2012 Technical Report per Activity

Each Program Participant must provide a small remark against each activity/deliverable to indicate the status of the activity (2-4 sentences required per activity) using the form below. Updated data from the current partners is also required.

CCAFS Center Led Activities
CIP - Centro Internacional de la Papa

Activity No. 43				
Activity title	Optimizing the value of historical breeding trials to model adaptability of potato and sweet potato clones (proof of concept)			
CCAFS Objective *(select from drop list)*	1.2 Breeding strategies	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	1.2.1 2013 (2)	
Activity objectives *(what the activity aims to achieve)*	**Objective 1**	To develop a user friendly software to generate growth and development coefficients from data recorded in AgTrials and data from NARS breeding programs (Tests will be conducted in a few regions but global applications is envisioned).		
Activity status	Partially completed			
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	This is work in progress toward an integrated system combining mathematical tools, a researchers/farmers knowledge elicitation tool, and inteligent systems. In 2012 we worked on designing and testing the instruments for eliciting information, developing the mathematical tools to generate growth parameters, selection of experiments that could be use to validate the protocol i.e. where elicitation and growth analyses were available, and an assessment of the tool developed. A prototype of the estimator was firts built in Excel and then programmed in R computer language. Elicitations were done remotely w/o the organization of aformal workshop			

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	Protocol and software (beta version in R programming language) to estimate growth and development parameters for modeling crops (using potato and sweet potato as examples), based on yields obtained in historical breeding trials (include training to breeders) + evaluation data in agtrials.org	2012	Completed	Other
Workshops	Workshop with potato and sweet potato breeders to validate the tools developed	2012	Partially completed	Document (*.doc, *.odt, *.pdf)
Data	Key crop growth parameters needed to model potato, sweet potato and Beans (with CIAT) derived from AgTrials data	2013	Select a status	Select a format
Reports, publications	Scientific paper on Optimizing the value of historical breeding trials to model adaptability of root and tuber crops to variable climatic conditions	2013	Select a status	Select a format
Model tools and software	Intelligent system (final version) of the parameter estimator: potato, sweet potato and beans	2013	Select a status	Select a format
Model tools and software	Protocol and intelligent software for breeders to estimate canopy cover with a conventional digital camera to facilitate more accurate field data acquisition	2013	Select a status	Select a format
Workshops	Training workshop	2013	Select a status	Select a format

	Acronym	Name	Contact Point Full Name	Contact Point Email
NARES - National agricultural research and extension services	KARI	Kenya Agricultural Research Institute		
NARES - National agricultural research and extension services	NARO	National Agricultural Research Organization		

Current Partners		Acronym	Name	Contact Point Full Name	Contact Point Email
	NARES - National agricultural research and extension services	INIA	Instituto de Investigaciones Agropecuarias		
	NARES - National agricultural research and extension services	INIAF	Instituto Nacional de Innovación Agropecuaria y Forestal	Erik Murillo	
	NARES - National agricultural research and extension services	GAU	Gansu Agricultural University	Bai Jianping	
	NARES - National agricultural research and extension services	CPRI	Central Potato Research Institute	P.M. Govindakrishnan	govindakrishnan_PM@yahoo.com
	CG - CGIAR Center	CIAT	Centro Internacional de agricultura Tropical	Diana Giraldo	d.giraldo@cgiar.org

Activity No. 71

Activity title	User-friendly geospatial potato & Sweet potato models		
CCAFS Objective *(select from drop list)*	1.2 Breeding strategies	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	1.2.1 2013 (2)
Activity objectives *(what the activity aims to achieve)* — **Objective 1**	To improve the capacity of assessing the expected behavior of potato and sweet potato varieties and clones to make better informed and targeted decisions under progressive climate change conditions (global application with data from several CCAFS and partner's sites). To participate in a global effort to improve the quality and accuracy of potato model under climate change conditions (temperature, water, CO2, pests & diseases)		
Activity status	Partially completed		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	Both potato and sweetpotato models are functional and programmed in SIMILE and C++. The geospatial version for simulating potential productivity for both crops was programmed in Python. Calibration datasets for selective sites around the world were provided by researchers participating in the AgMIP potato pilot and we are running first round of simulations with three models: USDA SPUDSIM, SUBSTOR and Solanum. AgMIP data can´t be shared yet so we have only shared the format approved with samples. Two scientific papers on sweet potato modeling and in in potato are in preparation and will be submitted in the first quarter of 2013.		

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	Software (individual model in C++ and geospatial in Python) containing crop growth models and climate generators, installed in CCAFS -CIP servers	2012	Completed	Other
Reports, publications	1) Sweet potato model with tests in Africa, 2) impact of CC on sweet potato production in africa and 3) the wavelet-based weather generator papers ready for submission	2012	Partially completed	Document (*.doc, *.odt, *.pdf)
Data	Data from AgMIP potato Sentinel sites tested and ready to run comparative assesment with existing models (must asses IPR issues)	2012	Completed	Spreadsheet (*.xls, *.ods)
Data	Geospatial model in R with links to geospatial wavelet-based weather generator and SPDSM downscaled data	2013	Select a status	Select a format
Workshops	Modeling workshop in Africa	2013	Select a status	Select a format
Communication products	Results from the AgMIP potato comparative analyses communicated	2013	Select a status	Select a format

	Model tools and software	Defined algorithms for an improved generic potato model based on modeling gaps detected with AgMIP comparative assessment	2014	Select a status	Select a format

Current Partners

	Acronym	Name	Contact Point Full Name	Contact Point Email
NGO_DO - Non-governmental organization/Development organization	ALTAGRO	Alternativas agropecuarias	Bruno Condori	bcondori@yahoo.com
NARES - National agricultural research and extension services	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária		
NARES - National agricultural research and extension services	CPRI	Central Potato Research Institute	PM Govindakrishnan	govindakrishnan_pm@yahoo.com
GO - Government office/department	USDA	U.S. Department of Agriculture	David Fleisher	David.Fleisher@ARS.USDA.GOV
CG - CGIAR Center	CIAT	Centro Internacional de agricultura Tropical	Diana Giraldo	d.giraldo@cgiar.org

2012 Technical Report per Activity

Each Program Participant must provide a small remark against each activity/deliverable to indicate the status of the activity (2-4 sentences required per activity) using the form below. Updated data from the current partners is also required.

