



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Theme 1
2013 technical report

1. Activity Reporting

Activity 440-2013 (Milestone 1.1.1 2013)

Title: Competitive grant scheme for collaboration with commodity CRPs to establish breeding priorities

Status: Incomplete. This activity was not carried out and funds were instead channeled towards a new collaborative activity: "Evidence-based prioritization of CSA investment at the national level: Development of a decision-support tool and indicator set for use in national policy processes". This prioritized activity involves CCAFS LAM, CCAFS Theme 4.2, CIAT, ICRAT, the World Bank, the University of Clemson and Universidad de los Andes (Colombia). For more details see Progress Report available on the intranet!

Gender component:

Deliverables:

Partners:

CIAT; ICRAF; The World Bank; FAO; University of Clemson

Locations:

Activity 441-2013 (Milestone 1.3.1 2014 (2).)

Title: Transformational adaptation and international development: What are the risks, costs, benefits and barriers.

Status: Complete. This project helped to establish a small community of practice (between a group of CSIRO, CCAFS, University of Melbourne, University of Mataram (Indonesia) and Practical Action (Sri Lanka) researchers) to explore the existing links (interactions, synergies and tradeoffs) between climate change impacts, potential transformational adaptation pathways and sustainable development; and to develop a working definition and shared framing of transformational adaptation which will be used to appropriately guide transformational adaptation concepts with participating organisations and with their stakeholders. The two main activities planned during the reporting period were:

- A three-day collaborative workshop held in Brisbane, Australia, on April 29-May 1, 2013 – The workshop aimed to look at transformational adaptation in the sustainable development context, identifying existing examples and future prospects.
- Collaborate on writing two joint publications on transformational adaptation and sustainable development as indicated above.

Deliverables:

- A collaborative workshop to be held in Brisbane, Australia aiming to look at transformational adaptation in the sustainable development context, identify existing examples and future prospects.

A three-day collaborative workshop was held in Brisbane, Australia, on April 29-May 1, 2013 – The workshop aimed to look at transformational adaptation in the sustainable development context, identifying existing examples and future prospects. The workshop demonstrated the benefits of bringing together different perspectives on a research topic of common interest. It also highlighted the need for more collaboration in that space. However, as the concept of transformational adaptation is a ‘heuristic, subjective and relative term and that there are different perspectives on what counts as transformational (Rickards and Howden 2012), diversity in the group brought some challenges in generating a common definition and identifying transformational adaptation in both the developed and developing world. The process itself (at the actual workshop and subsequent communications) of exploring transformational adaptation in the context of sustainable development has been an iterative learning experience for all participants involved.

- Policy brief

A 2000 word policy oriented piece was submitted to Issues in Science and Technology late September 2013 to gauge their interest. Once we heard back from the editor of a formal submission will be made for peer review.

- Scientific paper

Draft paper (analytical paper / case study research) under development for submission to Global Environmental Change.

Partners:

CSIRO; Melbourne University; University of Mataram

Locations:

Global

Activity 442-2013 (Milestone 1.2.1 2013 (2).)

Title: Analysis of varietal level responses and identification of crop substitution options for systemic adaptation

Status: **Partially complete.** this activity was not completed as initially planned, instead two project were initiated addressing the following issues:
 * Agricultural cul de sacs: when do different cropping systems hit a dead end under progressive climate change and require transformational change.
 * Re assessment of a four degrees world: impact on crops globally
 Final reports and deliverables are expected in 2014

Deliverables:**Partners:**

GIZ; University of Bonn

Activity 443-2013 (Milestone 1.2.1 2013 (2).)

Title: Analysis of crop yields responses to climate change (based on a database of over 1000 studies across the globe).

Status: Complete. This analysis was partially in the first quarter of 2013, when a first version of the paper was submitted to Nature Climate Change. The paper is now in the third round of review. It is expected that the final decision from the journal will arrive soon.

Gender component:

Deliverables:

Partners:

Stanford University; CSIRO; University of Nottingham

Locations:

Global

Activity 311-2013 (Milestone 1.1.2 2013 (1).)

Title: Managing climate related risks to improve livelihood resilience and adaptive capacity in agricultural ecosystems in Southern Mozambique.

Status: Complete. All activities planned for 2013 were carried out successfully. They include:

- * Household and village level baseline survey and reports completed in Xai-Xai and Chicualacuala districts.
- * Training workshop provided by CCAFS team to IIAM staff on Ecocrop model and vulnerability analysis
- * Continue with the identification of technologies/ practices that best suits the local conditions
- * Initiation of on-farm testing and demonstration of selected practices in the selected field sites
- * Characterization of the biophysical environment (soil, water, vegetation, ecology and land use)
- * Analysis of threats and opportunities to enhance ecosystems services for the improvement of the livelihoods

Gender component:

As part of the VBS social and gender differences were explored:

- * Perceptions of women and men were gathered separately to be able to present different gender perspectives.
- * Community infrastructure and resources and gender-differentiated access and utilization of those resources have been analyzed, based on a process of participatory visual interpretation of high-resolution satellite imagery
- * A Gender-differentiated comparison of current conditions was carried out

Deliverables:

- Ecocrop training workshop to local partners in Mozambique.

A Training workshop on the use of the ECOCROP model for Crop Suitability Analysis, was held in the facilities of the Mozambique Agricultural Research Institute (IIAM) in Maputo, on February 26-27th 2013. A total of 12 participants attended the training and filled an evaluation form. See also blog post:

http://ccafs.cgiar.org/fr/blog/innovative-models-manage-climate-risk-spreads-mozambique#.Ut_E5LROnEZ

- Survey and characterization of the biophysical environment (soil, water, vegetation, ecology and land use),
 The field work related to the survey and characterization of the biophysical environment (soil, water, vegetation, ecology and land use), has been completed. Various activities of compilation and data processing have already been performed, Field data of representative soil profiles has been introduced into the IIAM Soil Data Base (SDB) and the soil analysis is still ongoing (laboratory analysis). A Biophysical report is in progress and will include a section dedicated to the Vegetation and Floristic composition. work to be finalized, as planned in 2014.

- To test the identified practices and solutions according to each selected site characteristics.

The list of identified practices/interventions is provided in the Table 1 of the annual report. In 2013, a total of 15 trials to test and demonstrate practices and technologies for crops, livestock and agroforestry were installed in farmers' fields; from these, 4 crop trials were harvested and results are to be analyzed during the next reporting period and 3 crop trials were lost or not progressed due to inadequate husbandry and lack of monitoring. Additionally, community training and capacity activities were carried out in 6 communities in Xai-Xai district in storage and agro-processing methods for sweet potato, vegetables and fruits. Other trials and demonstrations are planned to be installed at the beginning of 2014.

- Baseline research survey

The survey data and related files have been uploaded into the CCAFS DATAVERSE repository.

- Lesson's learned from studies and development projects already implemented in Mozambique and identify best practices that can enhance the livelihood climate change adaptive capacity

Consultations, literature review, and lessons learn from similar projects and studies implemented in Mozambique, allowed the identification of potential interventions to be tested; this included the development of innovative nature based business solutions to agricultural productivity, ecosystem conservation and use and poverty reduction. Community capacity interventions were identified after the diagnosis survey. A draft report on the communities training and capacity needs is available and has been used as a tuning tool for testing and disseminating field interventions. Also an internal and planning workshop was held in March 6-7, 2013 with a total of 27 participants, composed by IIAM and IUCN team. The objective of the workshop was to familiarize all the team with the project objectives and expected results, the lessons learnt from studies and other similar projects and to carry out a planning exercise of the activities and interventions to be conducted during 2013 and 2014. A presentation of the preliminary results of the baseline survey, covering the results of the household survey conducted in November 2012, was presented by IUCN.

- Annual report

Two technical progress report were submitted in 2013 and are available.

Partners:

IUCN; MICOA; MNAG; UEM; Acclimatise

Locations:

Other

Activity 453-2013 (Milestone 4.2.1 2014 (4).)

Title: CCAFS Near-term Climate Project (collaboration with Theme 4)

Status: **Partially complete.** See more details as part of Theme 4.2 reporting

Deliverables:

Partners:

UCT

Locations:

Global

Activity 312-2013 (Milestone 1.2.1 2013 (2).)

Title: A methodological development of an online tool for the identification of Target Population Environments: improving the predictions of agricultural production using crop models

Status: **Complete.** The activities planned for 2013 were successfully carried out and progress is been made towards the completion of the 2014 deliverables.- Target population environments for upland rice BRSPrimavera were identified and characterized based on crop model ORYZA2000 application;- The drought impact on the agronomic traits leaf area index and total dry matter for BRSPrimavera was determined for each TPE in the production region in Brazil- The CSM-CROPGRO drybean crop model was calibrated and validated for cultivars Pérola and BRSRadiante.- Training and networking activities were also carried out

Gender component:

Deliverables:

- Draft about definition of environments high, medium and low productivity of beans and rice in Brazil and Colombia

The high, medium and low environment for upland rice in the central region of Brazil have been identified and characterized using the output of Oryza2000 model, considering different weather, soil and agronomic management information. Currently, the same analysis is been done in five Colombian regions dedicated to lowland rice. The Dry beans analyses for both Brazil and Colombia will start in January 2014.(See further details in progress report made available in the intranet)

- Initial methodological description for the TPEs approach to be implemented (proof of concept).

A methodology has been created and implemented to identify TPE through the use of crop model and it has been used to identify the environments for upland rice and lowland rice in Brazil and Colombia respectively.(See further details in progress report made available in the intranet- under deliverable 1)

- Short document about the plasticity variation of bean (Perola cultivar) and rice to different environmental conditions and planting dates.

The document is in progress but analysis and preliminary results have been presented in several seminars/discussion groups. The central Brazil upland rice production area was divided in three environments, highly favourable environment (HFE), favourable environment (FE) and low favourable environment (LFE) based on crop model simulation yield for BRS Primavera cultivar. The drought profile for each environment was also determined. Based on the occurrence probability of the main drought profile in each environment, we compared the plasticity variation for leaf area index (LAI) and total dry matter (TDM) traits.

- Document with the results of sensitivity analysis considering specific stresses on the bean and rice.

Drought stress profile for each environment was determined based on the aggregation of growth daily simulation model output and clustered. This analysis was completed for upland rice in Brazil, the next step is to replicate the analysis on Colombian lowland rice and dry beans in both Colombia and Brazil. (See further details in progress report made available in the intranet- under deliverable 1)

- Cluster and multivariate analysis of climatic variables and productivity to define and characterize environmental groups in Brazil and Colombia.

The study has been complete for central region in Brazil cultivated with upland rice, the main result showed that the best numbers of cluster were three and the most representative cases for each environment were selected. For environment 1 was selected all simulations with sandy (S) and sandy loam (SL) soils and 10/01, 30/12 and 20/12 sowing date. For environment 2, all simulations with clay (C) soil and 01/11, 10/11 and 20/11 sowing dates. Finally for environment 3, clay loam (CL) and sand clay loam (SCL) soil and all sowing dates. (See further details in progress report made available in the intranet- under deliverable 1)

- Meeting working group, in July (CIAT)

Additionally, EMBRPA's PI participated in workshop/networking activities such as:

- a) A seminar on "Environmental Groups for Upland Rice Target Population Environments in Brazil: Drought Profile and Yield Trend" given at the University of Florida, Nov 2013.

- b) Mini workshop aiming to carry out the Calibration and validation of 2 drybeans cultivars and applications based on CROPGRO model and to participate in meetings/discussions with UF Scientists. Result obtained: Two drybeans cultivars calibrated and validate for CROPGRO model.

- c) Seminar presented at the XVIII Brazilian Agrometeorological Meeting; September 03, 2013, Belém, Pará aiming to present the partial results obtained so far. d) Seminar given at the University of São Paulo/ESALQ to present the partial results obtained so far.

- ORYZA crop model calibrated, validated and applied for the upland rice region production in Brazil and for irrigated rice in Colombia

The following varieties were calibrated: For Brazil: Curinga, Primavera and Douradao (upland varieties) Colombia: Fedearroz 733, IR64 , CT21(Partially calibrated)

Partners:

EMBRAPA; CIAT

Locations:

Latin America (LAM)

Activity 456-2013 (Milestone 1.2.1 2013 (2).)

Title: The influence of climate change on the occurrence of crop pests and diseases

Status: **Partially complete.** A PhD student has started in October 2013 at University of Leeds (Stewart Jennings), funded by the National Environmental Research Council (NERC). The student is being supervised by Prof. Andy Challinor (School of Earth and Environment), Dr. Stephen Sait (School of Biology), and Dr. Andy Jarvis (CIAT/CCAFS). The student will look into modeling of potato late blight (*Phytophtora infestans*) in various locations in Peru (using data from Kroschel) and in the UK (using data from Rothamsted). The PhD has a duration of 3 years.

Gender component:

Deliverables:

- Progress report including: Development and evaluation of process-based modelling suites that assess both the direct and intermediate drivers of regional-scale crop yield, whilst taking full account of associated uncertainty. Evaluation of the efficacy of climate analogue techniques in translating regional-scale climate predictions into farmer-relevant information on likely future biotic and abiotic stresses.

All relevant reports related to a Leeds Uni PhD: Six-month report, transfer report (at 12 months), 24-month report, 33-month report and the PhD thesis. Journal articles may also happen during the course of this PhD.

Partners:

University of Leeds; CIAT; CIP

Locations:

Global

Activity 205-2013 (Milestone 1.3.1 2014 (1).)

Title: SIA - Integrated program of research into the resilience and adaptive capacity of socio-ecological systems to climate change.

Status: **Partially complete.** This activity (the whole SIA program) remains on schedule for a 2014 completion date. In 2013 SIA completed its West Africa field program. The decision was made in late 2013 to eliminate the programmed third field site (initially planned for Latin America), and instead focus on integration of the four SIA lenses and outcome oriented activities in Ghana in collaboration with the Regional Program Leader. SIA team members have been actively participating in a variety of cross-theme/region CCAFS efforts, including Scenarios workshops in multiple regions, National Adaptation Planning workshop and policy briefs from COP19 and GLF, gender and social differentiation workshops, stakeholder influence mapping in the Latin American region, and the Ghana multi-level planning workshop.

Gender component:

Deliverables:

* Refined operational conceptual and methodological frameworks for field research programs.

* Refined working meta-theory and meta-methodological framework

The ‘refined operation and conceptual and methodological framework’ will be the product of three separate integration workshop reports (October 2013, February 2014, and March 2014). It will also include insights on interdisciplinary research in the area of climate change adaptation as identified during the course of SIA development (2012 – present). The operation and conceptual framework will be grounded in examples from the implementation of the SIA framework in Ghana, including the April 2014 multi-level stakeholder workshop. This is considered a concluding report and will be delivered at the end of the contract period.

