



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



**CGIAR Research Program on Climate
Change, Agriculture and Food
Security (CCAFS)**

**CCAFS Site Portfolio: Core Sites in the
CCAFS Regions: East Africa, West
Africa and South Asia**

Version 3, April 2013

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Correct citation:

Förch W, Sijmons K, Mutie I, Kiplimo J, Cramer L, Kristjanson P, Thornton P, Radeny M, Moussa A and Bhatta G (2013). Core Sites in the CCAFS Regions: East Africa, West Africa and South Asia, Version 3. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

Titles in this series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

This document is published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is a strategic partnership of the CGIAR and the Earth System Science Partnership (ESSP).

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Introduction

The CGIAR Research Program Climate Change, Agriculture, Food Security (CCAFS) is a 10-year research initiative launched by CGIAR and the Earth System Science Partnership (ESSP). CCAFS seeks to overcome the threats to agriculture and food security in a changing climate, exploring new ways of helping vulnerable rural communities adjust to global changes in climate. CCAFS brings together the world's best researchers in agricultural science, development research, climate science, and Earth System science to identify and address the most important interactions, synergies and trade-offs between climate change, agriculture and food security. CCAFS also involves farmers, policy makers, donors, non-governmental organizations and other stakeholders to integrate their knowledge and needs into the tools and approaches that are being developed. The overall goal of CCAFS is to overcome the additional threats posed by a changing climate to achieving food security, enhancing livelihoods and improving environmental management. In 2010/2011, CCAFS initially focused on three regions: East Africa (EA), West Africa (WA) and South Asia (SA). Two additional target regions (Southeast Asia and Latin America) were added in late 2012. This report outlines the site selection process of current and future sites and provides a brief overview of the initially selected CCAFS sites.

Region Selection for Initial (Challenge Program) Regions

While there are many regions in the developing world that warrant research investment in relation to climate change, agriculture and food security, as a new program, it was necessary for CCAFS to choose a few initial target regions and sites where new research activities could be initiated. The three initial focus regions were East Africa (EA), West Africa (WA) and South Asia (SA). These were selected in the lead-up to the final challenge program proposal (see CCAFS Report No. 1, available at: <http://ccaafs.cgiar.org/content/publications#scenarios>) largely because they represent areas that are becoming both drier and wetter, and they were felt to be focal areas that will generate results that can be applied and adapted in other regions worldwide as the program evolves. These three regions were also chosen because together they match these and the following criteria to an even greater extent than other possible initial focus regions:

- Poverty and vulnerability: high degree of vulnerability to climate, large poor and vulnerable populations, drivers of vulnerability that extend beyond the focus region.
- Complementary set of social, cultural and institutional contexts.
- Complementary climatic contexts, with different temporal and spatial scales of climate variability and degrees of predictability.
- Significant but contrasting climate-related problems and opportunities for intervention.
- Security, governance, institutional capacity that favor likelihood of generating transferable results. Within both EA and WA, large rural populations who depend on rain-fed, cereal-based subsistence agriculture in the sub-humid and semi-arid zones and on pastoralism in the arid zones are highly vulnerable to climate variability and sensitive to any future changes of climate. Increasing frequency and severity of episodic climate shocks – primarily drought – have led to major food crises in the drylands of both regions, with resultant loss of lives and livelihoods, and a cycle of costly disaster relief competing with long term development for scarce resources.

The climate of WA is characterized by a strong latitudinal rainfall gradient that determines cropping systems, and by dramatic fluctuations in the rainfall regime at multi decadal time scales. These amplify the substantial year to year rainfall variability, and provide an opportunity to look historically at climate-driven shifts in crops and at past adaptations to changes in rainfall regime. The region suffers from widespread land degradation particularly in the semi-arid Sudano-Sahelian zone, but benefits from policy support for regional drought management and for intra-regional trade facilitated by a common currency across the Francophone countries. In contrast, EA exhibits strong

spatial heterogeneity of climate, topography, agro-ecosystems, livelihoods and environmental challenges. Temperature gradients associated with elevation often determine where subsistence agriculture versus higher-value horticultural and plantation agriculture (e.g. tea, coffee) are possible. Rainfall predictability at a seasonal lead time (of 2-3 months) is relatively high in EA, providing an opportunity to support risk management.