CCAFS Center Led Activities
CIP - Centro Internacional de la Papa

Activity No. 57

Activity title		Formalizing local perceptions of climate risk
CCAFS Objective *(select from drop list)*		2.1 Identify and test innovations that enable rural communities to better manage climate-related risk and build more resilient livelihoods
CCAFS Milestone No. *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*		2.1.1 2012
Activity objectives *(what the activity aims to achieve)*	**Objective 1**	Elicit knowledge and lessons learnt from existing studies on local perceptions of climate risks, communication networks, and adaptation strategies to cope with climate variability
	Objective 2	Understand local communication networks and assess ways to channel CCAFS forecast information using appropriate packaging
	Objective 3	test the feasibility and pertinence of using artificial intelligence to formalize local perceptions; 3)Integrate local (heuristic) and scientific (numeric) knowledge on climate risks and potential options for improving decision making at the local level.
Activity status		Partially completed
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*		The objective was to initiate the collation, organization and systematization of the ethno-climatological knowledge existing in agrarian societies, from previous studies on technology transfer specifically in the Andean zone. We tried capturing the complexity of knowledge elicited from small farmers, as well as the context in which decisions are made in the adaptation of livelihoods to climate change reinforced with the lessons on gender issues suggesting that it is important to know the particular contributions of each household members to family decisions and then try systematizing most important rules using artificial intelligence techniques

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Reports, publications	Review and conceptualization of existing case studies on local perceptions and communication networks	2012	Partially completed	Document (*.doc, *.odt, *.pdf)
Model tools and software	A prototype expert system summarizing farmers' perception of climate risk	2013	Select a status	Select a format
Model tools and software	Integration of local knowledge (expert system) to scientific knowledge (crop model)	2013	Select a status	Select a format
Workshops	Facilitating dialogs between meteorologists and farmers sentinel sites using perceptions as filtering protocols	2013	Select a status	Select a format
Reports, publications	Review and conceptualization of existing case studies on local communication networks and mental models	2013	Select a status	Select a format
Workshops	Validating dialogs between meteorologists and farmers in CCAFS regions using perceptions as filtering protocols	2014	Select a status	Select a format

Current Partners

	Acronym	Name	Contact Point Full Name	Contact Point Email
AI - Academic Institution	UniValle	Universidad del Valle	Cesar Ibarra	cnig2000@gmail.com
AI - Academic Institution	UM	University of Missouri	Corinne Valdivia	valdiviac@missouri.edu

		Acronym	Name
Select a partner.		CIAT	Centro Internacional de agricultura Tropical
		Contact Point Full Name	**Contact Point Email**
		Diana Giraldo	d.giraldo@cgiar.org
		Acronym	**Name**
Select a partner.		UNALM	Universidad Nacional Agraria La Molina
		Contact Point Full Name	**Contact Point Email**
		Cecilia Turin	ceciturin@yahoo.com

Activity No. 58

Activity title		Modelling climate-sensitive pest and diseases for potato- and sweet potato-based systems		
CCAFS Objective *(select from drop list)*		2.3 Support risk management through enhanced prediction of climate impacts on agriculture, and enhanced climate information and services	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	2.3.1 2012
Activity objectives *(what the activity aims to achieve)*	**Objective 1**	Vulnerability of crops to pests induced by climate change determined through phenology modeling, and a database on temperature-driven phenology models developed and computer-aide tools provided for pest risk mapping and adaptation planning.		
	Objective 2	Scientists and IPM practitioners use the project tools for: country-specific pest risk assessments, adaptation planning, improving their pest management strategies, and for providing information to policy makers to improve national pest management and quarantine programs.		
	Objective 3	Vulnerability of crops to pests induced by climate change determined through phenology modeling, and a database on temperature-driven phenology models developed and computer-aide tools provided for pest risk mapping and adaptation planning.		
	Objective 4	Scientists and IPM practitioners use the project tools for: country-specific pest risk assessments, adaptation planning, improving their pest management strategies, and for providing information to policy makers to improve national pest management and quarantine programs.		
Activity status		Completed		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*		CIP developed the Insect Life Cycle Modeling (ILCYM) software, which supports the development of process based temperature driven and age-stage structured insect phenology models and applies obtained models for species distribution and risk mapping in a geographic information system (GIS) environment using different climate data scenarios. ILCYM is as open-source computer aided tool built on R-codes with a user-friendly interface in Java computing language and continuous training, for the implementation of effective integrated pest management to counteract climate change effects on agricultural production.		

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	New version 3.0 of the Insect Life Cycle Modeling software (ILCYM) with new modules on two species interaction, regional pest risk distribution and assessments, vector and raster analysis under GIS, and temperature interpolation.	2012	Completed	Other
Capacity	Training courses in Africa for scientists of IARC and NARS in the application and use of ILCYM software	2012	Completed	Document (*.doc, *.odt, *.pdf)
Reports, publications	Publication on "Predicting climate-change-caused changes in global temperature on potato tuber moth Phthorimaea operculella (Zeller) distribution and abundance using phenology modeling and GIS mapping "	2012	Completed	Document (*.doc, *.odt, *.pdf)
Workshops	Modeling climate impacts on pests and diseases	2012	Completed	Document (*.doc, *.odt, *.pdf)
Model tools and software	Expert system to assess impact of key pests and diseases on crop yield	2013	Select a status	Select a format
Other	Use of low-cost nanotech sensors to measure leaf wetness and temperature data for model improvements	2013	Select a status	Select a format