- Practitioner training packages for the frameworks and toolkit

This deliverable is scheduled for 2014 and thus it's currently incomplete. The ‘training packages’ will include (1) The SIA diagnostic workshop applied at the community level, (2) methods applied by the PhD students and PI at various actor levels (i.e. influence mapping, actor mapping, ecosystem services toolkit etc) and (3) Farms of the Future (FOTF) methodology (4) training package for integrated multi-level adaptation planning

- Completed West Africa Field Research Program.

Two separate reports were submitted in June 2013 (immediately following the field site) and December 2013 (which includes both Ghana updates and methodological advances following the second pluri-disciplinary workshop) - and are available in the intranet as Deliverable 4. Associated field site outputs include a forthcoming “state of agricultural adaptation” working paper (currently being reviewed by Ghanaian stakeholders), multiple blog publications, photo series, and a facilitator training program conducted with Ministry of Food and Agriculture Staff prior to the community level diagnostic workshop

- Synthesis reports on first two field programs

The synthesis report on ALI field programs will consist of two principle components: (1) an internal report with content collated from each of the SIA progress reports (approximately 6 in total) submitted at various payment periods since 2012, and (2) a short synthesis of key outcomes, recommendations, and insights (perhaps in policy brief format). This second report will include contributions from Deliverable #1 (SIA framework document).

- Draft academic papers.

To date, three papers have been submitted to journals for review, and the remaining articles are expected to be completed and submitted by the end of 2014 (and 2015 for the fourth PhD student). Where possible, national level partners, and CCAFS researchers from various CGIAR centres and themes are included as co-authors in these documents. Several working papers are also being produced and have been added to the SIA 2014 publications list. Apart from the journal articles this includes:

- Working Paper: Deconstructing Local Adaptations Plan for Action (LAPA) – Comparative analysis of Nepal and Pakistan LAPA initiatives [Expected May 2014]
- Working Paper: State of Agricultural Climate Change Adaptation in Ghana [currently being reviewed by national stakeholders, and waiting for official release of Ghana’s National Climate Change Policy for inclusion in analysis]. [Expected June 2014]
- Working Paper: Developmental disabilities and adaptive capacity in Ghana [To be completed for

assessment and assignment of working paper number in Feb 2014]

Partners:

CSIR; ILRI; WUR; University of Oxford; LEAD Pakistan; DSTO; University of Hull

Locations:

West Africa (WA), South Asia (SAs)

2. Succinct summary of activities and deliverables by Output level

Output: 1.1.1

Summary:

Climate Analogue tool: To respond to the feedback and demands from the end- users and key stakeholders several major improvements were made to the Climate Analogue tool. Those include a new version of the R library (allowing faster processing of information, the use of higher resolution weather data for all countries around the world, the ability to display and compare multiple results simultaneously), a new homepage of the online tool with a new design and more user-friendly and updated tutorials. A new Offline version of the tool has also been developed to allow users to run the tool independently of poor internet connections. AgTrials initiative moved forward in terms of partnerships developed (CIMMYT/CSISA, CRP RTB, AgMIP, IBP/Crop Ontology), technical improvements (development of a data dictionary that includes locating short and concise descriptions of database fields alongside the data input elements in the application), new data content and development of further improvement plans. As of the end of 2013, 236 users were registered within the system and the total number of trials uploaded into the platform was increased by 7 times compared to 2012, reaching over 30,682 trials (from 197 institutions). A total of 4574 visits were registered over the year. Agtrial data are been used by RTB to carry out their assessment of yields on experiment stations as part of their overall yield gap study.* AMKN portal: Improvements have been completed in the development environment of the platform but have not yet been published to the user interface, pending the completion of other major changes and stabilization of the platform in general. Major improvements have also been made to the CCAFS sites section in terms of the quality and completeness of visible information. A major step forward will be reach in 2014 with the implementation of new functions and content.

Output: 1.1.2

Summary:

*Three National analogue training workshops specifically designed in response to the request from government actors from Panama, Rwanda and Kenya were carried out, Kigali and Nairobi gathering more than 50 participants from Ministries of Agriculture of Dominican Republic, Central American countries (CAC) and Kenya, as well as representatives from Universities, national research institutions and NGOs.

(See:<http://www.rlc.fao.org/es/agenda/taller-herramientas-para-la-adaptacion-y-mitigacion-del-cambio-climatico-en-la-agricultura-centroamerica-y-republica-dominicana/>; <http://www.ccafs-analogues.org/back-to-the-future-with-the-climate-analogue-tool/>; http://www.slideshare.net/slideshow/embed_code/30616854#) *

Successful training workshop on the use of the ECOCROP model as a tool to evaluate crop suitability and carry out vulnerability analysis carried out in Feb 26-27, at the IIAM headquarter in Maputo (Mozambique). Direct beneficiaries: IIAM staff. (See more at: <http://ccafs.cgiar.org/fr/blog/innovative-models-manage-climate-risk-spreads-mozambique#.Uvj4ArTReTw>) *

Successful 1 day National Policy Workshop on Climate Change Adaptation Policy in Mozambican Agriculture held in Feb 28 in Maputo in partnership with IIAM and CCAFS EA. A total of 45 participants from Ministries, IIAM, National Universities, NGOs, CGIARs and individuals attended the

workshop which allowed among others, to discuss the findings of the NAPA and Climate Change Capacity Needs Reviews commissioned by CCAFS and identify research priorities for agriculture and food security.* Successful 2-day Learning workshop on National Adaptation Plans (NAPs) and Agriculture held in Warsaw, Poland on 13-14 November. The 37 representatives convened from 10 countries across Africa, Asia and Latin America shared their experiences and identified future research and capacity needs, thus providing a basis for future CCAFS support to national-level processes. Results carried over into an official side event on 15 November, 2013, at the 19th Conference of the Parties of the UNFCCC (COP19) to draw the attention of the global political audience to the inclusion of agriculture in NAPs.*CCAFS theme 1, together CCAFS LAM, WA and CIAT, supported a first South-South exchange visit aiming to bring a Latin-American delegation of key agricultural stakeholders (Ministry of Agriculture from Honduras; Rice and cereal National Federations and Met Institute from Colombia) to Kaffrine, Senegal for them to share experiences and learn from the successful CCAFS West Africa pilot project on the development and novel use of agro-seasonal weather forecasts. This great experience led to an agreement among the institutions from the Colombian delegation to implement three pilots in Colombia, inspired by the strategic alliances from Kaffrine's model. Also a case study was written for UNEP. See video at: <http://www.youtube.com/watch?v=W26UICjEetw>*In the frame of the CCAFS-IIAM project "Managing climate related risks to improve livelihood resilience and adaptive capacity in agricultural ecosystems in Southern Mozambique", and based on the results from a diagnosis survey on the communities' training, technologies and information needs that can contribute to build and improve local skills for climate change adaptation, a series of training sessions and other technology transfer approaches have started to be implemented in the Xai-Xai and Chicualacuala districts.*Intellectual support in bridging the gap between research and the implementation of projects and strategies that effectively address gender issues ensured through the position of J. Twyman at CIAT/CCAFS T1 and the second year of the partnership established with the University of Florida (Prof. C.D. Deere). Delivered activities: CCAFS-LAM gender strategy; initial consolidation of a Faculty research Network (including key Faculty and research Centers linked throughout the US; first UF Masters students collaborated on a CIAT/CCAFS case study of gender and climate change in Colombia, first UF PhD student began a gender analysis of rice and climate change data; Manual published on the "Measures of Climate Change Adaptation Practiced by the Campesinos of Asocampo in the Río Las Piedras Watershed of Cauca, Colombia: A visual summary of local adaptation measures to climate change and the work and research in the field".

Output: 1.1.3

Summary:

*Collaborative gender research between T1, CIAT and University of Montpellier SupAgro carried out in the Río Piedras watershed (Southwest Colombia) aiming to better understand gender preferences in the adoption and maintenance of climate-smart agricultural practices. Key results illustrated gender differences in perceptions on which agricultural practices are considered more beneficial and found certain inequalities in the method and degree to which information reach men and women in the region. The study also identified traditional gender roles in agricultural activities and found considerable gender gaps in terms of ownership of resources.

Deliverable: Master thesis published; Field Manual of the Measures of Climate Change in Adaptation Practiced by the Campesinos of Asocampo in Rio Las Piedras Wastershed of Cauca, Colombia

(<http://dapa.ciat.cgiar.org/ccafs-gender-team-launches-new-field-manual/>); Blogs (<http://ccafs.cgiar.org/fr/blog/using-photos-illustrate-gender-sensitive-research-colombia#.Uv4U9rSaRWo>; <http://ccafs.cgiar.org/es/blog/breaking-through-gender-barriers-one-survey-time#.Uv4VVrSaRWo>)

Output: 1.2.1

Summary:

* Further development of the CCAFS-climate portal (commissioned to CIAT) leading to significant impact by putting high resolution climate information of long term climate changes into the hands of non-climate scientists. Deliverable: successful online portal with increased storage capacity and improved user interface with new friendly search engine, option of downloading files by geographic tile; a total of ~14 terabytes hosted; more than 90,000 new files in the database for diverse downscaling methods; an almost complete set of downscaled IPCC 5th Assessment Report GCM data for 4 RCP, 106 GCM, 4 future periods, 5 climatological variables and 4 resolutions (the highest at 1 Km²); new standalone version of the MarkSim weather generator for CMIP5 data; Portal positioned as a go to place for free and open access to downscaled climatic data; unique access statistics (30,145 of total visits, 135,839 download accounting for 125 TB).* Analysis of crop yields responses to climate change. Deliverable: IPCC-focused paper on crop yields responses to climate change globally and regionally for maize, wheat and rice (collaboration with Leeds and Stanford University) submitted to Nature Climate Change.* The influence of climate change on the occurrence of crop pests and diseases. Deliverable: A PhD student started in October 2013 at University of Leeds, funded by NERC under the supervision of Prof. Andy Challinor, Dr. Stephen Sait (School of Biology), Dr. Andy Jarvis. The research will address modeling of potato late blight (*Phytophtora infestans*) in various locations in Peru.* A methodological development of an online tool for the identification of Target Population Environments: improving the predictions of agricultural production using crop models (EMBRAPA-CIAT partnership). Deliverable: A methodology created and implemented to identify TPE through the use of crop ORYZA model and it has been used to identify the environments for upland rice and lowland rice in Brazil and Colombia (ongoing); The CSM-CROPGRO drybean crop model calibrated and validated for cultivars Pérola and BRSRadiante; Training and networking activities carried out.* Adaptation strategies for crops to climate change: Development of climate smart ideotypes for breeding strategies in rice and sorghum (Commissioned IRRI-CIRAD). Deliverables: Crop models ready for applications (full documentation of the SAMARA crop model); Calibration data generated for 12 rice varieties in 4 irrigated environments in the Philippines, for 2 seasons of rainfed lowland rice in Benin and multiple sowing dates in Senegal; Development and tests of down-scaled GCM scenarios including hindcasrs for two sites in the Philippines and one in India in collaboration with the Manila Observatory.* Analysis of varietal level responses and identification of crop substitution options for systemic adaptation. Part of an ongoing Master's Thesis is funded by BEAF/GIZ entitled: "Thresholds of crop suitability: When does Sub-Saharan Africa need transformational climate change adaptation?" Deliverables: EcoCrop results for current crop distribution for the relevant crops (Maize, sorghum, cassava, common bean, banana, groundnut, millet (finger an pearl) and yam); Analysis of suitability thresholds for each crop; First model runs with future climate data * Modelling the impacts of a +4°C rise in global temperatures on eight key staple crops in Sub Saharan Africa (SSA). Deliverables: Suitability results modeled with EcoCrop using the CMIP5 models and new RCPs (8.5). Work to be finalized in 2014 to be used as key input

for a high level document to be launched at the UN Climate Summit to be held in New York on the 23rd of September.

Output: 1.3.1**Summary:**

* 2d year of the SIA's integrated program of research (Systemic Framework for Integrated Adaptation Planning) into the resilience and adaptive capacity of socio-ecological systems to climate change across social, institutional, economic and environmental scales and levels. West Africa field program completed building on strong engagement and work carried out across the many levels of Ghana's climate change adaptation landscape. Deliverables: i) Close engagement with the Ghana CCAFS Platform, support provided to plan its launch and determining strategic direction that it would play within Ghana's adaptation regime, Policy brief made by the Platform's Executive Committee based on inputs from the preliminary results of SIA's Ghana field program; Strategic Paper (under final revision) build on the Policy brief which identifies key challenges in the political economic environment around agricultural adaptation in Ghana, and provides recommendations for action. ii) Forthcoming "state of agricultural adaptation" Working Paper; iii) Draft academic papers; iv) Stakeholder influence mapping exercise in Nicaragua in collaboration with CCAFS LAM; vi) Computer program developed translating a significant methodological innovation resulting from the successful integration of the SIA program with the CCAFS Regional Scenarios program. This novel contribution to the literature and practice of exploratory scenarios successfully applied in South East Asia and refined in the Andean and Central America regions; vi) Draft journal article aimed at "Regional Environmental Change" has been developed. *Collaborative CSIRO-CCAFS project on Transformational adaptation and international development: What are the risks, costs, benefits and barriers. Deliverables: A three-day collaborative workshop held in Brisbane; Small community of practice establish (including University of Melbourne, University of Mataram and Practical Action researchers) to explore the existing links, interactions, synergies and tradeoffs between climate change impacts, potential transformational adaptation pathways and sustainable development and to develop a working definition and shared framing of transformational adaptation which will be used to appropriately guide transformational adaptation concepts with participating organisations and with their stakeholders; policy oriented piece submitted to Issues in Science and Technology; analytical paper submitted to Global Environmental Change Journal; draft proposal of joint project.

Output: 1.3.2**Summary:**

* Meta Synthesis of National Climate change adaptation plans -which spans across twelve CCAFS countries at various stages of adaptation planning and implementation, in three priority CCAFS regions: West Africa, East Africa and South Asia- published and successfully launched at COP 19. Deliverables: CCAFS Report 10 presenting an analytical framework allowing 'dashboard' view of countries progress on key NAP process for informing national adaptation planning; Report launched during COP19 during a 2 days learning Workshop "Agriculture in National

Adaptation Plans (<http://ccafs.cgiar.org/national-adaptation-plans-and-agriculture-learning-workshop#.Uoaok8TkvZE>)" which gathered 37 country representatives and featured at the UNFCCC Side Event: "Agriculture in National Adaptation Plans: Experiences and Lessons Learned (http://ccafs.cgiar.org/fr/unfccc-side-event-agriculture-national-adaptation-plans-experiences-and-lessons-learned#.Uvz_rLTReTw)" * NAPA review and Climate change Capacity Needs Assessment carried out in Mozambique and presented at the National Policy workshop on "Climate change Adaptation for Agriculture: Challenges for Agriculture Research held in February 2013 in Maputo. Deliverables: Report including the NAPA review and Capacity Need assessment; Workshop report.*Initial development of a CSA Prioritization Tool that characterizes CSA practices, prioritized locally appropriate actions, and assesses costs and benefits to assist national decision makers in identifying CSA investment portfolios that integrate with national and local planning mechanisms. Deliverable: prioritization tool development team (including CIAT researchers, consultants and advisors from FAO, World Bank, ICRAF...); beta version of an analytic excel tool for use in the 2014 piloting; analytic excel tool was tested; mockup ; presentation at the Global launch of the CSA Alliance (Johannesburg, South Africa), II Taller Regional de LEDS LAC organized by the World Bank in Lima, Peru among others.