South Asia has been characterized by fertile soils, rice-wheat systems, a largely favorable climate and abundant surface and groundwater, providing the basis for food security for the several hundred millions of people in the region. Yet the region is considered to be highly vulnerable to climate change due to its huge population, predominance of agriculture, a relatively limited and depleting resource base, and projected large changes in climatic risks. The western region, with high investment in infrastructure and institutions, effective policy support, and intensive agriculture, faces greater future risks due to increasing episodes of heat and droughts and over-exploitation of natural resources, especially groundwater. The eastern region, with poor infrastructure, low agricultural productivity and limited human capital, already faces a high risk of flooding and drought. These risks are projected to increase over the next few decades.

While drought is clearly a major threat for many parts of Africa and South Asia, CCAFS must consider a holistic view of a changing climate; and wetter conditions, if too wet, may be equally problematic. In areas of increasing rainfall, there is a need to maximize the opportunities that climate change will bring. The three initial CCAFS focus regions offer the full range of anticipated conditions that will allow CCAFS to take this broader view.

Site Selection and Sampling Frame

The site selection process CCAFS followed was based upon two principles: 1) recognition of the need to build strong partnerships with a range of actors (NGO's, government agencies, national agricultural research extension systems (NARES), farmer groups and private sector) already working in these areas, without whom impact on sustainable poverty reduction and improved food security would not be possible; and 2) the desire to build on existing structures, institutions, projects and programs and not 'start from scratch'.

Thus the site selection process started in 2010 with a comprehensive look at what was already happening, where and with whom, in collaboration with CGIAR partners and regional stakeholders within each of the three regions. This wide range of stakeholders assisted in choosing sites where an agreed-upon set of criteria were met (see Table 1).

Table 1: CCAFS Site Selection Criteria

Criterion
A set of research locations representing key biophysical and agro-ecological gradients of the respective regions
Research locations that represent the key socio-economic and (where relevant) demographic gradients for the region, including extent of urbanization and gendered participation in different agricultural production systems
Research sites that lie along gradients of anticipated temperature and precipitation change
Research sites that lie along gradients of current and anticipated land use pressure
Research sites that represent different institutional (e.g. land tenure) arrangements. Similarly, gradients of significant difference in political and governance history
Sites that have significant but contrasting climate-related problems and opportunities for intervention
High potential sites, i.e. where impact is likely to be achieved: sites that build on ongoing CGIAR and national research infrastructure and research sites, and thus have good existing data on historical weather records; characterization of the natural resource base; detailed, longitudinal data on agricultural production; detailed, longitudinal socio-economic and demographic data at the household and village settlement/district level; data on the food system; and data on historical events and shocks experienced in relation to food security in the site
Governance and institutional capacity that favor the likelihood of scaling up and generating transferable results
Local champions knowledgeable about the site and available for/committed to collaborative work with CCAFS
A network of regional partners that will facilitate scaling up
Sites that have mitigation/carbon sequestration potential
Sites that are safe to work in, i.e. have good security for research teams
Research sites that are physically accessible and have the minimum logistical comforts for conducting research
Marginal sites with high vulnerability where impact will be difficult to achieve but where the need for innovative solutions to poverty and climate change vulnerability may be greatest