		Acronym	Name
CG - CGIAR Center		IITA	International Institute of Tropical Agriculture
		Contact Point Full Name	**Contact Point Email**
		Acronym	**Name**
ARI - Advanced Research Institution		ICIPE	African Insect Science for Food and Health
		Contact Point Full Name	**Contact Point Email**

Current Partners		Acronym	Name	Contact Point Full Name	Contact Point Email
	AI - Academic Institution		University of Hohenheim		
	NARES - National agricultural research and extension services	Kephis	Kenya Plant Health Inspectorate Services		
	NARES - National agricultural research and extension services	NACCRI	National Crops Resources Research Institute		
	AI - Academic Institution	UniValle	Universidad del Valle	Cesar Ibarra	cnig200@gmail.com
	ARI - Advanced Research Institution	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária	Paolo Hermann	

Activity No. 59

Activity title	Develop an Online/ offline mapping tool for rapid risk and impact assessment of CC effects on LB - validation of look up tables		
CCAFS Objective *(select from drop list)*	2.3 Support risk management through enhanced prediction of climate impacts on agriculture, and enhanced climate information and services	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	2.3.1 2012
Activity objectives *(what the activity aims to achieve)* — **Objective 1**	The objective of this activity is to develop tools for measuring at different spatial scales the effects of present and future climatic conditions on late blight development; and then applying these tools for risk assessment of changes potato late blight intensity due to climate change.		
Activity status	Partially completed		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	In the draft paper about to be submitted, we found that weather affects the severity of many plant diseases, and climate change is likely to alter patterns of crop disease severity. Predicting such future patterns can help prioritizing crop breeding and disease management research efforts. For this work we used gridded historic climate data, as the reference time point, and projected future climate data with a crop model to predict potato-growing seasons for each grid cell.		

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	Tool available online/ offline for spatial mapping of LB severity in future CC scenarios in DIVA - evaluating effects of resistance and management	2013	Select a status	Select a format
Reports, publications	Climate change effects on the global risk of potato late blight	2012	Partially completed	Document (*.doc, *.odt, *.pdf)

Current Partners		Acronym	Name	Contact Point Full Name	Contact Point Email
	CG - CGIAR Center	CCCAP	Community crafts association of the Philippines		
	CG - CGIAR Center	IRRI	International Rice Research Institute		
	AI - Academic Institution	KSU	Kansas State University	Karen Garret	

Activity No. 60

Activity title	Develop precise submodels for T and RH on LB development using current SAS based simulation model		
CCAFS Objective *(select from drop list)*	2.3 Support risk management through enhanced prediction of climate impacts on agriculture, and enhanced climate information and services	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	2.3.1 2013
Activity objectives *(what the activity aims to achieve)* — **Objective 1**	The objective is to improve the temperature and relative humidity sub models in the simulation model LATEBLIGHT and evaluate the models accuracy for disease management scenario testing when deploying upgraded sub models compared to the deployment of the current version (LB2004) of the temperature and relative humidity sub models		
Activity status	Select a status		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*			

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Data	Proof of concept of joint improved T and HR sub models improve overall accuracy and robusticity of model	2013	Select a status	Select a format
Reports, publications	Improved leaf temperature and relative humidity models for simulationg potato late blight in the tropics	2013	Select a status	Select a format

Current Partners

	Acronym	Name	Contact Point Full Name	Contact Point Email
AI - Academic Institution	KSU	Kansas State University		
ARI - Advanced Research Institution	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária		

2012 Technical Report per Activity

Each Program Participant must provide a small remark against each activity/deliverable to indicate the status of the activity (2-4 sentences required per activity) using the form below. Updated data from the current partners is also required.

CCAFS Center Led Activities
CIP - Centro Internacional de la Papa

Activity No. 70				
Activity title	Develop a climate downscaling methodology based on wavelets, multifractals and neural networks			
CCAFS Objective *(select from drop list)*	4.2 Assemble data and tools for analysis and planning	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	4.2.1 2012 (2)	
Activity objectives *(what the activity aims to achieve)*	**Objective 1**	Develop a climate downscaling methodology –using the advantages provided by non-linear tools and neural networks - capable of considering the orographic characteristics of different regions, as well as, the physical processes involved in local climatic variables.		
	Objective 2	Make comparative analyses with other CCAFS downscaling methodologies using remotely-sensed derived climatic data and outputs from RCMs e.g. ETA.		
Activity status	Partially completed			
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	A beta version was implemented in Matlab and tested over a highly variable space with rainfall going from 200-3000 mm/year. A heterogeneity filter was designed to accomodate variations in topography and rainfall supported by a log-normal disagregation cascade process. The results are very encouraging even under the extreme conditions tested. Our partner UC SantaBarbara focused their research on improving the understanding of climatic change in the zone, using CMIP5. The challenge is to downscale improved projections in complex terrains for modeling the impact on agriculture, a task we are seriously addressing under highly heterogeneous climatic conditions			

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	Statistical Physics downscaling model (SPDSM-beta-0 version) running with input from TRMM data. Comparative assessment in LAC & 2 papers submitted	2012	Completed	Other
Communication products	Starting by the end of 2012, CIP-CPAD & CCAFS: blogs, facebook, twitter, youtube and newsletters	2015	Select a status	Select a format
Model tools and software	SPDSM_beta-1 version with input from CPTEC Eta regional model data running in CCAFS-CIP server. Papers submitted	2013	Select a status	Select a format
Workshops	Workshops for sharing results of a comparative assessment among CCAFS downscaling tools from RCMs to local scales in selected sentinel sites.	2013	Select a status	Select a format
Capacity	Training materials and courses for professionals in CCAFS regions: SPDSM and links with crop and hydrology models	2014	Select a status	Select a format
Model tools and software	Final version of the SPDSM available in CCAFS server	2015	Select a status	Select a format
Data	Downscaled data available at CCAFS sites as produced, since 2013	2015	Select a status	Select a format