Output: 4.2.1**Summary:**

Financial support to Theme 4 on collaborative CCAFS Near-term Climate Project with the University of Cap Town (Mark New; CSAG group, members of the CORDEX Africa network). For further information please refer to Theme 4 report.

3. Publications

Publication #1

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Challinor AJ, Smith MS and Thornton P (2013). Use of agro-climate ensembles for quantifying uncertainty and informing adaptation. Agricultural and Forest Meteorology 170: 2-7.

Publication #2

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Cortes, A.J., Monserrate, F.A., Ramirez-Villegas, J., Madriñán, S., Blair, M.W. 2013. Drought Tolerance in Wild Plant Populations: the Case of Common Beans (*Phaseolus vulgaris* L.). PLoS ONE 8(4): e62898.

Publication #3

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Garrett KA, Dobson ADM, Kroschel J, Natarajan B, Orlandini S, Tonnang HEZ and Valdivia C (2013). 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 170: 216-227.

Publication #4

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Hawkins E, Osborne TM, Ho CK and Challinor AJ (2013). Calibration and bias correction of climate projections for crop modelling: An idealised case study over Europe. Agricultural and Forest Meteorology 170: 19-31.

Publication #5

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Iizumi T, Sakuma H, Yokozawa M, Luo J-J, Challinor AJ, Brown ME, Sakurai G and Yamagata T (2013). Prediction of seasonal climate-induced variations in global food production. Nature Climate Change 3: 904-908.

Publication #6

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Khoury CK, Greene S, Wiersema J, Maxted N, Jarvis A and Struik PC (2013). An inventory of crop wild relatives of the United States. *Crop Science* 53: 1-13.

Publication #7

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Koehler A-K, Challinor AJ, Hawkins E and Asseng S (2013). Influences of increasing temperature on Indian wheat: quantifying limits to predictability. *Environmental Research Letters* 8: 034016.

Publication #8

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Leibing C, Signer J, van Zonneveld M, Jarvis A and Dvorak W (2013). Selection of Provenances to Adapt Tropical Pine Forestry to Climate Change on the Basis of Climate Analogs. *Forests* 2013(4): 155-178.

Publication #9

Type: Journal papers

CCAFS Themes: Theme 1, Theme 3

Citation: Neufeldt H, Jahn M, Campbell BM, Beddington JR, DeClerck F, De Pinto A, Guldridge J, Hellin J, Herrero M, Jarvis A, LeZaks D, Meinke H, Rosenstock T, Scholes M, Scholes R, Vermeulen S, Wollenberg E and Zougmoré R (2013). Beyond climate-smart agriculture: toward safe operating spaces for global food systems. *Agriculture & Food Security* 2:12.

Publication #10

Type: Journal papers

CCAFS Themes: Theme 1, Theme 4.2

Citation: Ramirez-Villegas J, Challinor AJ, Thornton PK and Jarvis A (2013). Implications of regional improvement in global climate models for agricultural impact research. *Environmental Research Letters* 8: 024018.

Publication #11

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Ramirez-Villegas J, Jarvis A and Läderach P (2013). Empirical approaches for assessing impacts of climate change on agriculture: The EcoCrop model and a case study with grain sorghum. Agricultural and Forest Meteorology 170, 67-78.

Publication #12

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Ramirez-Villegas J and Khoury CK (2013). Reconciling approaches to climate change adaptation for Colombian agriculture. Climatic Change 119(3-4): 575-583.

Publication #13

Type: Journal papers

CCAFS Themes: Theme 1, Theme 4.2

Citation: Vermeulen SJ, Challinor AJ, Thornton PK, Campbell BM, Eriyagama N, Vervoort JM, Kinyangi J, Jarvis A, Läderach P, Ramirez-Villegas J, Nicklin KJ, Hawkings E and Smith DR (2013). Addressing uncertainty in adaptation planning for agriculture. Proceedings of the National Academy of Sciences of the United States of America 110(21).

Publication #14

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Warren R, Van Der Wal J, Price J, Welbergen JA, Atkinson I, Ramirez-Villegas J, Osborn TJ, Jarvis A, Shoo LP, Williams SE and Lowe J (2013). Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss. Nature Climate Change 3: 678-682.

Publication #15

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Watson J and Challinor A (2013). The relative importance of rainfall, temperature and yield data for a regional-scale crop model. Agricultural and Forest Meteorology 170: 47-57.

Publication #16

Type: Book chapters

CCAFS Themes: Theme 1

Citation: Berry P, Ramirez-Villegas J, Bramley H, Mgonja M and Mohanty S (2013). Regional Impacts of Climate Change and the role of Adaptation. In: M. Jackson, B. Ford-Lloyd, M. Parry (Eds.) Plant Genetic Resources and Climate Change. CABI publishing.

Publication #17

Type: Book chapters

CCAFS Themes: Theme 1

Citation: Glenn M, Kim SH, Ramirez-Villegas J and Laderach P (2013). Response of Perennial Horticultural Crops to Climate Change. In: J. Janick (Ed.) Horticultural Reviews 41: 47-130.

Publication #18

Type: Working papers

CCAFS Themes: Theme 1

Citation: Sova CA and Chaudhury AS (2013). State of agricultural climate change adaptation policy in Nepal. Working Paper No. 44. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Publication #19

Type: Working papers

CCAFS Themes: Theme 1

Citation: Sova CA, Helfgott A and Chaudhury AS (2013). Multilevel Stakeholder Influence Mapping in Climate Change Adaptation Regimes. CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS), Working Paper No. 46. Copenhagen, Denmark.

Publication #20

Type: Other

CCAFS Themes: Theme 1

Citation: Kissinger G, Lee D, Orindi VA, Narasimhan P, King'uyu SM, Sova C. 2013. Planning climate adaptation in agriculture. Meta-synthesis of national adaptation plans in West and East Africa and South Asia. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Report No. 10: Copenhagen, Denmark.

Publication #21

Type: Policy briefs

CCAFS Themes: Theme 1

Citation: Läderach P, Haggar J, Lau C, Eitzinger A, Ovalle O, Baca M, Jarvis A, Lundy M. 2013. Mesoamerican coffee: building a climate change adaptation strategy. International Center for Tropical Agriculture (CIAT), Policy Brief No. 2: Cali, Columbia.

Publication #22

Type: Policy briefs

CCAFS Themes: Theme 1

Citation: Lau C, Jarvis A, Ramirez J. 2013. Colombian agriculture: adapting to climate change. International Center for Tropical Agriculture (CIAT), Policy Brief No. 1: Cali, Colombia.

Publication #23

Type: Other

CCAFS Themes: Theme 1

Citation: Vermeulen S and Challinor A. How farmers can adapt to a warming world. Al-Jazeera.com, 6 June 2013.

Publication #24

Type: Conference proceedings

CCAFS Themes: Theme 1

Citation: Andy Jarvis, Julian Ramirez-Villegas, Valerie Nelson, Richard Lamboll, Nick Nathaniels, Maren Radeny, Catherine Mungai, Osana Bonilla-Findji, David Arango, Caitlin Peterson. e-proceedings. International workshop on Agricultural Innovation Systems in Africa (AISA), Nairobi, 29–31 May 2013

Publication #25

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Asseng S, Jones JW, Cammarano D, Ewert F, Angulo C, Rosenzweig C, Ruane AC, Goldberg R, Hatfield JL, Boote KJ, Thorburn PJ, Rötter RP, Palosuo T, Brisson N, Basso B, Shcherbak I, Martre P, Aggarwal PK, Bertuzzi P, Ripon D, Biernath C, Priesack E, Challinor AJ, Doltra J, Gayler S, Grant R, Heng L, Hooker J, Hunt LA, Ingwersen J, Streck T, Izaurralde RC, Kersebaum KC, Nendel C, Müller C, Waha K, Naresh Kumar S, O'Leary G, Olesen JE, Osborne TM, Semenov MA, Strattonovitch P, Steduto P, Stöckle C, Supit I, Wolf J, Tao F, Travasso M, Wallach D, White JW and Williams JR. (2013). Uncertainty in simulating wheat yields under climate change. Nature Climate Change 3: 827-832.

Publication #26

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Hawkins E, Ho CK, Osborne TM, Fricker TE, Ferro CAT, Challinor AJ (2013). Increasing influence of heat stress on French maize yields from the 1960s to the 2030s. *Global Change Biology* 19: 937-947.

Publication #27

Type: Journal papers

CCAFS Themes: Theme 1

Citation: Bergamaschi H, da Costa SMS, Wheeler TR, Challinor AJ (2013). Simulating maize yield in sub-tropical conditions of southern Brazil using Glam model. *Pesquisa Agropecuaria Brasileira*: 48,132-140.

4. Communications

Media campaigns:

1. Press coverage for Warren et al. article Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss in Nature Climate Change:

- <http://www.bbc.co.uk/news/science-environment-22500673>
- <http://www.latimes.com/news/politics/la-pn-common-plants-animals-threatened-by-climate-change-20130512,0,707585.story>
- <http://www.guardian.co.uk/environment/2013/may/10/carbon-dioxide-highest-level-greenhouse-gas>
- <http://frenchtribune.com/teneur/1318021-climate-change-could-impact-more-30-animals-century>
- <http://www.independent.co.uk/environment/climate-change/life-on-earth-under-threat-from-co2-levels-say-scientists-8612900.html>
- <http://www.bild.de/ratgeber/2013/klimawandel/klimawandel-halbierung-vieler-tier-und-pflanzenarten-bis-2080-30370536.bild.html2>. Series in Reuters AlertNet and El Espectador (Colombia) on CCAFS Climate-Smart Agriculture research in West Africa and Latin America (Spanish and English):
- Fast-growing groundnuts keep Ghana's farmers afloat amid climate shifts:
<http://www.trust.org/item/20130709095148-pwiz0/?source=search>
- Vegetables for Ghana's vulnerable: <http://www.trust.org/item/20130711131338-bule9/?source=search>
- "Soil power" comes in humble packaging: <http://www.trust.org/item/20130715154437-lft5q/?source=search>
- What women farmers want to know: <http://www.trust.org/item/20130719084036-mw3dt/?source=search>
- What's the verdict on chemical fertilisers? <http://www.trust.org/item/20130730090506-9h1ow/?source=search>
- Jorge Daza's marvellous biogas machine: <http://www.trust.org/item/20131204145135-9ylze/?source=search>
- Colombian sisal growers weave a more climate-resilient future:
<http://www.trust.org/item/20131211124128-sl6yk/?source=search>
- A farmer's dilemma: To sell or to eat? <http://www.trust.org/item/20131219134045-tzd4w/?source=search>
- La maravillosa máquina de Jorge Daza: <http://www.elespectador.com/noticias/medio-ambiente/maravillosa-maquina-de-jorge-daza-articulo-451547>
- Las dos caras del fique : <http://www.elespectador.com/noticias/actualidad/vivir/dos-caras-del-fique-articulo-4609463>. Articles relating to CCAFS Climate Analogues tool in Colombian newspapers El País and El Espectador:
- Agricultura para el futuro: <http://www.elpais.com.co/elpais/opinion/editorial/anonimo/agricultura-para-futuro>
- Presagios de un clima más severo: <http://www.elespectador.com/noticias/medio-ambiente/presagios-de-un-clima-mas-severo-articulo-444488>
- Así será el clima de 2030: <http://www.elespectador.com/noticias/medio-ambiente/asi-sera-el-clima-de-2030-articulo-4444704>. Coverage related to Vermeulen et al. article in PNAS on adaptation planning for

agriculture:

- CCAFS press release: <http://ccafs.cgiar.org/news/press-releases/new-report-identifies-regret-free-approaches-adapting-agriculture-climate-change>
- Blog post from Leeds: http://www.leeds.ac.uk/news/article/3408/regret-free_approaches_for_adapting_agriculture_to_climate_change
- Blog post from IWMI: <http://www.iwmi.cgiar.org/no-regrets-for-agriculture>
- Blog post from ILRI: <http://www.ilri.org/ilrinews/index.php/archives/11184>
- Interview from IRIN news: <http://www.irinnews.org/report/98230/call-for-no-regret-climate-adaptation-strategies>
- Interview from Daily FT (Sri Lanka): <http://www.ft.lk/2013/06/14/sri-lankan-water-history-informs-global-climate-change-study/#more-156798>
- Op-ed by Sonja Vermeulen and Andy Challinor on Al-Jazeera.com:
<http://www.aljazeera.com/indepth/opinion/2013/06/20136585711493753.html>

Blogs:

- Adapting on the ground: Are farmers' needs being met? (EA) (Laura Cramer)
<http://ccafs.cgiar.org/blog/Adapting-ground-farmers-needs-met#.UuFH4dlo7cs>
- In Sri Lanka, research translates into action on climate adaptation (SA) (Vanessa Meadu)
<http://ccafs.cgiar.org/blog/sri-lanka-research-translates-action-climate-adaptation#.UuFIENlo7cs>
- How will your forest grow? Climate Analogues provides clues for pine plantation adaptation (Caity Peterson)
<http://ccafs.cgiar.org/blog/how-will-your-forest-grow-climate-analogues-provides-clues-pine-plantation-adaptation#.UuFINNlo7cs>
- High-resolution satellites could improve crop yield forecasts (Wilco Terink) <http://ccafs.cgiar.org/blog/high-resolution-satellites-could-improve-crop-yield-forecasts#.UuFlsNlo7cs>
- Farmers become citizen scientist: Testing wheat crops for climate change adaptation (SA) (Jacob van Etten)
<http://ccafs.cgiar.org/blog/testing-wheat-crops-climate-change-adaptation#.UuFI4Nlo7cs>
- Blind vegetable farming: One calabash at a time (WA) (Yemi Ademiluyi) <http://ccafs.cgiar.org/blog/In-Ghana-tomatoes-self-confidence-together%2520#.Uukn-jOo7ct>
- East Africa reached by participatory action research activities (EA) (Anton Eitzinger)
<http://ccafs.cgiar.org/blog/East-Africa-reached-participatory-action-research-activities%2520#.UukoKzOo7cs>
- Water in a changing climate: Can we do more with less? (SEA) (Vanessa Meadu)
<http://ccafs.cgiar.org/blog/water-changing-climate-can-we-do-more-less#.UukoOzOo7ct>
- Wicked solutions to climate change in agriculture (Vanessa Meadu) <http://ccafs.cgiar.org/blog/wicked-solutions-climate-change-agriculture#.UukoSjOo7ct>
- In Central Asia climate change may make – or break – farmers' fortunes (Vanessa Meadu)
<http://ccafs.cgiar.org/blog/central-asia-climate-change-makes-or-breaks-farmers-fortunes#.UukoWD0o7ct>
- The next generation of smallholder farms (Chase Sova) <http://ccafs.cgiar.org/blog/next-generation-smallholder-farms#.UukoaD0o7ct>
- From Wall St to farmers in Ghana: finance fundamentals remain the same (WA) (Abrar Chaudhury and Chase