Relatively large areas were initially selected for consideration. These sites typically include several adjacent districts. They serve as the initial focus of CCAFS partnership-building and long-term research activities. CCAFS, together with its local partners, then identified 10 x 10 km sampling frames where the site selection criteria were met. This sampling frame was chosen based on consultation with CCAFS's statistical advisory group for several reasons (see the household baseline survey manual for a detailed description of the sampling protocols). This will allow CCAFS/partner research teams to link socio-economic research with land-use analyses and carbon measurements partially based on satellite images, for example. In some countries (i.e. WA and Ethiopia), 30 x 30 km sampling frames were chosen because of lower population densities and larger distances between villages, thus ensuring the criteria for household sampling were met in all regions. The sites were selected to include as much variation as possible between sites within each of the target regions. It is recognized that different research activities will be conducted at different scales, and thus it is understood that some research activities will be conducted within the 10km x 10km sampling frame, while other activities will be conducted at the broader landscape level and yet other activities will be conducted at the national level.

It is explicitly recognized that the initial set of sites may be augmented over time (as new priorities and opportunities emerge), that some sites may receive more attention than others, and it is possible that some sites may be phased out (if priorities change over time). Additional sites and partners are being added as research priorities for CCAFS are co-developed with local and regional partners.

Version 1 of this document listed the preliminary set of 36 sites that was selected in 2010 in order to initiate baseline survey implementation. Version 2 of this document included the first changes that were made to the set of sites. Seven sites in Punjab/Haryana (India) were replaced by one site for methodological reasons. An additional site was added in Kenya. Version 3 (this current version) focuses on the 15 core sites in which CCAFS is concentrating its activities. Most of the changes were made in SA, where 4 core sites were chosen from the many initial sites.

Through CCAFS's partner organizations (see Table 2), implementation of the CCAFS baseline in the initial core sites was carried out from 2010-2012. This baseline consists of surveys across three levels – household, village and organizations. It collects indicators that describe current behavior in relation to livelihood systems and farming practices in the CCAFS sites over time, as well as changes made to agriculture and natural resources management strategies in the recent past. Other indicators are helping CCAFS to understand the enabling environment that mediates these practices and behaviors (e.g. natural resource conditions, policies, institutions), as well as the provision of agricultural and climatic information at each site by the organizations that work there. The same survey is being carried out in very diverse locations across all of our target regions. This allows for valid and robust cross-site and cross-regional comparisons to be carried out. The plan is to revisit these households and villages after roughly 5 years, and again in 10 years, to monitor what changes have occurred since the baseline survey was carried out. The goal is not to attribute these changes to CCAFS, as multiple partners and interventions are already underway in these sites, but to be able to assess what kinds of changes have occurred and whether these changes are helping households adapt to, and mitigate, climate change.

All CCAFS baseline guidelines and tools for data collection, processing and analysis, as well as the data itself and the reports are publicly available from: <http://ccafs.cgiar.org/resources/baseline-surveys>

Table 2: CCAFS partner organizations implementing the household level baseline surveys

Country	Site(s)	Team Leaders	Institution
East Africa (EA)			
Kenya	Nyando – Katuk Odeyo Makueni – Wote	Joash Mango Muoti Mwangangi	ICRAF Kisumu Ministry of Agriculture
Tanzania	Usambara - Lushoto	Charles Lyamchai	Selian Ag Research Institute
Uganda	Albertine Rift – Hoima Kagera Basin- Rakai	Florence Kyazze Drake Mubiru	Makarere University NARO
Ethiopia	Borana - Yabero	Solomon Desta	Managing Risk for Improved Livelihoods (Maril)
West Africa (WA)			
	Regional Coordination	Keffing Sissoko, Baba Traore	Institut du Sahel (INSAH)
Mali	Segou - Cinzana	Diakite Lamissa	IER
Niger	Kollo - Fakara	Moussa Boureima	INRAN
Burkina Faso	Yatenga - Tougou	Leopold Some	INERA
Senegal	Kaffrine	Moussa Sal	ISRA
Ghana	Lawra - Jirapa	Jesse Naab	CSIR/SARI
South Asia (SA)			
India	Vaishali Karnal	RKP Singh	Consultant ICRISAT-ICAR
Bangladesh	Bagerhat - Morrelganj	Aminur Rahman	Bangladesh Centre for Advanced Studies (BCAS)
Nepal	Rupendehi	Chiranjibi Adhikari	Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED)