	Acronym	Name	
AI - Academic Institution	UCSB	University of California, Santa Barbara	
	Contact Point Full Name	**Contact Point Email**	
	Charles Jones	cjones@icess.ucsb.edu	
	Acronym	**Name**	
AI - Academic Institution	USA		
	Contact Point Full Name	**Contact Point Email**	

Current Partners		Acronym	Name	Contact Point Full Name	Contact Point Email
	NARES - National agricultural research and extension services	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária		
	GO - Government office/department	CPTEC	Centro de Previsão de Tempo e Estudos Climáticos		

Activity No. 44

Activity title	Developing methods to jointly model geo-spatial climate covariates such as topography, soil fertility and pests		
CCAFS Objective *(select from drop list)*	4.2 Assemble data and tools for analysis and planning	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	4.2.1 2012 (5)
Activity objectives *(what the activity aims to achieve)*	**Objective 1**	Develop a joint multifractal-based methodology capable of improving the accuracy of geospatial simulation of crop yields across space by modeling the intrinsic nature of the spatial heterogeneity yield limiting factors other than climate e.g. soil properties, topography and pests.	
	Objective 2	Analyze the multi-scale spatial heterogeneity of soil properties, topographic factors, and (data permitting) pests and their relationships using joint multifractal approaches.	
Activity status	Partially completed		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	The first step was to understand geospatial patterns in productivity and the scaling properties using NDVI-derived biomass in the Andes. Power law was used to assess the presence of singularities. Biomass productivity and topography was assessed through a joint multifractal distribution. A Fortran-based beta version of the software is submitted. In a short time the software will be available in R programming language. A paper is being drafted and will be submitted in 2013.		

Deliverables status *(You may add any unexpected deliverable)*

Type	Description	Year	Status	Format
Model tools and software	Proof of concept of joint multi-fractal analysis of productivity and topography under different climatic conditions: Joint Multifractal Analysis & Scaling System - JMASS-beta-0 version.	2012	Completed	Other
Communication products	CIP-CPAD: blogs, facebook, twitter, youtube and newsletters, starting in 2012	2014	Select a status	Select a format
Reports, publications	Papers submitted, reports, scientific meetings. First two papers drafted in 2012	2013	Select a status	Select a format
Model tools and software	JMASS-beta version with pest analysis (Programmed in R)	2014	Select a status	Select a format
Workshops	Workshops analyzing the pros and cons of addressing spatial variability with joint MFA in Andes and African agriculture under climate change scenarios. data and papers on comparative analyses sumitted	2013	Select a status	Select a format
Capacity	Training on JMASS techniques and scaling approach	2014	Select a status	Select a format
Data	Output data from different sites and scenarios available and incorporated into CCAFS support for decision-making in target areas.	2014	Select a status	Select a format

Current Partners		Acronym	Name	Contact Point Full Name	Contact Point Email
	AI - Academic Institution	UCSB	University of California, Santa Barbara	Charles Jones	cjones@icess.ucsb.edu
	NARES - National agricultural research and extension services	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária		

		Acronym	Name
	CG - CGIAR Center	CIAT	Centro Internacional de agricultura Tropical
		Contact Point Full Name	**Contact Point Email**
		Diana Giraldo	d.giraldo@cgiar.org

Activity No. 243			
Activity title	Development of new virtual crop parameters for assessment of potential invetsments to improve resilience to climate change for potato and sweet potato, 2012 funds		
CCAFS Objective *(select from drop list)*	4.3 Refine frameworks for policy analysis	**CCAFS Milestone No.** *(select from drop list / for further details go to CCAFS 2012 - 2015 LOGFRAME sheet)*	4.3.1 2012 (1)
Activity objectives *(what the activity aims to achieve)*	**Objective 1**		
Activity status	Partially completed		
Insert a small remark to indicate the status of the activity. *(2-4 sentences required per activity)*	The purpose of this activity is to explore the effect of changes in the different coefficients of the SUBSTOR potato crop model on simulated fresh weight tuber yields. Breeders, on the other hand, are interested in applications of crop growth models to explore the performance of a particular clone or variety in different environments and to assess the performance of so called "virtual cultivars". The experiences recorded in the present report may add valuable information and can contribute to the ongoing communication between breeders and crop modelers at CIP about this issue. The ultimate aim of this exercise is to assess the possibility of using SUBSTOR for virtual crop modeling.		

Deliverables status *(You may add any unexpected deliverable)*	**Type**	**Description**	**Year**	**Status**	**Format**
	Reports, publications	Prepare report on new cultivar. Prepare paper for inclusion in journal special issue	2012	Partially completed	Document (*.doc, *.odt, *.pdf)

Current Partners		Acronym	Name
	CG - CGIAR Center	IFPRI	International Food Policy Research Institute (IFPRI)
		Contact Point Full Name	**Contact Point Email**

2012 summary report of activities and deliverables by Output level

Each Program Participant must prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives. Length is dependent on budget size so please refer to the table on the explanatory notes.

