2012).

II. CONSULTANCY OBJECTIVES

- 2.1 The objective of this consultancy is to analyze the effect of climate change on production and productivity of key crops in the region to guide decision makers and the Bank in the identification, design and execution of alternatives to adapt to these impacts and minimize vulnerability.
- 2.2 Type of consultancy: Consulting Firm. The amount of the contract includes all expenses that might incur during the development of this assignment (i.e. gathering of data, travel, printing and publishing of the report, etc.)
- 2.3 Duration: 22 months
- 2.4 Place of work: the consultancy will take place in the firm's premises.
- 2.5 Means of payment: Remuneration will be processed as defined in section VI "Schedule of Payments".

III. ACTIVITIES AND DELIVERABLES

- 3.1 The consulting team assigned to this task will collaborate with relevant international and national regional institutions, including –among others– EMBRAPA, INTA, INIAs and

the International Potato Center (CIP) when deemed necessary during the execution of the activities of the present consultancy. Specific activities to be undertaking include:

- i. **Compilation of CMIP5-based future climate projections for crop simulation:** The Coupled Model Intercomparison Project (CMIP) has made available the latest set of Global Climate Model (GCM) simulations through the Earth System Grid (ESG) online portal. Monthly and daily output of roughly 30 GCMs will be downloaded and post-processed. These data consist in daily and/or monthly historical and RCP (RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5) simulated maximum, minimum, and mean temperature, as well as total rainfall and shortwave radiative flux. The data will be made available in appropriate formats for the research community. Part of these data will be used as the basis for the vulnerability analysis.
- ii. **Modeling of present-day and future agricultural yields for 6 regionally important crops:** In addition to maize and soybean (for which experiments of high-soil-temperature will be conducted), three additional crops will be selected on the basis of their regional importance. These crops may include (but are not restricted to) rice, potato, common bean, wheat, coffee, cassava, and bananas. Regionally minor crops may warrant being included given their importance for local food security. For these crops, one or more crop models (either empirical, process-based, or both) will be used to simulate present-day and future (2030, 2050) mean yields and yield variability.

Crop models will be calibrated using relevant site-specific or regional-scale observations from CIAT DAPA's modeling partners and CIAT's programs trial databases (e.g. EMBRAPA, INTA, INIA Uruguay, CIP, among others). Among the models to be used, there are those related within the Decision Support System for Agrotechnology Transfer (DSSAT), the Agricultural Production Systems Simulator (APSIM), the General Large Area Model (GLAM) for annual crops, EcoCrop, various niche modeling techniques, among others. Current and future climate simulations will be used to quantify the likely impacts under climate change scenarios.
- iii. **Economic modeling:** Using present-day and future projected agricultural yields, IFPRI's IMPACT (International Model for Policy Analysis of Agricultural Commodities and Trade) model will be used to predict future market changes for the selected crops given changes in crop yields.
- iv. Previously described activities (i, ii and iii) will be carried out at the regional level (LAC), sub-regional level (4 sub-regions) and for selected countries (at least 8 countries). Country selection will take into account at least data availability, climate change agenda at the national level and local counterpart involvement.
- v. **Synthesis of impact assessment findings:** Using the simulated crop yields and those biophysical processes that are important in the region, as

well as the results from IMPACT's market projections, important findings will be used to develop in-depth impact case studies. Vulnerable areas, communities and crops within the different countries will be first identified. Data analysis will be performed with the aim of highlighting key vulnerabilities throughout the region, and will combine social data (e.g. malnourished infants, percent of impoverished people, income levels) with economic data (e.g. projected changes in prices).

- vi. **Identification of the germoplasm to be used in the evaluations.** Three commercial genotypes of maize and soybean will be selected for evaluation to high temperature, one tolerant and one susceptible to this condition, and one variety that is widely grown in the region (and probably also susceptible to this environmental condition expected as result of climate change).
- vii. **Conditioning of infrastructure for evaluation of response to high temperatures.** Controlled conditions will be established through the assemblage of plastic tunnels with automatic temperature control. All the planned high-soil-temperature evaluations will be executed in these facilities.
- viii. **Evaluation of the effect of three temperatures (2 and 4 °C) above ambient temperature on soil.** Trials under plastic tunnels including different crops will be used to estimate the effect of high temperature on key soil biological variables including soil mineralization, microbial biomass, micorrizal activity and capacity for biological nitrogen fixation (associated with maize and soybean, respectively).
- ix. **Evaluation of the effect of three temperatures (2 and 4 °C) above ambient temperature on germination, development and productivity of maize and soybean.** Trials under plastic tunnels including all the commercial materials identified will be planted as randomized complete block with three replications. Soil temperature, seed germination, plant emergence will be determined. No destructive traits will be used, as SPAD chlorophyll meter readings, canopy temperature depression, photosynthetic efficiency, and stomatal conductance will be measured in each crop stage. At flowering, number of flowers per plant (soybean) and synchrony of flowering (maize), days to flowering and days to maturity, leaf area and plant biomass partitioning will be also determined. At harvest, yield and yield components will be estimated.
- x. **Evaluation of the effect of three temperatures (6 °C) above ambient temperature on soil.** As described in No. 7.
- xi. **Evaluation of the effect of three temperatures (6 °C) above ambient temperature on germination, development and productivity of maize and soybean.** As described in No. 8.
- xii. **Outreach and dissemination plan of the results.** Includes technical and logistic arrangements for at least three (3) events designed for