In brief, the following steps were taken in the site selection process:

1. Review and collation by a consultant and CCAFS, in collaboration with the CG wide ICT-KM program, in early 2010 of existing climate change and agriculture related initiatives, both inside and outside CGIAR across the 3 targeted regions. Numerous partners and donors were consulted during this period, particularly CG center 'climate focal points' in an attempt to better understand existing work related to climate change and incorporate in the CCAFS database.
2. A process towards site selection was discussed at a global stakeholder meeting in Nairobi in May 2010¹, including improving the database of on-going projects, and consulting with regional organizations and NARES researchers, development, government and private sector partners.
3. Criteria for site selection were discussed at the Nairobi stakeholder meeting. These criteria centered on: opportunities to build on comparative advantage of partners; strong partnerships already established, particularly with CG centers; ongoing projects of relevance; learning opportunities for adaptation and mitigation; relevance of sites to national and regional food security issues; potential for impact; physical accessibility and security; pre-existing information;

¹ http://ccafs.cgiar.org/sites/default/files/pdf/CCAFS_MP7_Planning_Workshop_Report_May_2010_0.pdf

and that sites chosen across the region should collectively capture important agro- ecological and socio-economic gradients.

4. The CCAFS management team agreed upon the final list of criteria for site selection (see Table 1).
5. Experts were engaged in each region and information as to potential sites that matched the criteria was collected, again through extensive consultation with CGIAR researchers and the principal regional and national organization partners (ASARECA, CORAF, ICAR, NCAR and BCAR). The regional facilitators (or in some cases interim regional facilitators) were actively involved in this summary.
6. The Statistical Service's Centre at University of Reading was engaged to help develop the survey instruments and sampling frame that was agreed upon by the CCAFS team.
7. Regional partnership-building (and scenarios development) workshops were held in Nairobi, Dakar, and New Delhi with sessions for participants to make suggestions to existing information on potential sites. Alignment with initial priority sites and partners (at least one per country) was sought. Workshop reports are available at: <http://ccafs.cgiar.org/scenarios/regional-workshops>
8. Visits were made by CCAFS researchers to the EA sites and further information on potential partners, existing data and projects was collected. Local partners in each country helped to choose the 10x10km sampling frame within the area where the criteria were met.
9. In WA, the Institute du Sahel and ICRISAT were engaged to help further define the 30x30km sampling frames where the criteria were met (larger areas were chosen here because of the lower population density and large distance between villages).
10. Visits were made by CCAFS researchers to SA and detailed surveys and discussions were held with potential partners. Based on the extent of climate risks, and availability of partners and data, a larger number of sites were selected for the baselines at broader regions. In 2012, four sites were selected as 'core sites' in which CCAFS is focusing its activities.
11. It is important to note that partnership building and site selection is an on-going process; additional sites and partners are being added as research priorities for CCAFS are co-developed with local and regional partners.

Selection of Additional CCAFS Regions

The original choice of the three target regions for CCAFS started from the understanding that South Asia and Africa are particularly vulnerable to climate change and deserving of priority attention. Of the various candidates in these two parts of the world, the decision to select three reflected a balance between two competing considerations: (i) working across contexts that are sufficiently heterogeneous to ensure that outputs and outcomes of place based research have global relevance, and (ii) ensuring that sufficient resources are brought to bear to address the deliberately complex problems that CCAFS seeks to address. Details of the deliberations on choice of target regions are given in Box 8 of CCAFS Report No. 1 (available at: <http://ccafs.cgiar.org/resources/reports-and-policy-briefs>). As mentioned above, the initial selection process sought to sample across the challenges of major hydro-meteorological shocks, significant climate-related environmental problems, and high rural poverty rates coupled with large populations dependent on rain-fed subsistence agriculture. Other factors included were the strength of national and regional climate institutions and processes that can support climate information for adaptation, the degree of CGIAR presence, overall progress toward food security goals, and opportunities for synergistic research with the potential for both immediate regional benefits and transferability beyond the regions.