CCAFS Center Led Activities

CIP - Centro Internacional de la Papa

Theme 1. Adaptation to Progressive Climate Change	
Objective 1.2 Develop breeding strategies for addressing abiotic and biotic stresses induced by future climatic conditions, variability and extremes, including novel climates	
Outcome 1.2: Strategies for addressing abiotic and biotic stresses induced by future climate change, variability and extremes, including novel climates mainstreamed among the majority of the international research agencies who engage with CCAFS, and by national agencies in at least 12 countries	
Output 1.2.1 Understanding and evaluating the response of different varieties/crops to climate change in time and space, and generating comprehensive strategies for crop improvement through a combination of modeling, expert consultation and stakeholder dialogue	
Prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives	In 2012 CIP finished the development of sweet potato and potato models, including potential productivity, as well as productivity limited by water and N. The models were re-programmed in Python/ArcGIS to evaluate the expected impact of climate change and to generate hypotheses about the behavior of different varieties. The potato model contains growth and development parameters representing, not only the varieties grown in higher latitude (S. tuberosum tuberosum) but also S. andigena and bitter varieties. In the case of sweet potato, a representation of the genetic variability as determined by DArT markers were selected and trials were run to parameterize the model. Several orange flesh varieties grown in Africa were included. It was shown that the model is a good predictor of field experiments. In addition, CIP was given the co-leadership in the global potato model intercomparison (AgMIP) project, with USDA. The aim is to assess model uncertainty and define future research needs. Several datasets from experiments around the globe have been selected to test the validity of a suite of around ten potato models. In spite of the number of years CIP has been conducting selection and evaluation trials around the globe, the number of experiments suitable to generate model parameters of varieties as well as clones is limited. The reason is that the most important trait for selection is tuber yield at harvest. Therefore the number of trials with detail growth data are scarce. A set of experiments were conducted to determine growth and development parameters. In addition, we designed a combinations of tools to take advantage of the knowledge acquire through conducting field trials in different environements of the crops that could complement the information on yield of different genetic materials under different environmental conditions. An instrument to elicit expert knowledge was developed and validated. The data collated was use as input for a software developed in R programming language. With the elicited data the software generates the growth and development parameters required by the crop model to simulate expected yield under different climatic conditions. The tool was used with a few of the experiments loaded in AgTrials with encouraging results. In 2013 we will expand the validation in several regions and a larger number of environments. We believe the approach can be extrapolated to other crops and we will test this hypothesis in 2013. The geospatial version of the models were used to assess the expected impact of climate change scenarios. We introduced a new procedure to decrease the statistical biased introduced when a model is parameterize at a very small spatial scale and used to simulate at a larger scale (aggregation bias); e.g. using a sweet potato model parameterized at field level and model the entire African continent. A timeseries of the normalized difference vegetation index (NDVI), a good estimator of net primary productivity, was used to generate a geospatial index. It was hypothesized that each pixel could be characterize in relation to the other pixels in terms of its production potential. That is why the highest NDVI in a timeserie was used as an indicator of the highest yield attainable for each pixel. This was used as the weighting matrix to correct the potential yield estimated by the crop model. The results indicated that sweetpotato will not be negatively affected by climate change; instead, mountainous areas will tend to enhace their potential productivity. Sweetpotato is a heat and drought tolerant multi-purpose crop that will play an important role in food security in Africa in the future.
Theme 2. Adaptation through Managing Climate Risk	
Objective 2.1 Identify and test innovations that enable rural communities to better manage climate-related risk and build more resilient livelihoods	
Outcome 2.1: Systematic technical and policy support by development agencies for farm- to community-level agricultural risk management strategies and actions that buffer against climate shocks and enhance livelihood resilience in at least 20 countries	
Output 2.1.1 Synthesized knowledge and evidence on innovative risk management strategies that foster resilient rural livelihoods and sustain a food secure environment	
Prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives	Several studies have been conducted in the Andes by CIP, the University of Missouri at Columbia and Peruvian and Bolivian universities, NGOs and governmental institutes. One of the lessons learnt is the need to understand the local language e.g. Ethno-botanical indicators. Several methods were tested for eliciting knowledge in a gender and generation inclusive manner. A second aspect is the need to foster the communication among different actors interested in sustaining food security under a changing environment. Simple things such as bringing different stakeholders together just to learn from each other are quite useful. Learning about communication networks is crucial to get the message across and generate impact. Combinations of these techniques have been implemented in the Southern Andes by CIP, combined with climate smart alternatives to reduce the vulnerability to climate variability and change. The project was designed with a well defined gender inclusion strategy. An independent assessment concluded that most of the livelihood capitals were enhanced and vulnerability reduced. All these experiences were revised and are in the process of being systematized. An additional step was initiated; the organization and systematization of the ethno-climatological knowledge existing in those agrarian societies, from previous studies on technology transfer . We try to capture the complexity of knowledge on small farmers, as well as the context in which decisions are made in the adaptation of livelihoods to climate change and interesting lessons on gender issues that suggest that it is important to know the particular contributions of the household members to family decisions. The idea is to use artificial intelligence to synthesize knowledge and evidence, to support management and decision making.
Objective 2.3 Support risk management through enhanced prediction of climate impacts on agriculture, and enhanced climate information and services	
Outcome 2.3 Enhanced uptake and use of improved climate information products and services, and of information about agricultural production and biological threats, by resource-poor farmers, particularly vulnerable groups and women, in at least 12 countries	
Output 2.3.1 Improved, value-added climate information products, knowledge, tools, methods; and platforms for monitoring and predicting impacts of climate fluctuations on agricultural production and biological threats; to support management of agricultural and food security risk	
Prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives	Predicting climate impact on small-holder agricultural production is quite a task. First of all, we have the disconnect between the temporal and spatial resolutions demanded for a reliable assessments and the resolution of the climate predictions. In the second place we have the lack of historical data to understand and model the changes during the last, say 50 years. Thirdly, the indirect impact of climate variability and change through pests and diseases must be addressed through the development of platforms combining phenology models with crop growth models. Moreover, there is a felt need of somehow incorporating elements of the human dimension. CIP and partners are addressing all these constraints, not only through numerical methods and the use of artificial intelligence tools, but also through a better understanding of the perceptions of different stakeholders in the target areas and the communications networs used by them as a complementary option to enhance climate information and services.