consultation, training and/or dissemination of the methodology and analysis.

- xiii. **Other activities deemed necessary for the successful competition of the operation.**

3.2 Expected outputs from this consultancy are:

- i. Compilation of latest IPCC projections (CMIP5) for 2030 and 2050
- ii. Modeling of crop yields for 6 regionally important crops under future climate scenarios using a variety of crop models.
- iii. Socio-economic modeling using the IMPACT model to project changes in prices (market changes)
- iv. A compelling final analysis of spatio-temporal trends in poverty and likely social changes (vulnerabilities) driven by the projected changes in regional market prices and crop yields
- v. Assessment of crop response to higher temperatures as result of climate change, of commercial varieties of maize and soybean.
- vi. Strengthening of local capacities (human resources and infrastructure) and development of methodologies for evaluating the effect of climate change on key traits of soil functioning and crop productivity.
- vii. Elucidation of the soil properties and crop physiological processes that would be most sensitive to increases on temperature as result of climate change.
- viii. Outreach and dissemination plan.

IV. DELIVERABLES¹

4.1 The consultancy will be responsible for submitting the following interim and final deliverables:

- i. Work plan to be submitted within 3 weeks after signature of the contract.
- ii. Outreach and dissemination plan to be submitted 2 months after contract signature.
- iii. First report to be submitted within 6 months after contract signature, including as a minimum the selection of commercial varieties to be evaluated, assemblage of infrastructure, application of proposed experimental and assessment methodologies, and initial assessment of the

¹Every report submitted to the Bank for review must be sent in one electronic file that should include cover, main document, and all annexes in MSWord format and MS Excel where appropriate. All final reports must be submitted to the Bank in one electronic file that should include cover, main document, and all annexes using PDF format. Zip files will not be accepted as final reports, due to regulations from the Records Management Section.

- effect of higher temperatures (2 and 4 °C above ambient) on soil and seedling.
- iv. Second report to be submitted 12 months after signature of the contract, containing a comprehensive analysis of the effect of high temperatures (2 and 4 °C above ambient) on variables studied, and including a full description of the CMIP5 projections that will be used, as well as the crop models and crop yield simulation strategy.
 - v. Third report to be submitted within 15 months after contract signature, including as a minimum methodologies and initial assessment of the effect of higher temperatures (6 °C above ambient) on soil and seedling.
 - vi. Fourth report to be submitted 18 months after signature of the contract, containing a comprehensive analysis of effect of high temperatures (6 °C above ambient). This report will also include preliminary results of crop simulation and IMPACT modeling.
 - vii. Geographic information used as input and produced as output from the consultancy will be made available online. An appropriate portal, likely linked to IDB and/or the CCAFS will be used. To be submitted at the end of contract.
 - viii. Spatially-explicit IMPACT model output datasets to be submitted at the end of contract.
 - ix. Draft final report to be submitted at the end of contract, including a full description of methodologies, data, results and comprehensive analysis of the effect of high temperatures (2, 4 and 6 °C above ambient) on soil and crop traits. This also includes the identification of agriculture hotspots in LAC due to the impacts of climate change.
 - x. Final report including comments from the Bank as well as input gathered from dissemination activities. Includes printed book (250 copies) as well as electronic version of the report.
 - xi. Dissemination activities (to be agreed with the Bank, and in accordance with the available funds).