- Sova) <http://ccafs.cgiar.org/blog/wall-st-ghana-finance-fundamentals-remain-same#.Uukopz0o7ct>
- Farmers map strategies to adapt to climate change in Colombia (LA) (Marcela Beltran) <http://ccafs.cgiar.org/blog/farmers-map-strategies-adapt-climate-change-colombia#.Uukovz0o7ct>
 - New paper outlines Nepal's efforts to combat climate change effects (SA) (Chase Sova) <http://ccafs.cgiar.org/blog/combat-climate-change-effects-nepal-outlined#.Uuko1z0o7ct>
 - Climate models: More questions than answers (Sonja Vermeulen) <http://ccafs.cgiar.org/blog/climate-models-more-questions-answers#.Uukp2z0o7ct>
 - What are climate-smart villages? (SA) (Cecilia Schubert and Dharini Parthasarathy) <http://ccafs.cgiar.org/what-are-climate-smart-villages#.Uukp6z0o7ct>
 - Pioneering peers inspire farmers in Kenya to get “climate-proofed” (EA) (Vivian Atakos et al.) <http://ccafs.cgiar.org/pioneering-peers-inspire-farmers-kenya-get-climate-proofed#.UukqBj0o7ct>
 - How growing mangoes can make a difference in a farmer’s life (SA) (Dharini Parthasarathy) <http://ccafs.cgiar.org/how-growing-mangoes-can-make-difference-farmers-life#.UukqHT1dXpZ>
 - Villages can become climate-resilient. This is how! (EA) (Ruth Aine) <http://ccafs.cgiar.org/villages-can-become-climate-resilient-how#.UuFjPtlo7cs>
 - Beekeeping can help women farmers manage climate risks (EA) (Vivian Atakos and John Recha) <http://ccafs.cgiar.org/beekeeping-can-help-women-farmers-manage-climate-risks#.UukqRD1dXpZ>
 - Groundnuts in Ghana: How change on the ground can combat change from above (WA) (Caity Peterson) <http://ccafs.cgiar.org/groundnuts-ghana-how-change-ground-can-combat-change-above#.UukqVj1dXpZ>
 - How a group of elderly and disabled farmers turned vulnerability into strength (WA) (Caity Peterson) <http://ccafs.cgiar.org/how-group-elderly-and-disabled-farmers-turned-vulnerability-strength#.UukqZj1dXpZ>
 - Influencing policy through action research in Climate-Smart Villages (EA) (Vivian Atakos) <http://ccafs.cgiar.org/influencing-policy-through-action-research-climate-smart-villages#.Uukqcz1dXpZ>
 - People power equals soil power in Ghana’s Upper West (WA) (Caity Peterson) <http://ccafs.cgiar.org/people-power-equals-soil-power-ghanas-upper-west#.Uukqgj1dXpZ>
 - Scaling-up the climate-smart agricultural sweet spot (EA, WA) (Cecilia Schubert) <http://ccafs.cgiar.org/scaling-climate-smart-agricultural-sweet-spot#.Uukqkz1dXpZ>
 - Sustainable intensification: A tool in the sustainable food system toolbox (Tara Garnett) <http://ccafs.cgiar.org/sustainable-intensification-tool-sustainable-food-system-toolbox#.Uukqoj1dXpZ>
 - For Africa to Feed Africa... “Make peace” with climate change (WA) (Robert Zougmore) <http://ccafs.cgiar.org/africa-feed-africa%E2%80%A6-%E2%80%9Cmake-peace%E2%80%9D-climate-change#.UukqtT1dXpZ>
 - What women farmers want to know (WA, gender) (Caity Peterson) <http://ccafs.cgiar.org/what-women-farmers-want-know>
 - In Ghana, reduced vulnerability for those that garden together (WA, gender) (Caity Peterson) <http://ccafs.cgiar.org/ghana-reduced-vulnerability-those-garden-together#.Uukq0z1dXpZ>
 - Ghana’s climate change adaptation landscape discussed from various angles (WA) (Chase Sova) <http://ccafs.cgiar.org/ghanas-climate-change-adaptation-landscape-discussed-various-angles#.Uukq6z1dXpY>
 - What’s the verdict on chemical fertilizers? (WA) (Caity Peterson) <http://ccafs.cgiar.org/blog/what%E2%80%99s-verdict-chemical-fertilisers#.UukrWD1dXpZ>

- A trailblazer in adopting climate smart practices: One agriculture cooperative's success story in Nepal (SA) (Sona Shakya et al.) <http://ccafs.cgiar.org/blog/trailblazer-adopting-climate-smart-practices-one-agriculture-cooperative#.UukrZD1dXpZ>
- Farmers and genebanks: Saving traditional crops with strong alliance (Platform for Agrobiodiversity Research) <http://ccafs.cgiar.org/blog/farmers-and-genebanks-saving-traditional-crops-strong-alliance#.Uukrej1dXpY>
- Are there synergies between climate change adaptation and mitigation in coffee production? (LA) (Eric Rahn) <http://ccafs.cgiar.org/blog/are-there-synergies-between-climate-change-adaptation-and-mitigation-coffee-production#.UukrlD1dXpZ>
- Sharing the tools that could help Central American battle climate change (LA) (Jose Luis Urrea) <http://ccafs.cgiar.org/blog/sharing-tools-could-help-central-america-battle-climate-change#.UuFlj9lo7cs>
- Empowering women farmers to feed the world (EA, gender) (Scolastica Tuwei et al.) <http://ccafs.cgiar.org/blog/empowering-women-farmers-feed-world#.UukrtD1dXpZ>
- Steadying the aim for crop breeders using target population environments (Caity Peterson) <http://ccafs.cgiar.org/blog/steadying-aim-crop-breeders-using-target-population-environments#.UukryD1dXpZ>
- Researchers map actors' power and influence in adaptation policy (SA) (Chase Sova) http://ccafs.cgiar.org/blog/researchers-map-actors%E2%80%99-power-and-influence-adaptation-policy-0#.Uukr_T1dXpZ
- Closing the distance from the Green Climate Fund to farmers in Ghana (WA) (Abrar Chaudhury and Chase Sova) <http://ccafs.cgiar.org/blog/closing-distance-green-climate-fund-farmers-ghana#.UuksCT1dXpZ>
- With proper planning, farmers can thrive in a world of shifting climates (EA) (James Kinyangi et al.) <http://ccafs.cgiar.org/blog/proper-planning-farmers-can-thrive-world-shifting-climates#.UuksHj1dXpZ>
- Tackling climate change: Kenya holds first national adaptation planning meeting for agriculture (EA) (Vivian Atakos et al.) <http://ccafs.cgiar.org/blog/tackling-climate-change-kenya-holds-first-national-adaptation-planning-meeting-agriculture#.UuksLT1dXpZ>
- Engaging the private sector for a climate-smart future in Nepal (SA) (Gopal Bhatta et al.) <http://ccafs.cgiar.org/blog/engaging-private-sector-climate-smart-future-nepal#.UuksRT1dXpZ>
- What is needed to respond to the changing West African climate? (WA) (Fiona Percy) <http://ccafs.cgiar.org/blog/what-needed-respond-changing-west-african-climate#.UuksVj1dXpZ>
- East African policy-makers learn from innovative climate change adaptation experiences (EA) (Catherine Mungai) <http://ccafs.cgiar.org/blog/east-african-policy-makers-learn-innovative-climate-change-adaptation-experiences#.UuksaT1dXpZ>
- When the genes don't add up (Caity Peterson) <http://ccafs.cgiar.org/blog/when-genes-don%E2%80%99t-add#.Uuksdz1dXpZ>
- The "Farms of the Future" arrives in West Africa (WA) (Mathieu Ouedraogo and Sekou Toure) <http://ccafs.cgiar.org/blog/%E2%80%9Cfarms-future-arrives-west-africa#.Uukssz1dXpZ>
- What is the potential impact from climate change for Africa's farmers? (Nilar Andrea Chit Tun) <http://ccafs.cgiar.org/blog/what-potential-impact-climate-change-africas-farmers#.Uuks1z1dXpZ>
- Can climate-smart agriculture and forests work together at the landscape level? (Paul Neate) <http://ccafs.cgiar.org/blog/can-climate-smart-agriculture-and-forests-work-together-landscape->

level#.Uuks8D1dXpZ

- Which way forward for climate-smart agriculture? (EA, WA, SA) (Vivian Natakos and Mary Nyasimi)
http://ccafs.cgiar.org/blog/which-way-forward-climate-smart-agriculture#.Uuks_D1dXpZ
- Facing the imminent challenge: Feeding a growing population while saving our forests (Cecilia Schubert)
<http://ccafs.cgiar.org/blog/facing-imminent-challenge-feeding-growing-population-while-saving-our-forests#.UuktDj1dXpZ>
- The time is now to engage youth in agriculture (EA, WA) (Vivian Atakos) <http://ccafs.cgiar.org/blog/time-now-engage-youth-agriculture#.UuktNz1dXpZ>
- Smart farming yields fruit in Nyando (EA) (Rachel Kyte) <http://ccafs.cgiar.org/blog/smart-farming-yields-fruit-nyando#.UuktmT1dXpZ>
- Farmers forge ahead as the UNFCCC fails to step up (Lucy Holt) <http://ccafs.cgiar.org/blog/farmers-forge-ahead-unfccc-fails-step#.Uuktpj1dXpZ>
- The two faces of fique (LA) (Caity Peterson) <http://ccafs.cgiar.org/blog/two-faces-fique#.UuktWd1dXpZ>
- How to put climate adaptation into action? Lessons learned from Nepal (SA) (Jessica Thorn)
<http://ccafs.cgiar.org/blog/how-put-climate-adaptation-action-lessons-learned-nepal#.UuktzT1dXpZ>
- Taking the lead: Local champions train farmers on climate change and gender issues (SA, gender) (Aditi Kapoor) <http://ccafs.cgiar.org/blog/taking-lead-local-champions-train-farmers-climate-change-and-gender#>
- Searching for better bean varieties in Uganda (EA) (Clare Mukankusi) <http://ccafs.cgiar.org/blog/searching-better-bean-varieties-uganda#.Uukt6z1dXpZ> AgTRIALS Blogs:
 • AgTrials-NEWS- <http://gisweb.ciat.cgiar.org/trialsitesblog/?p=490>
 • AgTrials and AgMIP advance collaboration - <http://gisweb.ciat.cgiar.org/trialsitesblog/?p=520>
 • Research trial data sharing exercise between Agtrials and AgMip -
<http://gisweb.ciat.cgiar.org/trialsitesblog/?p=533>
 • Intellectual property rights and protocols in Agtrials.org and Proper permission to access data -
<http://gisweb.ciat.cgiar.org/trialsitesblog/?p=564>
 • Yam traits now available through CropOntology - <http://gisweb.ciat.cgiar.org/trialsitesblog/?p=593>
 • From PLOS Biology: "Where Have All the Crop Phenotypes Gone?" -
<http://gisweb.ciat.cgiar.org/trialsitesblog/?p=609>
 • New Modifications to AgTrials.org - <http://gisweb.ciat.cgiar.org/trialsitesblog/?p=625>
 • Feeding the future - <http://gisweb.ciat.cgiar.org/trialsitesblog/?p=647>
 • 1st International e-Conference on Germplasm Data Interoperability -
<http://gisweb.ciat.cgiar.org/trialsitesblog/?p=655>

Websites:

<http://www.ccafs-climate.org>
<http://analogues.ciat.cgiar.org/climate/>
<http://www.agtrials.org>
<http://www.amkn.org>

Social media campaigns:

- 1. Colombia-Senegal exchange:
- Video documentation of field trips by aclimatecolombia.org (Spanish):

[http://www.youtube.com/watch?v=W26UICjEetw\)](http://www.youtube.com/watch?v=W26UICjEetw)

- Flickr photoset (<http://www.flickr.com/photos/cgiarclimate/sets/72157635396330062/>)
- “Photostory” distributed via blogs, twitter in English, Spanish and French (Flickr photoset English: <http://www.flickr.com/photos/cgiarclimate/sets/72157635377612501/>; Flickr photoset Spanish: <http://www.flickr.com/photos/cgiarclimate/sets/72157635406362143/>; Flickr photoset French: <http://www.flickr.com/photos/cgiarclimate/sets/72157635452083025/>; “Photostory” English: When Colombia met Senegal: A photostory <http://ccafs.cgiar.org/blog/when-colombia-met-senegal-photostory#.Uuf4wtlo7cs>)
- Blogs in French and English (English: Bridging climate forecasts with farmer realities: The story of Seck and Ousmane <http://ccafs.cgiar.org/blog/bridging-climate-forecasts-farmer-realities-story-seck-and-ousmane#.Uuf4yNlo7cs>)
- UNEP south-south cooperation mechanism – case study submitted for inclusion in online portal (<http://www.unep.org/south-south-cooperation/case/>) 2. UNFCCC COP19 side event (NAP workshop, Side Event and GLF session):
- Live tweeting during event
- Presentations on slideshare (<http://www.slideshare.net/cgiarclimate/agriculture-in-national-adaptation-plans-experiences-and-lessons-learned>)
- Blogs covering event (Can countries bankroll climate adaptation without undermining development? <http://ccafs.cgiar.org/blog/can-countries-bankroll-climate-adaptation-without-undermining-development#.UugLadro7cs>) NAPs workshop during COP19
- Blog covering event in English and Spanish (The serious business of NAP-ing <http://ccafs.cgiar.org/blog/serious-business-nap-ing#.UugDLtlo7ct>)
- Live tweeting and Twitter promotion before and after event (Storify summary: <http://storify.com/CCAFSCaity/agriculture-in-national-adaptation-plans-workshop>)
- Video interviews posted on YouTube:
 - Deissy Martinez
<http://www.youtube.com/watch?v=tgIV6fPMCUc&list=UU6KnRP9RNE3346W49oeceaA&feature=c4-overview;>
 - Leocadio Sebastian
<http://www.youtube.com/watch?v=LM0FJ71N5R4&list=UU6KnRP9RNE3346W49oeceaA&feature=c4-overview;>
 - Stephen King'uyu <http://www.youtube.com/watch?v=Z-6GwSWuTwc&list=UU6KnRP9RNE3346W49oeceaA&feature=c4-overview;>
 - Delali Nutsukpo
http://www.youtube.com/watch?v=v0pfkuvX0_s&list=UU6KnRP9RNE3346W49oeceaA&feature=c4-overview;
 - Victor Orindi
<http://www.youtube.com/watch?v=LWUDp7ReAKo&list=UU6KnRP9RNE3346W49oeceaA&feature=c4-overview>
- Presentations on CCAFS slideshare: <http://www.slideshare.net/cgiarclimate/tag/npcop19>

- Flickr photoset: <http://www.flickr.com/photos/cgiarclimate/sets/72157637657978745/>

Newsletters:

none

Events:

- * NAPs workshop (see above)
- * COP19 side event (see above)

Videos and other multimedia:

- * Colombia-Senegal exchange (in spanish!) by aclimatecolombia.org:
<http://www.youtube.com/watch?v=W26UICjEtw>

Other communications and outreach:

- * Live video seminar: Who has the right to climate change adaptation, 18 February (Gender) :
<http://ccafs.cgiar.org/events/18/feb/2013/who-has-right-climate-change-adaptation-social-differentiation-promoting-climate#.UukR97SsTu4>

5. Case studies

Case Study #1

Title:

South-south learning exchange between Senegal and Latin-America: sharing experiences to strengthen the resilience of the agricultural sector in the face of climate variability and change

Author: Osana Bonilla-Findji

Type: Capacity enhancement

Project description:

Increasing climate variability and change threatens agriculture and food security in developing countries. Over the last 3 years CCAFS West Africa has been carrying out a successful pilot project in Kaffrine (Senegal) aiming to put climate information into farmer's hands to help them to reduce the risks they face as the climate becomes more and more variable. It targets the development and novel use of agro-seasonal weather forecasts based on participatory approaches that include the analysis and technology evaluation by farmers in field. In 2013, CCAFS Latin-America started to support several projects on adaptation to climate change in Colombia through a CIAT-Ministry of Agriculture (MADR) partnership. A key area of action relates to the development of climate specific management approaches, participatory technology evaluation and seasonal climate forecasts. Given the affinity between those initiatives and building on the success of the Senegalese experience, CCAFS theme 1 together with the regional teams of LAM, WA and CIAT, supported a first exchange visit to bring a Latin-American delegation of key agricultural stakeholders to Dakar and Kaffrine.