Theme 4. Integration for Decision Making	
Objective 4.2 Assemble data and tools for analysis and planning	
Outcome 4.2 Improved frameworks, databases and methods for planning responses to climate change used by national agencies in at least 20 countries and by at least 10 key international and regional agencies	
Output 4.2.1 Integrated assessment framework, toolkits and databases to assess climate change impacts on agricultural systems and their supporting natural resources	
Regional site and baseline characterization	
Prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives	One of the highlights of our research in 2012, was the work led by our partners at the University of California, Santa Barbara. These studies focused on the large-scale characteristics of the South American Monsoon System (SAMS): seasonal amplitudes, onset and demise dates and durations. Changes in the SAMS are investigated with the gridded precipitation, CFSR reanalyses and fifth phase of the Coupled Model Intercomparison Project (CMIP5) simulations for two scenarios ("historical" and high emission representative concentration pathways "rcp8.5"). Qualitative comparisons with a previous study indicate that some CMIP5 models have significantly improved their representation of the SAMS relative to their CMIP3 versions. Some models exhibit persistent deficiencies in simulating the SAMS. The observations and CMIP5 model simulations (historical experiment) consistently show statistically significant trends indicating the SAMS has larger seasonal amplitudes, early onsets, late demises and longer durations in recent decades. Future changes in the SAMS are analyzed with six CMIP5 model simulations of the rcp8.5 high emission scenario. All simulations unquestionably show significant increases in seasonal amplitudes, early onsets and late demises of the SAMS. The simulations for this scenario project a 30% increase in the amplitude from the current level by 2045-2050. In addition, the rcp8.5 scenario projects an ensemble mean decrease of 14-day in the onset and 17-day increase in the demise date of the SAMS by 2045-2050. These projections coincide with other results and predict severe changes with large temporal variances. Nonetheless, the coarse resolution of GCM outputs does not allow to even resolve large areas, much less the high heterogeneity of the agricultural landscape which also demand resolutions finer than those resulting from existing regional models. When information at a large scale is available, then downscaling techniques are employed. One of these techniques exploiting the auto-similarity, auto-affinity and scale invariance of the information is known as Multifractal downscaling. We developed a beta version of a Multifractal downscaling technique complemented by a heterogeneity filter. The study was conducted with TRMM rainfall data over the period between 01-01-1999 to 12-31-2008. Specifically, this data highlights the effect of mountain terrain – 200 to 6000 m.a.s.l. – on the heterogeneity of rainfall - < 200 to 3000 mm y-1- information in a small area of the Southern Andes. On the productivity site, we started developing tools for addresing spatial variations and their scaling properties in order to improve CCAFS capacity of modeling crop productivity at different spatial scales. Significant advances on the understanding of the spatial behavior of estimated primary productivity were made. It was also suggested that understanding the relationships of factors affecting yield should be analized at multiple scales and joint multifractal distribution are particularly useful in elucidating those patterns.
Objective 4.3 Refine frameworks for policy analysis	
Outcome 4.3 New knowledge on how alternate policy and program options impact agriculture and food security under climate change incorporated into strategy development by national agencies in at least 20 countries and by at least 10 key international and regional agenciesat least 10 key international and regional agencies	
Output 4.3.1 Climate change impacts assessed at global and regional levels on agricultural systems (socially and gender differentiated producers and consumers, and their natural resources), national/regional economies, and international transactions and potential of international and regional policy changes to enhance adaption and support agricultural greenhouse gas emissions mitigation	
Prepare a succinct summary of activities and deliverables, organised by Output level of the CCAFS objectives	

List of publications that acknowledge CCAFS support

(a) Each Program Participant must list all publications that acknowledge CCAFS support. Only include publications that came out in final version in the calendar year. Please do not include journal papers under review (submitted etc) or out in electronic format ahead of print, except of course for electronic-only journals.
(b) Please try to format references in the Harvard style. A clear guide can be found here: http://libweb.anglia.ac.uk/referencing/harvard.htm

(c) For journal articles, please indicate all of the references that are "green open access" with a single asterisk and those that are "gold open access" with a double asterisk. This is now a requirement from CGIAR donors. Green open access means that the authors have made a free copy available on a website. Gold open access means that the journal allows free download (either as standard practice or because the authors paid for it).
(d) For all publications that are up online, please provide a web link if possible. This will help us to advertise your work more widely.

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	Type	Citation identifier
Publication 1	Journal papers	http://dx.doi.org/10.1016/j.agrformet.2012.04.018
	Citation	
	K.A. Garrett, A.D.M. Dobson, J. Kroschel, B. Natarajan, S. Orlandini, H.E.Z. Tonnang, C. Valdivia, The effects of climate variability and the color of weather time series on agricultural diseases and pests, and on decisions for their management, Agricultural and Forest Meteorology, Volume 170, 15 March 2013, Pages 216-227, ISSN 0168-1923, 10.1016/j.agrformet.2012.04.018.	
Publication 2	**Type**	**Citation identifier**
	Journal papers	http://dx.doi.org/10.1016/j.agrformet.2012.06.017
	Citation	
	J. Kroschel, M. Sporleder, H.E.Z. Tonnang, H. Juarez, P. Carhuapoma, J.C. Gonzales, R. Simon, Predicting climate-change-caused changes in global temperature on potato tuber moth Phthorimaea operculella (Zeller) distribution and abundance using phenology modeling and GIS mapping, Agricultural and Forest Meteorology, Volume 170, 15 March 2013, Pages 228-241, ISSN 0168-1923, 10.1016/j.agrformet.2012.06.017.	
Publication 3	**Type**	**Citation identifier**
	Journal papers	10.1080/01431161.2011.652315
	Citation	
	Heidinger, Haline; Yarlequé, Christian; Posadas, Adolfo; Quiroz, Roberto. (2012). TRMM rainfall correction over the Andean Plateau using wavelet multi-resolution analysis. TRMM rainfall correction over the Andean Plateau using wavelet multi-resolution analysis. International Journal of Remote Sensing, vol. 33, issue 14, pp. 4583-4602. Vol. 33(14):4583-4602	

Publication 4	**Type** Journal papers	**Citation identifier** http://dx.doi.org/10.1175/JCLI-D-11-00335.1
	Citation Carvalho, Leila M. V., Charles Jones, Adolfo N. D. Posadas, Roberto Quiroz, Bodo Bookhagen, Brant Liebmann, 2012: Precipitation characteristics of the south american monsoon system derived from multiple datasets. J. Climate, 25, 4600–4620.	
Publication 5	**Type** Book chapters	**Citation identifier** http://www.dfid.gov.uk/R4D/Output/188378/Default.aspx
	Citation Milori, D.M.P.B.; Segnini, A.; da Silva, W.T.L.; Posadas, A.; Mares, V.; Quiroz, R.; Martin-Neto, L. Emerging techniques for soil carbon measurements. CCAFS Working Paper No. 2. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen, Denmark (2011) 30 pp. In: Wollenberg, E., Nihart, A., Tapio-Bistrom, M.-L., Grieg-Gran, M. (Eds.), Climate Change Mitigation and Agriculture. Earthscan, London, UK, pp. 252-262	

2012 Case studies

Number of case studies to be submitted is dependent on budget size so please refer to the table on the explanatory notes. Each case study should be about half a page, and Program Participants are expected to build a portfolio of case studies over the years that demonstrate all different types.