V. QUALIFICATIONS

- 5.1 Expertise: The proposed team leader must hold a Doctorate Degree in Agriculture, Geography, Environmental Sciences or in a related discipline. A minimum of 10 years of experience on scientific research focused on agriculture, climate change and/or environmental issues is required. The candidate must have a proven publication record as well as the ability to lead a team of scientists. Good communication skills and proficiency in English and Spanish are highly desirable. The proposed team must include, at minimum, the following:
- i. Plant nutritionist and physiologist with over 10 years of experience working in the tropics

- ii. Economist or agricultural economist with experience using mathematical models and tools for economic evaluation, impact analysis and decision making
 - iii. Agronomist specialized on soil management
 - iv. Expert in climate and atmospheric science with experience in the assessment of climate change impacts and adaptation options
 - v. Expert in outreach and dissemination
- 5.2 Experience: The firm must have access to a wide variety of crop genetic resources and no less than 10 years developing methods and knowledge to improve agricultural production including research on crops and soils. Proven track record on the analysis of climate change impacts on agricultural production, vulnerability and adaptation measures is required. In addition, the firm must have regional presence and a considerable network of national and regional research institutes, academia and private sector.
- 5.3 Languages: English and Spanish.
- 5.4 Skills: Strong analytical skills on probabilistic hazard assessment, vulnerability assessment, soil evaluation, abiotic stress phenotyping, crop management, cost-benefit analysis, ability to conduct calculation and assessment on natural hazardous impacts associated with climate change; produce high quality written and visual communication products.

VI. SUPERVISION

- 6.1 The overall supervision of this contract, including approval for payments, will be the responsibility of the Climate Change and Sustainability Division (INE/CCS) through Ana Rios, Climate Change Senior Associate.

VII. SCHEDULE OF PAYMENTS

- 7.1 The modality for payment of services is a lump sum disbursed according to the following schedule:
- i. 10% upon signature of the contract and submission and approval of the work plan and outreach and dissemination plan (paragraph 4.1-i and 4.1-ii)
 - ii. 20% upon delivery and approval of the first report (paragraph 4.1-iii)
 - iii. 10% upon delivery and approval of the second report (paragraph 4.1-iv)
 - iv. 10% upon delivery and approval of the third report (paragraph 4.1-v)
 - v. 10% upon delivery and approval of the fourth report (paragraph 4.1-vi)
 - vi. 15% upon delivery and approval of a draft final report including information, datasets and agriculture hotspots in LAC (paragraph 4.1-vii to 4.1-ix)
 - vii. 25% upon delivery and acceptance by the Bank of a revised final report in which comments and suggestions were taken into account (paragraph

PROCUREMENT PLAN FOR NON-REIMBURSABLE TECHNICAL COOPERATIONS										
Country: Regional (LAC)		Executing agency: BID		Public or private sector: Public						
Project number: RG-T2239		Title of Project: Climate Change Vulnerability in the Agricultural Sector								
Period covered by the plan: April 2013- April 2016										
Threshold for ex post review of procurements:										
		Goods and services (in US\$):		Consulting services (in US\$):		615,000				
Item No.	Ref. AWP	Description (1)	Estimated contract cost (US\$)	Procurement Method (2)	Procurement (ex ante or ex post) (3)	Source of financing and percentage IDB/IMF %	Local/other %	Estimated date of the procurement notice or start of the contract	Technical review by the PTL (d)	Comments
1		Component 1								
		Consulting services								
		CIAT - climate projections, crop modeling, economic analysis, synthesis and soil temperature experiments	615,000	SSS	N/A	100	-	Jun-13		Justification provided in the TC Document (Section IV)
		Peer review	5,000	ICQ	N/A	100	-	May-15		
2		Component 2 - Outreach and dissemination								
		Goods and works								
		Workshops and seminars*	15,000	PC	N/A	100	-			
Total			635,000	Date: February 2013						
<p>(1) Grouping together of similar procurement is recommended, such as computer hardware, publications, travel, etc. If there are a number of similar individual contracts to be executed at different times, they can be grouped together under a single heading, with an explanation in the comments column indicating the average individual amount and the period during which the contract would be executed. For example: an export promotion project that includes travel to participate in fairs would have an item called "airfare for fairs", an estimated total value of US\$5,000, and an explanation in the Comments column: "This is for approximately four different airfares to participate in fairs in the region in years X and XI".</p>										
(2) Goods and works: CB: Competitive bidding; PC: Price comparison; DC: Direct contracting.										
(2) Consulting firms: CQS: Selection Based on the Consultants' Qualifications; OCBS: Quality and cost-based selection; LCS: Least Cost Selection; FBS: Selection under a Fixed Budget; SSS: Single Source Selection; QBS: Quality Based selection.										
(2) Individual consultants: ICQ: International Individual Consultant Selection Based on Qualifications; SSS: Single Source Selection.										
(3) Ex ante/ex post review: In general, depending on the institutional capacity and level of risk associated with the procurement, ex post review is the standard modality. Ex ante review can be specified for critical or complex process.										
(4) Technical review: The PTL will use this column to define those procurement he/she considers "critical" or "complex" that require ex ante review of the terms of reference, technical specifications, reports, outputs, or other items.										
* The purchase of airplane tickets for a total amount of \$15,000 are not included in the procurement plan.										