Introduction / objectives:

- To promote South-South cooperation and mutual learning between key agricultural sector actors from Senegal, Colombia and Honduras on innovative approaches to strengthen the adaptive capacity of the agricultural sector
- To share lessons learned on the development of agro-climatic seasonal forecasting
- To highlight the quality and innovation of the work carried out by the Senegalese team and support them in promoting the scaling out of successful experiences

Project results:

The LAM delegation visited Dakar and Kaffrine and met their pairs from the Senegalese institutions that participate actively and made possible this project. The exchange visit achieved the following results:

- The strengthening of ties between the two delegations through face-to-face exchange and a joint workshop held in Kaolak that allowed them to share their strategies for incorporating climate change into an agricultural agenda.
- It led to an agreement among the institutions from the Colombian delegation to implement three pilots in Colombia, in the framework of the CIAT-MADR Convention, inspired by the Kaffrine model
- Follow up visit of the Kaffrine project coordinator to Colombia in November, 2013 to further promote this

experience in a National workshop organized in the frame on strategic alliance between CIAT and the Ministry of Agriculture

- Plan for a second exchange visit, this time of a Senegalese delegation to Colombia in May 2014
- A case study was written for UNEP's south-south learning platform.

Partners:

Colombian Ministry of Agriculture and Rural Development, CIAT, FEDEARROZ, FENALCE, National meteorological institute (IDEAM), National University, Ministry of Agriculture Honduras, Senegal: Ministry of Agriculture, ISRA, ANACIM, IPAR

Links/sources for further information:

Blogs:

- When Colombia met Senegal: A photostory: <http://ccafs.cgiar.org/blog/when-colombia-met-senegal-photostory#.UvZhiLReTw>
- Generating a climate conscience through south-south learning: <http://ccafs.cgiar.org/blog/generating-climate-conscience-through-south-south-learning#.UvZiDbTReTw>
- Bridging climate forecasts with farmer realities: The story of Seck and Ousmane:
<http://ccafs.cgiar.org/blog/bridging-climate-forecasts-farmer-realities-story-seck-and-ousmane#.UvZiBLReTw>
- Colombia y Senegal generando conciencia frente al cambio climático:
<http://www.aclimatecolombia.org/colombia-y-senegal-generando-conciencia-frente-al-cambio-climatico/#sthash.Do9yUGPz.dpuf>

VIDEO from the Exchange (in Spanish): <http://www.youtube.com/watch?v=W26UICjEetw>

PHOTOS: <http://www.flickr.com/photos/cgiarclimate/sets/72157635396330062/>



Case Study #2

Title:

National Adaptation Plans in agriculture: Engaging policy on the global stage at COP19

Author: Caitlin Peterson

Type: Policy engagement

Project description:

Only three years have passed since the UNFCCC introduced the national adaptation plan (NAP) process to guide the development of plans and actions for addressing pressures on food security as a result of climate change. Taking an agriculture-specific approach, the 2013 CCAFS report “Planning climate adaptation in agriculture” aimed to take stock of progress to date in the NAP building process, synthesizing lessons from 12 countries in

West and East Africa and South Asia. The report presented a “dashboard” view of the approaches taken and status of NAPs for each country, highlighting shortcomings, priorities, and recommendations for future directions. Using the report as a centerpiece, CCAFS Theme 1 organized a 2-day workshop followed by an official side event at the 19th Conference of the Parties of the UNFCCC (COP19) in Warsaw, Poland, to bring together these countries to share their experiences and lessons learned in the NAPs development process.

Introduction / objectives:

The workshop’s goals were to 1) synthesize lessons learned and 2) identify future research and capacity needs for NAPs, thus providing a basis for future CCAFS support to national-level processes. These results were then to be carried over into an official COP19 side event on 15 November, 2013, to draw the attention of the global political audience to the inclusion of agriculture in NAPs. The synthesis of these results took place during the subsequent COP19 side event; issues of “fickle and slow” donor funding and difficulties in obtaining pre-emptive, flexible funds for NAPs were highlighted. Emphasis was placed on the necessity for quick institutional action and the reconciliation of development plans with climate change adaptation. The side event was attended by UNFCCC negotiators, national-level technical staff and funders who brought further perspective to the discussion. A follow-up policy brief is currently under preparation.

Project results:

From 13-14 November, 2013, the Agriculture in NAPs workshop was attended by 37 participants from 10 countries, representing all 5 CCAFS regions. These ministry-level officials from the agricultural sector each had experiences to offer on their country’s NAP process. Mali and Guatemala, in the beginning stages of creating a NAP, were able to cultivate south-south exchanges to inform their approach. Kenya, currently rolling out final development plans, learned from countries that have previously developed National Adaptation Programmes of Action (NAPAs). Ghanaian representatives shared innovative solutions to financial obstacles. The process generated tremendous benefits for participants, and strengthened the CCAFS relationship and potential influence with important national delegations in our target regions. The synthesis of these results took place during the subsequent COP19 side event; issues of “fickle and slow” donor funding and difficulties in obtaining pre-emptive, flexible funds for NAPs were highlighted. Emphasis was placed on the necessity for quick institutional action and the reconciliation of development plans with climate change adaptation. The side event was attended by UNFCCC negotiators, national-level technical staff and funders who brought further perspective to the discussion. A follow-up policy brief is currently under preparation.

Partners:

Lexeme Consulting, CIAT, ICRAF, ICRISAT, ILRI, Ministry of Environment, Water and Natural Resources, Kenya; Min of Env and Forest, Ethiopia; Min of Food and Agr, Ghana; Min of Agr, Mali; Min Ag Burkina Faso; Min of Ag, Guatemala, CDKN-SA

Links/sources for further information:

- Event announcement: UNFCCC Side Event: Agriculture in national Adaptation Plans: Experiences and Lessons Learned (<http://ccafs.cgiar.org/unfccc-side-event-agriculture-national-adaptation-plans-experiences-and-lessons-learned#.Uvjf22JdXpY>)
- Event announcement: National Adaptation Plans and Agriculture: A Learning Workshop

(<http://ccafs.cgiar.org/national-adaptation-plans-and-agriculture-learning-workshop#.Uvjf4JdXpZ>)

PHOTOS:Flickr photos, COP19 side event:

<http://www.flickr.com/photos/cgiarclimate/sets/72157637800780053/>

Flickr photos, learning workshop:

<http://www.flickr.com/photos/cgiarclimate/sets/72157637657978745/PUBLICATION>:

- Planning climate adaptation in agriculture (<http://ccafs.cgiar.org/publications/planning-climate-adaptation-agriculture#.Uvj5v2JdXpY>)

BLOGS:• The serious business of NAP-ing: <http://ccafs.cgiar.org/blog/serious-business-nap-ing#.Uojh4fnku-0>

• Can countries bankroll climate adaptation without undermining development? <http://ccafs.cgiar.org/blog/can-countries-bankroll-climate-adaptation-without-undermining-development#.UooSo2RAQy0>

• Combined solutions to strengthen adaptation: <http://ccafs.cgiar.org/blog/combined-solutions-strengthen-adaptation#.UpLBFOL1Xu4>

• New report highlights lessons from national adaptation planning (<http://ccafs.cgiar.org/research-highlight/new-report-highlights-lessons-national-adaptation-planning#.Uvjm7mJdXpa>)



Case Study #3

Title:

A gendered perspective on the adoption and maintenance of climate-smart agricultural practices in Cauca, Colombia

Author: Mariola Acosta

Type: Social differentiation and gender

Project description:

Although the importance of a gender dimension in agriculture is increasingly appreciated in academia and starting to be considered in agricultural climate change projects and policies, the gender implications for the adoption and maintenance of new agricultural practices specifically designed for climate change adaptation is only beginning to be explored. As men and women play different roles in agricultural production, it is expected that gender could influence respective abilities to adapt to climate change and its impacts in agricultural systems. This case study examined gender as a crucial dimension influencing the adoption and maintenance of new agricultural practices and climate change adaptation measures and explored gendered perceptions of its effects on men's and women's productive activities. Data was gathered from May to July of 2013 at the Rio Piedras watershed in the Department of Cauca, Colombia as part of a larger scale effort to design a common roadmap for the analysis of gender dimensions in agriculture and climate change adaptation within CCAFS.

Introduction / objectives:

Using PRA methods, semi-structured interviews and questionnaires, the study aimed to 1) explore gendered perceptions of climate change, 2) identify benefits and barriers affecting the implementation and maintenance of climate-smart agricultural practices by gender and 3) examine gender differences in information access, division of labor, asset ownership and agricultural decision-making.

Project results:

71% of women (compared to 43% of men) reported changing their on-farm activities as a result of climate change, indicating greater impacts on women's activities. Nevertheless, it is men who decide whether to adopt new practices and who participate in agricultural extension activities. Relative tenure insecurity and smaller plot sizes may influence women's willingness to adopt new practices that require making long-term investments in their land. Composting was indicated by both genders to be the most important practice for production. However, all other practices differed considerably between men and women, indicating that gender roles in the production system may influence priorities regarding CSA practice implementation. Different needs and priorities for men and women will thus require tailored extension services in this region. The challenge remains to predict ex ante 1) the appropriateness of CSA practices for specific households, 2) the benefits those practices will bring and for whom, and 3) their long-term sustainability.

Partners:

Fundación Río lasPiedras, FundaciónEcohabitantes, Asocampo (Asociación campesina municipio de Popayán Red de Reservas Naturales Departamento del Cauca).

Links/sources for further information:

Master's Thesis published: "Gender considerations in agriculture and in the adoption and maintenance of climate-smart agricultural practices: a case study in Cauca Department (Colombia)" Field manual:

<http://ccafs.cgiar.org/blog/new-field-manual-captures-farmers-climate-adaptation-activities-colombia#.UwHJcvI5NqU>

Blog:

<http://ccafs.cgiar.org/blog/climate-smart-agriculture-worms-eye-view#.UwHJxPl5NqU>

Flickr photos gender research in Cauca:

<http://www.flickr.com/photos/cgiarclimate/sets/72157635925155444/with/9955325154/Blog:http://ccafs.cgiar.org/es/blog/breaking-through-gender-barriers-one-survey-time#.UwHI1vl5NqU>



Case Study #4

Title:

Integrating local level adaptation planning and prioritization with district, regional and national institutions in Ghana

Author: Ariella Helfgott

Type: Capacity enhancement

Project description:

The Systemic Framework for Integrated Adaptation Planning (SIA) is an integrated program of research into resilience and adaptive capacity of food systems to climate change across social, political-institutional, economic and environmental scales and levels. The SIA team applies multiple lenses: the political lens, the social lens, the economic and financial lens and the environmental lens. The integration of the lenses is facilitated through systems thinking and action research undertaken through participatory capacity development programs. SIA research programs have been conducted in the Terai region of Nepal and in Upper West Ghana. In the context of the SIA research program in West Africa, a field program was developed that built on strong engagement and work carried out across the many levels of Ghana's climate change adaptation landscape: from CCAFS research sites in Lawra and Jirapa to the country's central administration in Accra.

Introduction / objectives:

The SIA team conducted institutional capacity development activities to better integrate local level adaptation planning activities with district, regional and national adaptation prioritization planning actors, including the Ghanaian Ministry of Food and Agriculture (MoFA), Ministry of Health (MoH) and Ministry of Education (MoE).

Project results:

A lecture and discussion series attended by district and regional representatives of each of the above Ministries was co-hosted by MoFA and SIA. Each week a SIA team member gave a lecture on an aspect of local and integrated adaptation planning: participatory diagnostic assessment; prioritization and planning; social differentiation, adaptive capacity and the adaptation program design; ecosystem services; alignment of multi-actor adaptation regimes; and financial structures for cross-level adaptation support. An intensive week long program trained MoFA, MoH and MoE representatives on the theory and practice of the SIA diagnostic, planning and prioritization workshop (SIA DPP). MoFA staff then implemented this new knowledge by facilitated the SIA DPP in Orbili village together with the SIA team. The SIA DPP involves establishing community linkages with appropriate support agencies at higher planning and decision making levels. Institutional linkages were thus improved between the community, MoFA, MoH and MoE to address interrelated adaptation challenges in the region.

Partners:

Ministry of Food and Agriculture (MoFA), Ministry of Health (MoH) Ministry of Education (MoE).

Links/sources for further information:

SIA facebook group: <https://www.facebook.com/pages/Systemic-Integrated-Adaptation/290278634411363>



6. Outcomes

Outcomes #1

Title:

Theme 1 lead author in IPCC 5th Assessment Report, and CCAFS research featured prominently

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

CCAFS researcher Andy Challinor was invited to be lead author of the chapter "Food production and food security" in the Intergovernmental Panel on Climate Change's 5th Assessment Report (AR5); lead authors are experts carefully selected based on their knowledge and integrity in their fields. The chapter drew heavily from CCAFS research and key figures are included not only in the full length IPCC report but also in the "Summary for Policy Makers," a high-impact presentation designed explicitly to be available for use by decision makers and stakeholders outside of the research sphere. CCAFS research produced five of the figures in the chapter. The Intergovernmental Panel on Climate Change periodically delivers Assessment Reports, considered the most comprehensive scientific reports on climate change in the world. These reports are the largest and most detailed summaries of the status of climate change, produced by a team of thousands. As a "scientific benchmark" for where climate issues currently stand, they serve as the basis for international climate negotiations and the source for scientific, technical and socio-economic information used by the UNFCCC in its negotiations. The reports also have far reaching influence on policy makers globally, providing the evidence base for informed decision making and investment. The latest IPCC 5th Assessment Report builds on the previous 4th Assessment Report with a revisited analysis of crop production tendencies with regard to projected changes in temperature and rainfall, and data to support not only a summary of existing literature and current adaptation options and constraints, but a critical evaluation of the importance and utility of the various research outcomes.