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CASE STUDY 1

Title
Transitioning to Climate Resilient Development. Perspectives from Communities in Peru

Author
Frank Sperling, Corine Valdivia, Roberto Quiroz, Roberto Valdivia, Lenkiza Angulo, Anton Seimon and Ian Noble

Type
Social differentiation and gender

Date (DD/MM/YYYY)
1/5/2008

Countries
Peru

Keywords
Climate change, El Niño Southern Oscillation (ENSO), traditional climate indicators

Photo URL

Introduction/Objectives (400 characters)

The study was conducted in Piura, northwestern Peru, and Puno, in the Peruvian Altiplano. It examined the abilities of rural communities to cope with climate variability induced by El Niño Southern Oscillation (ENSO) and La Niña. It captured the perceptions of communities concerning their vulnerability to climatic hazards, and the role of weather and climate information in relation to nonformal information sources for forecasting and adapting to climatic extremes.

Description of the project,procedures etc. (1100 characters)

Coordinated by CIP, the assessments were carried out in four communities in Piura and six communities in Puno. In Piura, the communities covered a transect going from 30 masl to 1470 masl whereas in Puno the sites were located around Lake Titicaca, at about 4000 masl. A participatory process was used for eliciting information from the participants. The assessments focused on the communal perceptions concerning their exposure to environmental risks. Participants were asked to recall events that represented major disasters by significantly affecting agriculture, infrastructure and human health. The severity of the events was ranked by the participants. A time line for these events was constructed. Discussions then focused on the availability and use of weather and climate information. Besides formal information sources, local and traditional climate information and indicators were identified and their relevance and attributed reliability for forecasting climate events compared to formal information sources were discussed. Participants then discussed the copping and adaptation mechanisms employed by the communities to lessen their vulnerability to and the impact of extreme climatic events. Results were presented in regional workshops to government agencies and NGOs.

Project results (be concrete as possible), innovate findings, novel outcomes and short discussion on the implication of these results (1100 characters)

A major challenge for the studied communities is to protect critical assets, and development activities have to be conducted with a full appreciation of the risk envelope and the vulnerability of the communities. The risks made it difficult for communities to accumulate assets or regain them once they are lost in extreme events. Research on climate resilient agriculture needs to be strengthened to improve the portfolio of options to reduce vulnerability. Targeted investments in infrastructure are also required. The assessment showed a strong willingness of participants to better manage environmental risks and also the important fact that they are aware of their limitations in terms of resources, knowledge and information. The review of local indicators on climate suggests that they are still of importance and there is some lack of trust on formal information sources. Thus, trust building exercises between formal information providers and rural communities are required. In any event, it is important that formal information formats fit into the local knowledge and decision making structures. The study shows that there is a widespread perception of climate change (e.g. changes in the pattern of rainy seasons) which is relevant to the livelihoods of the communities.

Partners involved and their role (250 characters)

Intermediate Technology Development Group (ITBC), Centro de Investigación de Recursos Naturales y Medio Ambiente (CIRNMA), University of Missouri, World Bank's Environment Department Climate Change Team

Links/Sources for further information

http://sanrem.missouri.edu/WB-EDP%20115-%20Transitioning%20to%20Climate%20Resilient%20Development-Peru.pdf

Title
Advances in Insect Life Cycle Modeling to better understand impacts of climate change on future pest distribution and risks

Author
Henri Tonnang, Henry Juarez, and Jürgen Kroschel

Type
Capacity enhancement

Date (DD/MM/YYYY)
10/12/2012

Countries
Peru

Keywords
Global warming, Pest risk assessment, Potato production, Adaptation planning

Photo URL

Introduction/Objectives (400 characters)

CIP developed the Insect Life Cycle Modeling (ILCYM) software, which supports the development of process based temperature driven and age-stage structured insect phenology models and applies obtained models for species distribution and risk mapping in a geographic information system (GIS) environment using different climate data scenarios. ILCYM is an open-source computer aided tool built on R-codes with a user-friendly interface in Java computing language. The uDig GIS platform contains basic tools for managing and mapping geographic information. The use of global coarse and monthly sources of climate surfaces is limiting the precision of predictions of the potential distribution and abundance of insects. To improve the software capacity to capture the small-scale distribution of pests in mountainous regions, a new sub-module for climate data interpolation was developed and integrated in ILCYM.

Description of the project,, procedures etc. (1100 characters)

CASE STUDY 2

A literature review on different methods and R-source codes for climate data interpolation was conducted and the thin plate smoothing spline (Tps) algorithm was selected. This method constructs surfaces through the fitting of thin plate spline functions of geographical position (longitude and latitude) and elevation estimated from means of climate variables. The analysis consists of developing a statistical model of spatial variation of observed climate variable means considering noisy estimates of standard period means. Once the algorithm was successfully adapted to ILCYM, daily temperature data from 27 weather stations located in the Mantaro valley of Peru were applied for testing the sub-module. However, due to the high quantity of data processing of results took about one month. Consequently, it was decided to first calculate the three temperature- dependent risk indices (establishment index, ERI, generation index, GI, and activity index, AI) implemented in ILCYM location by location and then conduct the interpolation of the calculated values. With this approach, the number of points to be interpolated was considerably reduced and data processing was consequently very fast yielding satisfactory results.

Project results (be concrete as possible), innovate findings, novel outcomes and short discussion on the implication of these results (1100 characters)

The new integrated sub-module called "Index interpolator" inputs daily min. and max. temperature data and simultaneously calculates the three risk indices location by location and applies the thin plate algorithm for interpolation of the indices displaying regional risk maps of insect pest population establishment potential, distribution and abundance. While the generation and activity indices produced very reasonable results at high resolution validated through field observations, the resolution of the establishment index is weak and not yet satisfactory displaying well pest potential establishment, which needs more research. A link for displaying the results in Google map was also included.

Partners involved and their role (250 characters)

CG-Centers (Bioversity, CIAT, CIMMYT, CIP, ICRISAT, IITA, and IRRI) and stakeholders (CABI, FAO, FERA, UC Davis, Leeds, Kansas, Ohio State) to share experiences on pest risks analysis, surveillance, diagnostic and to develop joint modeling approaches to better understand the effects of climate change on agricultural pests, diseases and crop losses.

Links/Sources for further information

www.cipotato.org/ilcym/

2012 Outcome report

Frequency of reporting outcomes is dependent on budget size so please refer to the table on the explanatory notes. (max 1 page)

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OUTCOME 1

What is the outcome of the research (use of research results by non-research partners)?

The high Andes, center of origin of the potato, is constantly exposed to frost, droughts and hailstorms. Due to mainly environmental constraints and lack of support, malnutrition and child mortality are very high. The research focused on designing low-cost "green houses" built with local materials and agrofilms, selecting horticultural crops adapted to the conditions and taste and optimizing the use of the space and time. With local NGOs, and GOs, 16 rural schools were used as the centers for irradiating the technology to 1200 students. 150 students -female and males- and 185 women built their own in their respective houses. Women and students learned how to prepare and consume horticultural products, products seldom included in Andean diets. Average yield over 18 crops was around 8 kg m-2 per season with 2-4 seasons per year in places where only one season is feasible due to the harsh climate. On average 85 % was used for the household nutrition and with the sale of the remaining 15 % families generated income for around $ 180-360 per year; roughly 25 % of the yearly household income determined in the baseline survey. Students - the farmers of the future -were also trained on how to cope with negative climate impact e.g. how to generate their own seeds and how to produce organic fertilizers with local input, together with transformation of local products and the production of import quality handicrafts.

What outputs produced in the three preceding years resulted in that outcome?

Participatory selection of horticultural crops and varieties; Enhancing soil fertility with the use micorrhiza in greenhouses at around 4000 masl;

What partners helped in producing the outcome?

Centro de Investigación en Recursos Naturales y Medio Ambiente (CIRNMA-NGO); Universidad Nacional del Altiplano; Local branches of the Ministry of Education

Who used the output?

Local rural schools, high school graduates in their parent´s farms, women farmers

How was the output used?

As a tool for teaching and extension, teachers became "extension agents" teaching their students and parents through PTA´s gatherings designed to promote adequate nutrition for school-age kids and how to produce horticultural products; as income generation for students during and after their schooling ages; as a source of healthy food and income for rural women.

What is the evidence for this outcome: Specifically, what kind of study was conducted to show the connection between the research and the outcome? Who conducted it? Please provide a reference or source.

Reports of the ALTAGRO Project, a bilateral project listed under CCAFS (Summaries in English and reports in Spanish) and an independent evaluation conducted by Dr Victor Barrera (Report in Spanish)

Gender and Social Differentiation related activities summary report - 2012

CRPs that have presented their Gender Strategy to the Consortium in 2012 should show progress in 2013 in relation to implementing the Strategy. Therefore it is expected from Program Participants that findings of gender and social differentiation activities and their significance to be referred in this summary report. It is essential to relate progress towards outcomes to the baseline gender-differentiated conditions being used to measure change. This report should also refer specifically to what is being learnt about gender and how this knowledge is being used to inform research priority-setting and approach. If none or few of your activities integrate gender please explain why it is not relevant to your research portfolio.

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The review and conceptualization of existing case studies on local perceptions and communication networks provides interesting lessons on gender issues and suggests that it is important to know the particular contributions of the household members to family decisions, for us to be able to construct a model of agricultural risk management and livelihood strategies in the face of climate change.

The active participation of women in farming activities is widely recognized and studied. However, women's participation in farming decision-making has been less documented. Besides identifying gender participation in decision making, it is also important to identify the criteria used by each gender for making decisions about the use of resources and livelihood strategies.

In this regard, Kusch (1970, cited by Llanos 1992) pointed out that in the Andean culture, perception and feeling are very important. Studies in Peruvian highland farming communities in recent years showed that men and women express different emotions when confronting extreme weather events. Emotions or feelings affect perceptions and these in turn influence decisions to address climate change (Valdivia, et al 2007).

These findings are important for defining the logical sequence of decisions for building our expert system. We know that farming family members are gender and age assigned to different productive (livestock and pasture management, irrigation, handicrafts and cropping activities) and distributive activities (food preparation and consumption, trade, cash disposal, investment) that they decide about, schedule and perform. So the following questions arise: Who in the family are the decision makers in relation to changes in livelihood on account of climate change? Will they be men, women or both and how? It's therefore very important to understand how men, women, children and the elderly, within the family unit organize their responsibilities, skills and tasks (Fernández, 1989, cited by Llanos 1992). Llanos (1992) found that the participation of women in production activities of the Peruvian Altiplano pastoral systems was very active. However, their participation in decision making was less significant as most decisions were influenced by the men of the household. However, recent studies conducted under the Altagro project in highland farming communities found that the participation of women is crucial in conserving genetic resources of potato and the preservation of local knowledge. Moreover, it has been established that women's decisions in the Altiplano farming systems are based on the analysis of the available alternatives for better ensuring their food security, using what scientists call the "safety first" approach (Valdivia, personal communication).