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

CCAFS publications from 2009-2013 factored prominently into the development of the chapter "Food production and food security" from the 5th Assessment Report. Specifically, Schroth et al. (2009), Jarvis et al. (2012), Ramirez-Villegas et al. (2012), Glenn et al. (2013), Ramirez-Villegas et al. (2013), and Vermeulen et al. (2013) were all cited in the chapter. CCAFS/CG related publications were cited a total of 52times in the chapter. The selection of CCAFS researcher Andy Challinor as a lead author for AR5 is a result of his widely recognized expertise and several key high level publications he authored in the past three years. These include: Izumi et al (2013), Asseng et al. (2013); Hawkins et al. (2013); Vermeulen et al. (2012); Ramirez-Villegas & Challinor (2012); Thornton et al. (2011); Challinor et al. (2010). The article "A meta-analysis of crop yield under climate change and adaptation" by Challinor et al. was produced in 2013 and will be published in Nature Climate Change in early 2014. This report contains a number of the figures that were used in the production of the AR5 chapter and is in essence a synthesis of the science findings of the report.

What partners helped in producing the outcome?

Chapter co-authors: CSIRO (Mark Howden); Stanford University (David Lobell); INTA (Maria Isabel Travaso);

University of Leeds (Andy Challinor and Jim Watson); ILRI (Phillip Thornton); University of Copenhagen (John R. Porter)

Who used the output?

The AR5 report is only now being released, but the Summary for Policy Makers is the primary source of evidence for policy makers across the globe related to positions in international negotiations, and in terms of investment at regional and national levels. The “Food, Fibre and Forest Products” chapter from the previous AR4 report (2007) has been cited 619 times in scholarly articles and books, according to Google Scholar. Although the users represented by these statistics are primarily researchers, the report is also used by politicians, NGOs, journalists/media representatives and other climate change related stakeholders who most often cite it simply as “IPCC 2007”. If the success of the AR4 report is any guide, the AR5 chapter containing CCAFS content can be expected to reach a minimum of 1,000 citations.

How was the output used?

The IPCC reports have extraordinarily broad reach as demonstrated by the number of times they are cited in academic papers. Although in the non-academic sphere their use is not as well-documented, the reports are considered the authority when it comes to assessments of climate change impacts and future climate projections. Previous assessments have won the Nobel Peace Prize, and the summary for policy makers is the primary source of evidence for national governments to base their climate change strategies upon, and in international negotiations is the authoritative source of science for framing international processes. It can also be assumed that they are used often not only as the justification and factual foundation for future research, but also as the jumping-off point for on-the-ground adaptation plans and initiatives and the basis for adaptation policy and investment prioritization in the development sphere. The CCAFS-related publications (outputs) cited in the AR5 were used as scientific evidence for the literature evaluation and analyses developed therein.

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.

The IPCC assessment reports are considered the authority on climate science and often have the last word in questions of investment prioritization and development and adaptation planning by a wide range of stakeholders, especially policy makers. They underpin the UNFCCC’s COP negotiations, making the AR5 a critical pathway for massive dissemination and uptake of CCAFS research results by non-research partners. The fact that CCAFS research is featured prominently within the report means that its use by non-research partners and stakeholders will be equally great. The statistics mentioned in the above section are based on Google Scholar citation searches for the primary authors of both the 4th and 5th Assessment Reports. However, most of the evidence for the 5th Assessment Report outcome is expectative (based on use of the previous report) and further investigation as to use of the “Food production and food security” chapter remains to be seen in the coming year, as the report becomes available online.

Outcomes #2

Title:

Beyond the climate science: CCAFS-Climate data applied by thousands of non-research users around the world.
(Theme 1 and Theme 4 Outcome)

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

After 4 years of existence, and thanks to continuous improvement efforts, the CCAFS Climate portal (<http://www.ccafs-climate.org>) has become the go to place to get free and open access to downscaled climate data, primarily for use in understanding the effects of climate change on agriculture. CCAFS-Climate is having significant impact by putting high resolution climate information of long term climate changes into the hands of non-climate scientists and next users which represent up to 19% of all CCAFS-Climate users (NGOs, foundations, non-research international/national organizations, donors and governmental institutions). The portal has successfully moved beyond its immediate sphere of influence and now has a broad, multidisciplinary and global user base that employs the data to support impact and adaptation analyses in multiple target and non-target CCAFS sectors.

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

- Design and deployment of the CCAFS Climate Portal (2010)
- Full update of the Portal, including new graphic design, improved functionality, php-oriented webpage structure, a form to capture and store user information, licensing, and detailed descriptions of all available datasets (~early 2012)
- A full set of downscaled IPCC Fourth Assessment Report GCMs, which consists of 24 GCMs, three emissions scenarios (A1B, A2, and B1) and seven periods (2020 through 2100). (~early 2012).
- Addition of the MarkSim downscaling tool and its related datasets to the portal (~June 2012)
- Upgrade in the storage system at CIAT/DAPA, allowing all data to be stored at CIAT (~November 2012).
- Development of a dynamically downscaled dataset using the PRECIS Regional Climate Model, by the UK's MetOffice for South America Andean Region (~November 2012).
- Development of a dynamically downscaled dataset using the Eta Regional Climate Model, by CPTEC for South American (~December 2013). A major additional step towards achieving this outcome has been the recent release of a new ready-to-use dataset corresponding to the IPCC's 5th Assessment Report (AR5), which includes a complete dataset of Global Climate Models for four Representative Concentration Pathways and four time periods (2030s, 2050s, 2070s and 2080s) (December 2013-January 2014). The various MarkSim tools have also recently been updated with the new CMIP5 data.

What partners helped in producing the outcome?

- Philip Thornton (ILRI – International Livestock Research Institute, Kenya)
- Andy Jarvis (CIAT, International Center for Tropical Agriculture, Colombia)
- Peter Jones (Waen Associate, United Kingdom)
- Roberto Quiroz (CIP – International Potato Center, Peru)

- Andy Challinor (University of Leeds, United Kingdom)
- Jawoo Koo (IFPRI – International Food Policy Research Institute, United States)
- Rachel Warren, Tyndall Centre, University of East Anglia

Who used the output?

The major cohort currently using the platform is scientists from academia and research institutes from all over the world, who use the data for research in fields ranging from biodiversity, agriculture (especially crop modelers and agro-climatologist) and ecosystem functioning. To a lesser - but no less important - degree, CCAFS-climate users are composed of foundations, NGOs, non-research international organizations, non-research national level institutions, donors and governmental institutions, who principally use the data for policy and decision making. According to download-related statistics, this second group represents approximately 19% of all CCAFS-Climate users. An estimated 400 different non-research institutions from around 60 countries (out of a total of ca. 2000 unique users), have downloaded CCAFS-Climate data for some purpose, as summarized in the table at the end of this report.

How was the output used?

As mentioned above, most of the downloaded data is being used by researchers and its use include a number of impact studies which generated greater understanding of the possible risks posed by progressive climate change over agriculture (24%), ecology and species distribution (53%), climate dynamics (3%), hydrological modeling (4%). However, the use for non-academic purposes is also considerable, especially in the fields of policy making, food security, and adaptation planning (17% of the publications). Specifically, non-research users report that CCAFS-Climate data were used for:

- Generation of early warning information for government use
- Study of climate change at the country-level for informing decision makers
- Government planning purposes
- The informing of crop insurance policy development and water policy development
- Agroclimatic and vulnerability assessment, especially in developing countries
- Adaptative capacity enhancement in developing countries
- Modeling of the situation of economic cultures and rainforest species in future scenarios of climate changes in specific regions of Brazilian Amazon (GIZ, the Brazilian Environmental Ministry and state governments)
- Understanding downscaled climate modeling in order to create more robust impact assessments In addition to the direct use of CCAFS-Climate data by non-research partners as noted above, research institutions (CIAT, IFPRI and INPE, among others) have used the data in studies targeted at policy and decision makers, development practitioners, and sector-specific actors. Policy-targeted studies include a climate change vulnerability assessment for a natural park in Bhutan (WWF), a report on climate change adaptation planning in Latin American and Caribbean cities (ICF; GHK), a climate change impact report for smallholders in Bogotá, Colombia (CIAT), and comprehensive analyses of agriculture and climate change in West, East and Southern Africa (IFPRI). Sector-specific studies performed using CCAFS-Climate data include an analysis of the impacts of climate change on cocoa in Ghana and Cote d'Ivoire (CCAFS) and the development of future climate scenarios for Uganda's tea growing areas and Tanzania's coffee growing areas (CIAT). These examples, among others, demonstrate the global applicability and relevance of the data available on the platform and their broad use – either directly or

indirectly – by the non-research community.

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.

Every time that the data are downloaded, the user must specify their affiliation and their planned use for the data. These reports were used as evidence for non-research partner use of CCAFS-Climate data. Likewise, a report from Google Analytics tells use the overall usage of the site in terms of number of visits, etc. A summary of these analyses is provided below.

Metric	Total (2009-Present)	Total in 2013
Total number of visits	75,011	30,145
Total Number of unique visits	37,688	14,587
Average of total visits per month	1,744	1,216
Number of countries that accessed the data	185	163
Institutions that have accessed the data	Almost 1700	Almost 700
Number of files uploaded:	108,098	65,489 Total
Number of Downloads	175,487 (2012-2013)	135,839
Data Download Size	154 TB (2012-2013)	125 TB
Refereed publications	Around 157	Around 52

Top 8 countries (largest #of visitors and downloaders)

- United (States 13.400)
- United Kingdom 5.097)
- Colombia(4.639)
- Mexico(3.691)
- China(3.503)
- Germany(3.429)
- India(3.308)
- Brazil(2.808)

7. Outcome indicators

Outcome indicator #1

Outcome indicator:

One to five flagship technical and/or institutional approaches identified and developed with farmers, key development and funding agencies (national and international), civil society organizations and private sector in three regions, which would directly enhance the adaptive capacity of the farming systems to the climate change conditions

Achievements:

The Farms of the Future approach consists of the analogue model together with a participatory approach to facilitate adaptation learning of communities and institutions across analogous sites. After 3 years, the analogues tool is online and accessed widely, and FOTF exchanges have been held in South Asia (Nepal), West Africa (Mali, Burkina Faso, Ghana, Niger) and East Africa (Kenya, Tanzania). The approach has also featured in high level communications activities and is cited as being good practice in adaptation strategies.

Evidence:

<http://ccafs.cgiar.org/fr/climate-analogues#.UwyWurSaRWoBlog posts>

- <http://ccafs.cgiar.org/blog/%E2%80%9Cfarms-future-arrives-west-africa#.Uukssz1dXpZ>
- <http://ccafs.cgiar.org/blog/sharing-tools-could-help-central-america-battle-climate-change#.UuFlj9lo7cs>
- http://ccafs.cgiar.org/blog/climate-scenarios-and-analogues-glimpse-past-present-and-future-climates?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+CgiarClimateBlogs+%28CGIAR+Climate+blogs%29#.UuuvePlDUsI
- <http://www.ccafs-analogues.org/back-to-the-future-with-the-climate-analogue-tool/>
- <http://www.ccafs-analogues.org/how-will-your-forest-grow-climate-analogues-provides-clues-for-pine-plantation-adaptation/>
- <http://www.rlc.fao.org/es/agenda/taller-herramientas-para-la-adaptacion-y-mitigacion-del-cambio-climatico-en-la-agricultura-centroamerica-y-republica-dominicana/News>
- <http://www.elpais.com.co/elpais/opinion/editorial/anonimo/agricultura-para-futuro>
- <http://www.elespectador.com/noticias/medio-ambiente/presagios-de-un-clima-mas-severo-articulo-444488>
- <http://www.elespectador.com/noticias/medio-ambiente/asi-sera-el-clima-de-2030-articulo-444470>

Outcome indicator #2

Outcome indicator:

Breeding strategies of regional and national crop breeding institutions in three target regions are coordinated, informed by CCAFS-led crop modeling approaches that are developed and evaluated for biotic and abiotic constraints for the period 2020 to 2050

Achievements:

CCAFS climate is providing data for modelling efforts that have been completed in all 5 regions for a range of crops. Significant progress has been made in modelling genotypic impacts, and using these to inform breeding strategies. Breeding strategies for banana, cassava, potato and beans have been published at the global level, and at the national level Zimbabwe is using results for maize to define national breeding strategies.

Evidence:

Blog posts

- <http://ccafs.cgiar.org/blog/when-genes-don%E80%99t-add#.UwyXf7SaRWo>
- <http://ccafs.cgiar.org/fr/blog/steadying-aim-crop-breeders-using-target-population-environments#.UwyYJLSaRWo>
- <http://ccafs.cgiar.org/blog/hot-out-oven-fresh-data-ccafs-climate>
- <http://ccafs.cgiar.org/blog/mitigating-change-climate-relations-breeders-and-modelers-africa-unite-climate-smart-crops#.UwybFrSaRWp>
- <http://repository.cimmyt.org/xmlui/bitstream/handle/10883/3211/98024.pdf?sequence=1>

Journal articles-

Beebe, S. et al., 2011. Chapter 16: Genetic Improvement of Common Beans and the Challenges of Climate Change. Crop Adaptation to Climate Change. Wiley & Sons. ISBN: 978-0-8138-2016-3-

Ceballos, H., Ramirez-Villegas, J., Bellotti, A.C., Jarvis, A. and Alvarez, E., 2011. Chapter 19: Adaptation of Cassava to Changing Climates. Crop Adaptation to Climate Change. Wiley & Sons. ISBN: 978-0-8138-2016-3.-

Ramirez-Villegas, J., Jarvis, A., Van den Bergh, I., Staver, C. and Turner, D., 2011. Chapter 20: Changing Climates: Effects on Growing Conditions for Banana and Plantain (*Musa* spp.) and Possible Responses. Crop Adaptation to Climate Change. Wiley & Sons.- Schafleitner, R. et al., 2011. Chapter 11: Adaptation of the Potato Crop to Changing Climates. Crop Adaptation to Climate Change. Wiley & Sons.-

Ramirez-Villegas, J., Jarvis, A., Hanson, J., Leibing, C., and Fujisaka, S. 2012. Crop and Forage Genetic Resources: International Interdependence in the Face of Climate Change. In: Halewood, M., López Noriega, I., Louafi, S.

(Eds.) Crop Genetic Resources as a Global Commons: Challenges in international law and governance. Routledge, Taylor and Francis Group, London and New York. Print ISBN: 978-0-84407-893-6; Online ISBN978-1-84407-892-9. 424 p.-

Cairns, J., J. Hellin, et al. 2013. "Adapting maize production to climate change in sub-Saharan Africa." *Food Security*: 1-16. -

Singh, Piara, S Nedumaran, B R Ntare, K J Boote, N P Singh, K Srinivas, and M C S Bantilan. 2013. "Potential Benefits of Drought and Heat Tolerance in Groundnut for Adaptation to Climate Change in India and West Africa." *Mitigation and Adaptation Strategies for Global Change*: 1–21. doi:10.1007/s11027-012-9446-7.

Outcome indicator #3

Outcome indicator:

Integrated adaptation strategies for agricultural and food systems inserted into policy and institutional frameworks at regional, national or sub---national level in 2 target regions. Policy makers and key stakeholders use CCAFS research outputs - guidelines, tools and methods--- to support the development of NAPAS, sector specific adaptation plans, or germplasm benefit sharing policies.

Achievements:

A meta-synthesis and facilitated dialogue between 12 countries on progress of agricultural NAPs has been completed, and published. This is a baseline document for informing national strategies in at least 6 countries where CCAFS has significant influence.

Evidence:

Publication:

Planning climate adaptation in agriculture (<http://ccafs.cgiar.org/publications/planning-climate-adaptation-agriculture#.Uvj5v2JdXpY>)

Events-

Event announcement: UNFCCC Side Event: Agriculture in national Adaptation Plans: Experiences and Lessons Learned (<http://ccafs.cgiar.org/unfccc-side-event-agriculture-national-adaptation-plans-experiences-and-lessons-learned#.Uvjf22JdXpY>)-

Event announcement: National Adaptation Plans and Agriculture: A Learning Workshop (<http://ccafs.cgiar.org/national-adaptation-plans-and-agriculture-learning-workshop#.Uvjf42JdXpZ>)

Blogs

- New report highlights lessons from national adaptation planning (<http://ccafs.cgiar.org/research-highlight/new-report-highlights-lessons-national-adaptation-planning#.Uvjm7mJdXpa>)
- The serious business of NAP-ing (<http://ccafs.cgiar.org/blog/serious-business-nap-ing#.Uvjml2JdXpY>)
- Can countries bankroll climate adaptation without undermining development? (<http://ccafs.cgiar.org/blog/can-countries-bankroll-climate-adaptation-without-undermining-development#.UvjmdmJdXpY>)
- Combined solutions to strengthen adaptation: <http://ccafs.cgiar.org/blog/combined-solutions-strengthen-adaptation#.UpLBFOL1Xu4>

8. Leveraged funds

None

9. Theme leader summary by outputs

Output: 1.1.1

Summary:

This is the largest output of Theme 1, and constitutes the nuts and bolts of climate smart agriculture: the component technologies and practices alongside approaches for outscaling promising options. A number of climate smart technologies and practices are at different stages along the development spectrum, from initial testing in pilots, through to developed technologies which are now ready for outscaling and significant climate-related investment.

The most investment ready practice/technology is alternate wetting and drying (AWD) for rice, a technology developed and tested by IRRI over the past years through both agronomic experimentation and large scale participatory field trials. This technology is truly climate smart in that it has a vastly reduced carbon footprint, in addition to maintaining high productivity levels and using up to 30% less water. The use of this technology on a large scale will increase resilience to water scarcity in the rice production systems of the Mekong Delta, with additional application domains in many parts of South Asia. The technology is already receiving significant policy attention, e.g. the 20-20-20 strategy in Vietnam (See output 1.3.2 for more information).

CIMMYT have also continued testing and evaluation of conservation agriculture approaches both on-station and on-farm. This has been accompanied by exhaustive surveying of socio-economic factors of farming households. This is providing a wealth of information to understand barriers of adoption, and gender implications of different technologies and practices.

Water-based climate smart options this year have focused on storage systems. An IWMI study in Nepal has shown how multiple use strategies, consisting of ponds and tanks, can provide solutions to some of the challenges of climate change impacts at the sub-basin scale. However, significant gender inequity challenges were found, with women significantly less empowered to adopt and invest in water storage technologies when compared to men. Ongoing research is looking at means of overcoming these barriers. Work on aquifer recharge technologies has also continued in South Asia.

Other center-based work has focused on drought and waterlogging tolerant Brachiaria grasses for Latin America which are being tested with farmers in Colombia, Honduras and Nicaragua. Stress tolerant cactus species and other rangeland species for the harshest of environments in drought prone northern Africa and Middle East have been evaluated by ICARDA. ICRAF have trialled mango varieties in Kenya, and published suitability maps for 100 common species of tree for agroforestry mixes. This information is helping to determine the application domains for climate smart agroforestry options in Africa.

Many of these evaluations of climate smart technologies and practices are now being focused on climate smart

villages (CSVs). For example, in East Africa over 500 farmers from CSVs in Uganda, Tanzania, Kenya and Ethiopia have participated in holistic adaptation evaluations of a range of technologies including bean, cassava, sweet potato and livestock technologies.

In 2013, a number of innovative approaches to enable adoption of climate smart technologies and practices have also come to fruition. Bioversity's work on the Seeds for Needs concept, an approach for participatory appraisal of adapted seed varieties under a dynamic climate, literally went viral this year. Use of crowdsourcing approaches, alongside novel ICTs and mobile technologies has established one of the largest participatory action research experiments in the world, with thousands of farmers testing, evaluating and sharing experiences in India involving 142 villages covering 8 districts in 2 states. A number of NGOs, state universities, government agencies and international donors are now looking to the Seeds for Needs approach to implement in their development programs across India. The approach is also being trialled by Bioversity in other regions, and is moving towards a global synthesis of best practice in mass, participatory and crowdsourced varietal evaluation in the face of climate change. The numbers are impressive: 200 accessions of Durum wheat with 400 farmers in Ethiopia, 20 accessions of sorghum, pigeon-pea and cowpea each with 500 farmers in Tanzania and Kenya, 100 accessions of buckwheat in China, and for taro and sweet potato in Papua New Guinea. Similar approaches are currently initiating in Latin America (Honduras and Nicaragua) and South East Asia (Cambodia and Lao), where the approach is at an earlier stage of development, but nevertheless already yielding significant results.

Another promising approach for enabling climate smart practices/technologies is through intelligent advisory services. IRRI has started developing site-specific management applications for mobile phones to fine-tune management of climate smart rice technologies in different agro-ecologies. CIAT is also trialling climate-specific management approaches with 1,000s of farmers in Colombia engaged in fruit, rice and maize production. This novel application of big data to the issue of climate adaptation is demonstrating the importance of climate, and how through adaptive management practices farmers can be resilient to climatic impacts.

Information systems are under development for compiling information on climate smart practices and technologies. These integrative tools are designed to manage information from across center activities, and provide a window into synthesized information of climate smart practices and technologies coming out of the CGIAR. A CSA compendium, developed jointly by ICRAF and CIAT, compiles evidence on the benefits of dozens of climate smart practices and technologies from the published literature. This searchable database is now being transformed into an organic, crowd-sourced web interface that centralizes information on the costs, benefits and barriers of an exhaustive list of climate smart technologies and practices. More on this in 2014. Agtrials is also coming of age, now containing results from 30,682 trials, covering 9 crops across the globe. This basic information on varietal performance, connected with climate data, allows users to evaluate the relative performance of different varieties under different climate conditions, enabling better targeting of technologies to agro-ecologies, and enhancing understanding of genotype x environment relations.

Output: 1.1.2**Summary:**

A significant amount of effort in 2013 has been placed on the development of national capacity to adapt to climate change in Colombia under an US\$8m agreement with the Ministry of Agriculture of Colombia. During 2013, CIAT established a partnership of 11 national organisations, representing civil society, major producer and trade federations, national government and research institutions. Action research is ongoing in 52 municipalities of the country involving >800 evaluation plots, 92 distinct training workshops with 1,279 participants from 52 different institutions participating. This significant level of activity is focused on 3 primary areas of research: improving the ability to model climate impacts and understand varietal responses to climate in order to improve technical assistance on varietal adaptation, evaluating resource efficient climate smart practices with low water and carbon footprints, and the development of climate-smart advisory services for major staples.

A spin-off of the Colombian work is an aggressive south-south learning exchange which in 2013 consisted of a high profile visit of a Colombian and Honduran delegation to share experiences in climate smart agriculture around the Kaffrine site. A multi-stakeholder workshop in Manizales, Colombia also facilitated knowledge exchange between Colombian, Senegalese, Costa Rican, Guatemalan and Honduran experiences to the extent that a high level delegation from Honduras will visit the Ministry of Agriculture in Colombia to explore how to replicate Colombian successes under a similar approach for Honduras. CCAFS is demonstrating significant traction in south-south learning of adaptation best practice and will continue these activities in 2014.

Work in climate smart villages in East Africa has taken off in 2013 with significant multi-disciplinary and multi-level activity especially in the Ugandan, Tanzanian and Kenyan sites. IITA, CIAT, ICRAF and ICRISAT have all pooled together to evaluate adaptation options with local communities and civil society and local government organisations. Approaches such as crop modelling, participatory rural appraisal, gender focal groups and soil health monitoring tools have all been applied to paint a comprehensive picture of gender-specific adaptation entry points for local communities. Multi-level governance analyses are now scaling to higher levels with the aim of feeding into national policy formulation.

The East Africa work does not stop there. Significant partnership with national programs and local civil society organisations has leveraged a massive participatory action research platform for generating adaptive capacity. Specifically, In Hoima and Rakai (Uganda), CIAT Uganda in collaboration with the National Crops Resources Research Institute (NaCRRI) completed an evaluation of promising bean based technologies for enhancing farmer adaptive capacity over three seasons. Participatory evaluations of 15 bean genotypes with varying traits was conducted through existing farmer groups identified from the CCAFS baseline survey. Overall, 320 individual farmers participated in the trial evaluations of which 56% were female farmers. Results of the evaluations showed highly significant differences in the agronomic performance, diseases resistance and yield among the 15 genotypes. Marketability (based on seed size and colour), yield and adaptability were major drivers for farmer selection. The next step is to widely test these genotypes across other sites in East Africa and to work with NARO and KARI in Kenya on releasing these for drought prone areas of East Africa. In addition, ZARDI Bulindi (NARO) is

working with 40 farmers to evaluate two cassava varieties which are resistant to mosaic virus, and two sweet potato varieties. In Lushoto (Tanzania), SARI evaluated maize, beans and root crops for yield, disease resistance, pest and water stress tolerance. Seventy seven farmers from four villages participated in evaluating three local varieties of sweet potatoes, 152 farmers participated in the evaluation of two varieties of cassava, while another 96 farmers evaluated two varieties of Irish potato. Preliminary observations indicate that the Kiroba variety will be more tolerant to the cold season raising hopes that the potato growing season can be extended in highland regions experiencing cold stress. In Nyando, KARI is supporting farmers to evaluate improved varieties of sorghum, pigeon peas, and sweet potatoes. Eight stable drought tolerant sorghum varieties developed by KARI and ICRISAT were evaluated against the commercial variety (KARI Mtama 1). The best progeny P1 yielded three times more than the commercial variety. If planted widely, this variety can triple sorghum yields on smallholder farms. Three varieties of pigeon pea were also evaluated, with at least 100 farmers expressing interest in growing the best performing pigeon pea variety. The growth characteristics and yield of seven sweet potato varieties was evaluated, out of which two varieties (Vita and SPK013) had the highest yields. Further trials will be conducted in subsequent seasons to establish the extent pigeon pea can be adopted as an alternative crop for food security in drought and flood prone regions of the Lake Victoria basin. In Borana (Ethiopia), the regional program commissioned a study by MARIL to develop appropriate livestock genetic erosion indicators and to assess the loss of livestock genetic resources in pastoral areas caused by climate change and other related socio-economic factors. The study identified the most significant causes of genetic erosion and their relationships with climate change, along with their intensity and appropriate interventions. The results show that the indigenous Ethiopian Borana Breed is under threat. Recurrent drought, feed and pasture deterioration, conflict between clans and ethnic groups, lack of awareness RPL EA 2013 technical report about inbreeding and selective breeding, restocking programmes by NGOs, emergence of unplanned cultivation coupled with restricted mobility, the extension of markets and economic globalization were among the causes of genetic erosion. Indicators of livestock genetic erosion included small size, low milk yield, and mixed colors.

The capacity of local and national institutions to adaptively manage water allocation in drought prone regions has been increased by the development of decision support tools for water allocation. IWMI worked in Malawi to develop these tools for use in integrated irrigation-aquaculture systems. IWMI also completed a visionary exercise on the future of desalination as an option for water supply in coastal regions in 2050. The foresight exercise uses learning curves to evaluate if desalination as a technology will become cost-effective by 2050. The results are encouraging and will be published in a major report in early 2014.

An analogues approach to climate adaptation has provided fascinating results in Kenya and Zimbabwe under an ICRISAT led initiative where gender takes center stage (with funding from GIZ). Detailed surveys and focus group discussions demonstrate how the characteristics of household heads differ, as well as coping and adaptation strategies for crop production within and across analogue sites. Gender differences exist in preferred crops and management strategies across sites. Lower yields at both drier and wetter analogues compared to their reference sites indicate potential reduction in maize yields in warmer 2050s climates, and more alarmingly lower maize yields in female headed households in Kadoma and in Chiredzi show the significant gender inequality in climate change and agricultural planning. The different preferences for crop management strategies imply

gender issues for differently managed households will vary across sites.

Analogue approaches have also been used as the basis for Farms of the Future exchanges in West Africa to build adaptation capacity in rural communities and rural institutions. Analogous future climates for 13 villages across Senegal, Niger, Mali, Ghana and Burkina Faso were identified by local organisations during a training workshop of 35 regional participants, and a series of farmer and researcher exchanges were facilitated with the aid of CORAF. The exchanges involved over 100 participants who witnessed a range of climate smart practices from soil and water conservation techniques, assisted natural regeneration of trees, composting and corraling, crop diversification, vegetable production, seeds production, through to fish ponds. During the exchange visits an analysis of the potential barriers to adoption and uptake of and diversification pathways of climate smart agriculture practices was undertaken.

Output: 1.1.3

Summary:

Work under this output has reduced in 2013 compared to 2012. This year, the focus was on two major topics – exploration of crop wild relatives as sources of genetic diversity for agricultural adaptation, and on neglected and under-utilised species as resilient options for communities in Nepal, Bolivia and India.

On underutilised crops, training of community members on cultivation practices were carried out in India (13 villages in Tamil Nadu, 5 villages in Madhya Pradesh and villages across Bageshwar, Almora and Nainital in Uttarakhand), Bolivia (8 communities around Lake Titicaca) and Nepal (villages of Taliun, Lekhnath NP, Namdu and Kachorwa). The target of training courses has been women farmers and other vulnerable groups particularly. An estimated 2950 people benefited directly from these activities. Community Biodiversity Registers were introduced in target communities of the project to document cultivation of resilient crops and their traits allowing farmers to share knowledge and seeds for adaptation purposes. Knowledge about food preparation and income generation opportunities from resilient crops were also disseminated during community-based workshops, seed fairs and farmer visits.

Global efforts to adapt staple foods like rice, wheat, and potato to climate change have been given a major boost by new research that reveals the details and whereabouts of their “wild relatives” – their undomesticated distant cousins that could contain genetic secrets to making food crops more productive and resilient. Some of these wild and weedy species have evolved to tolerate drought, higher temperatures, or pest and disease outbreaks, all of which are expected to become more frequent as a result of climate change. But according to the research carried out by CIAT together with the UK’s University of Birmingham, as part of a project led by Kew’s Millennium Seed Bank and the Global Crop Diversity Trust, close to three quarters of these plants are in serious need of collecting for conservation in the world’s seedbanks, meaning scientists are currently missing out on significant opportunities to breed more productive, climate-smart crops. Using a technique called gap analysis, scientists studied 81 of the world’s most important food crops – including rice, wheat, maize, potato,

bean, cassava, sorghum, and banana,. They found that of the 1089 wild relatives identified, over 70% are seriously underrepresented in gene banks. But fortunately, the new findings also show where these species might be found in the wild. With the new information, collecting teams will seek out the species that have highest priority and are most at risk in the largest coordinated conservation exercise for crop wild relatives ever undertaken. The study and collecting work are part of a major 10-year project funded by the government of Norway to help boost the resilience of staple foods crops to climate change.

Output: 1.2.1

Summary:

Under this cluster of activities there is significant effort being made to improve approaches to deepen our understanding of climate impacts at crop and varietal level, and use of this knowledge to better inform breeding strategies.

On impact modelling, ICRISAT conducted a comprehensive assessment of climate change impacts on smallholder farming systems in Eastern and Southern Africa under the global Agricultural model intercomparison and improvement project (AgMIP) with whom CCAFS closely collaborates. The direction and magnitude of impacts of projected changes in climate on crop growth and performance was influenced by both the current climate and the management practices employed. For example in Kenya, significant decline in yields was observed in systems using Katumani variety, higher fertilizer nitrogen and low plant populations. But there is hope. The study finds that to a large extent the negative impacts can be minimized and opportunities can be capitalized by deploying the available varieties and adjusting the management practices employed by smallholder farmers.

Bioversity International is developing a resource box that allows users to select a variety of tools for the different steps in the research cycle, mix and match these tools in a flexible manner and design a comprehensive capacity building strategy for managing germplasm flows and interdependence in the context of climate change adaptation. About 100 researchers, genebank managers and extension agents from Bhutan, Burkina Faso, Cambodia, Costa Rica, Côte d'Ivoire, Ethiopia, Guatemala, India, Lao PDR, Nepal, Rwanda and Uganda have been trained in the use of GIS and climate modeling tools and techniques applied to crop experimentation. The partners are accessing materials from CG genebanks, but also accessing them through bilateral exchanges between the national genebanks of the participating countries. The researchers are also investigating obtaining materials for international exchange from participating farmer communities, in conformity with national laws. A number of field tests are in the planning stage, which will bring together these actors together with farmers to assess the potential of newly introduced germplasm to adapt to changing climate conditions. In Bhutan, the tools and techniques will be used to revise national crop conservation and breeding strategies. With the support of a consultant, Bioversity International is finalizing the resource box which will be made available online and in hardcopy form.

Progress has also been made in integrating crop and livestock modelling approaches to better understand

climate impacts on livestock systems, and integrate livestock assessments more effectively with cropping system assessments. ILRI took the lead on this with the development of the GRRange model is a remarkable scientific advancement as it allows the modelling of climate change impacts on rangeland ecology, representing multiple complex processes such as soil nutrient and water dynamics, vegetation growth, fire, and wild and domestic animal off take. A month-long training of two African partners was held and the tools developed will be used in further trainings.

Linkage of CCAFS work with the influencing of key breeding strategies is now being established. CIAT's mandate crop breeding strategies have been informed by CCAFS science. A number of publications and analyses over the past few years have contributed to new, refreshed strategies for CIAT's mandate crops. This includes the validation of a biotic constraint focus in cassava, and a focus on heat tolerance in common bean. Outputs from CIAT work on beans has been extensively disseminated and used to help inform strategies under the PABRA program in Africa, which involves 22 national programs. The Global Cassava Partnership, an alliance of multiple cassava R+D institutions have extensively adopted CIAT's concept of the rambo root, promoting cassava as a substitution crop and identifying biotic constraints as the priority for future breeding efforts. Within this alliance there are at least a dozen breeding organisations participating.

CIMMYT has evaluated the genotypic response to environmental change by analysing GxE using 96 environmental covariates (combination of climatic variable x physiological stage). The results from this GxE analysis will lay an important foundation for future work to identify the sensitivities of the developmental stages of CIMMYT wheat/maize genotypes to important climatic variables in different geographic regions. Patterns of change in the climatic profiles at different locations together with genotypic sensitivities to climate can help identify and refine breeding strategies for different regions, and CCAFS results are feeding into the MAIZE and WHEAT CRPs.

At the national level CIMMYT have successfully influenced Zimbabwe's breeding strategies for maize. Discussions and presentations summarising the outputs of CCAFS research to maize breeders within the Crop Breeding Institute lead them to seek external funding to develop screening capacity to initiate breeding for drought and heat stress.

The use of detailed models to assist breeding programs through the design of climate smart ideotypes are progressing under the leadership of CIRAD and IRRI, though significant challenges exist in the provision of detailed climate information to feed such models.

In banana, several stakeholder tools for generating approaches to adaptation planning were refined through work with three different regional banana networks in Africa and Latin America representing over 35 countries. And in potato, a review paper summarizing the state of the art knowledge on drought tolerance and water use efficiency by the potato crop was published. ICRISAT simulated yield components of West African maize, millet, peanut, sorghum genotypes for wet, dry, current climates in order to identify most appropriate genotypes for

climate adaptation, and genotype evaluation in ICRISAT headquarters, along with simulation modelling is providing insights on breeding priorities for CRPs on Dryland Cereals and Legumes.

Output: **1.3.1****Summary:**

An institutional and governance assessment methodology has been developed by ILRI and tested in one climate smart village (Wote, Kenya). The development of this methodology has forced the research team to clarify the role of local institutions with respect to climate change adaptation specifically, distinguishing this from a more generic "governance" assessment. It has also highlighted the challenge of defining the appropriate unit of analysis for "community" adaptation.

An analogues approach to climate adaptation planning has provided fascinating results in Kenya and Zimbabwe under an ICRISAT led initiative where gender takes center stage (with funding from GIZ). Detailed surveys and focus group discussions demonstrate how the characteristics of household heads differ, as well as coping and adaptation strategies for crop production within and across analogue sites. Gender differences exist in preferred crops and management strategies across sites. Lower yields at both drier and wetter analogues compared to their reference sites indicate potential reduction in maize yields in warmer 2050s climates, and more alarmingly lower maize yields in female headed households in Kadoma and in Chiredzi show the significant gender inequality in climate change and agricultural planning. The different preferences for crop management strategies imply gender issues for differently managed households will vary across sites.

Analogue approaches have also been used as the basis for Farms of the Future exchanges in West Africa to build adaptation capacity in rural communities and rural institutions. Analogous future climates for 13 villages across Senegal, Niger, Mali, Ghana and Burkina Faso were identified by local organisations during a training workshop of 35 regional participants, and a series of farmer and researcher exchanges were facilitated with the aid of CORAF. The exchanges involved over 100 participants who witnessed a range of climate smart practices from soil and water conservation techniques, assisted natural regeneration of trees, composting and corraling, crop diversification, vegetable production, seeds production, through to fish ponds. During the exchange visits an analysis of the potential barriers to adoption and uptake of and diversification pathways of climate smart agriculture practices was undertaken.

Bioversity researchers are assisting community seed banks, technically and operationally, to integrate climate change adaptation more effectively into their activities. This is done through training activities as well as through building relationships with national and international genebanks through which "new" germplasm can be accessed that has better adaptation potential. These efforts are based on an assessment of socio-economic and agro-ecological farming conditions. And finally, IWMI used participatory video to appraise patterns of vulnerability and adaptive capacity for women, with a focus on agricultural water management.

Output: 1.3.2**Summary:**

In 2013 significant traction was gained on this output. There was significant activity of policy support in a number of countries across all 5 CCAFS priority regions, and the year culminated in the publication of a CCAFS report “Planning climate adaptation in agriculture” aimed to take stock of progress to date in the NAP building process, synthesizing lessons from 12 countries in West and East Africa and South Asia. The report presented a “dashboard” view of the approaches taken and status of NAPs for each country, highlighting shortcomings, priorities, and recommendations for future directions. Using the report as a centerpiece, CCAFS Theme 1 organized a 2-day workshop followed by an official side event at the 19th Conference of the Parties of the UNFCCC (COP19) in Warsaw, Poland, to bring together these countries to share their experiences and lessons learned in the NAPs development process. The agriculture in NAPs workshop was attended by 37 participants from 10 countries, representing 4 CCAFS regions. These ministry-level officials from the agricultural sector each had experiences to offer on their country’s NAP process. Mali and Guatemala, in the beginning stages of creating a NAP, were able to cultivate south-south exchanges to inform their approach. Kenya, currently rolling out final development plans, learned from countries that have previously developed National Adaptation Programmes of Action (NAPAs). Ghanaian representatives shared innovative solutions to financial obstacles.

At the country level, an assessment of the status of National Adaptation Plan of Action (NAPAs) in Ethiopia, Tanzania and Uganda and National Adaptation Plan (NAP) in Kenya was completed in 2013. The review focused on assessment of vulnerability to current climate variability and of areas where risks would increase due to climate change, key adaptation measures identified in both NAPAs and NAPs as well as criteria used for prioritizing them, institutional arrangements and socially differentiated adaptation planning approaches applied, and prioritized list of activities including profiles of projects/activities intended to address urgent and immediate adaptation needs.

In collaboration with the Ministry of Environment, Water and Natural Resources (MEWNR) and the Ministry of Agriculture, Livestock and Fisheries (MoALF) in Kenya, a National Adaptation Planning meeting for the Agriculture Sector was organized in mid-September 2013. The meeting built consensus on the priority actions for agriculture proposed in the 2013 – 2017 National Climate Change Action Plan (NCCAP), and considered how Kenya should proactively deal with food production challenges and opportunities presented by climate change. The meeting brought together 47 stakeholders in agriculture and climate change—donors, international and national research institutions, academia, government, private sector representatives, civil society organizations and the media. Prior to that, six roundtable meetings were convened on Climate-Smart Agriculture (CSA) to identify Technologies and Practices; Finance and Investments; Knowledge and Capacity building and Policies and Legal Frameworks for CSA in Kenya. A number of priority actions for climate smart agriculture related to improved water management were identified, including water harvesting, storage and efficient use for agricultural production. Actions were also proposed to support agro-forestry and sustainable land management as well as adoption of improved livestock and fisheries technologies. The key recommendation from the adaptation planning meeting was formation of a consortium to generate specific investments in targeted areas, timelines and budgets, based on the agreed priorities.

In Uganda, IITA examined the role of policy frameworks in facilitating adaptation of climate smart options, focusing on the inter-relationships between policies (and its actors) at national, district and community levels and the constraints hampering policy implementation. The study reviewed national policies that guide natural resource use and management, combined with key informant interviews across the policy implementation continuum. Policies reviewed include National Agriculture Policy 2011; Uganda Forestry Policy 2001 (and acts and regulations); Uganda National Climate Change Policy 2012; National Adaptation Programmes of Action (NAPA); National Wetlands Policy; National Environment Management Policy; and Rakai District Environment Management Bill. Findings show that the policy formulation process follows a top down approach. Also, key implementers are often excluded in the formulation process, and implementation is dependent on donor funding. The limited resources also limit exchanges between communities and districts. Technically, policies are not clear to the users; environmental benefits are not appreciated by many actors and are therefore often excluded from development plans at district and lower levels.

Some significant outcomes from this activity cluster are also now appearing. In 2013 CCAFS science contributed to Nicaragua establishing the National Adaptation Plan for agriculture. Among the issues prioritized is the adaptation of smallholder coffee farmer livelihoods, and market-based diversification of coffee-based income at the national level, an issue which was prioritized partly based on CIAT's impact analyses and engagement in private and public sector policy fora. The National Policy led to the government of Nicaragua to request IFAD to support Nicaragua on the adaptation of the coffee and cocoa supply chain to market and climate change. IFAD will invest 24.12 Mio USD to facilitate productive investments and provide technical assistance to improve productivity and increase adaptation capacities to climate change of poor smallholder producers of cacao and coffee in Nicaragua. This will be complemented by the strengthening of relevant public institutions and policies oriented at providing improved climate-proofed inputs to the production, improved information systems on weather events, as well as a general strengthening of the public sector to formulate incentive-based public policies for smallholder farmers.

The Strategic Action Plan for Mesoamerica has been formulated using a methodology that combines analysis of scientific evidence on the current state of plant genetic resources for food and agriculture (PGRFA) in the region in the context of climate change adaptation, and a broad participatory process involving stakeholders from all countries in the region: Panamá, Costa Rica, El Salvador, Nicaragua, Honduras, Guatemala and Mexico. The plan proposes 64 actions in 6 thematic components, which constitute a road map to strengthen conservation, access and use of plant genetic resources in Mesoamerica for the next ten years. The 6 thematic components are: on-farm and in situ conservation, sustainable use, institutions and policies, education and capacity building, operations, and financial components. The SAPM has been taken up by several national and regional bodies already.

Output: 1.3.3**Summary:**

Multistakeholder research teams in 9 countries continue to analyze their existing access and benefit sharing laws for plant genetic resources vis-a-vis their commitments, under the international plant treaty, to participate in an international system of crop genetic diversity pooling and sharing for agricultural research. ICAR, NBPGR and Bioversity (for CCAFS) published a road map for policy and institutional reforms in India that need to be undertaken at the levels of the Ministries of Agriculture and Environment to implement the multilateral system of access and benefit sharing. ICAR is in the process of developing a south-south technology transfer program whereby India will make adapted crop germplasm available for use in arid and semi-arid farming systems in sub-Saharan Africa. The national agriculture research council led a process to draft a revision of the National Agrobiodiversity Policy to prioritize implementation and participation in the multilateral system of access and benefit sharing. The draft is currently being considered by the Minister of Agriculture; if accepted, it will be further submitted to Cabinet in 2014 (see case study on policy engagement). Eight countries initiated exercises to confirm what crop genetic resources they will include in the multilateral system of access and benefit sharing. One completed the exercise, and the other seven will finish in 2014, sending notification to the secretary of the plant treaty.