The following steps were used in 2012 to select 2 additional regions for hosting CCAFS activities:

1. A document was drafted outlining the selection criteria, the list of potential target regions, and the proposed process. This was completed after consultation with the CCAFS Management Team and Steering Committee.

2. This document, along with the global vulnerability assessment report (http://ccafs.cgiar.org/resources/climate_hotspots), was circulated to CG center climate change contact points and key global partners, soliciting written comments.
3. An activity was designed to weight each candidate region according to the criteria using objective methods or expert judgment. Where expert judgment is required, the following stakeholders were consulted: (a) Contact points and 5-8 global partners; (b) the Management Team; and (c) the Steering Committee.
4. The results of these deliberations were written up, including the shortlist of proposed regions, and circulated to partners for final feedback, allowing the Management Team to propose final selections in November 2012.

After this process was completed, **Latin America** and **Southeast Asia** were selected as additional CCAFS target regions. Host institutions were selected, Regional Program Leaders hired, and selection of specific sites is now underway. Baselines will be conducted in the new sites in early 2014.

The following section provides site portfolios, including brief site descriptions, coordinates of the sampling frames for the baseline surveys, initial CCAFS activities, on-going CG and non-CG research and activities, current/potential partners and maps for the CCAFS sites in the initial three target regions. The maps will also be available in black and white for ease of printing.

CCAFS Site Portfolios and Maps for East Africa (EA)

Country	Site	Site ID	Sampling frame	Sampling frame ID
Kenya	Nyando	KE01	Katuk Odeyo	01
Kenya	Makueni	KE02	Wote	02
Uganda	Albertine Rift	UG01	Hoima	03
Uganda	Kagera Basin	UG02	Rakai	04
Tanzania	Usambara	TZ01	Lushoto	05
Ethiopia	Borana	ET01	Yabelo	06

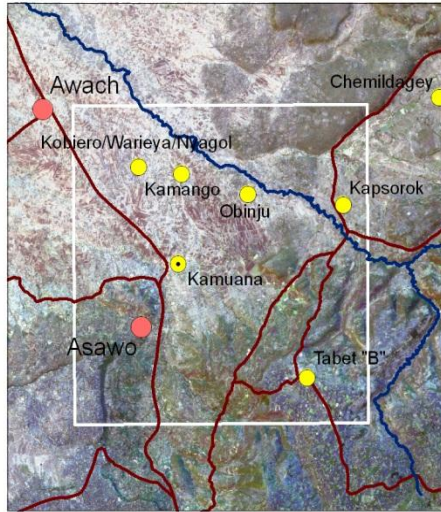
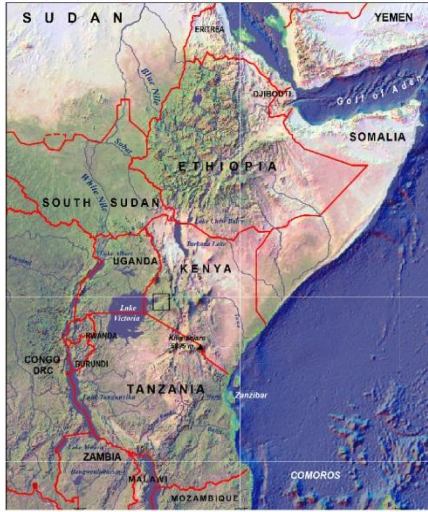
CCAFS Sites: East Africa



- CCAFS Sites
- Ethiopia: Borana (ET01)
- Kenya: Nyando (KE01)
- Kenya: Makueni (KE02)
- Uganda: Albertine Rift (UG01)
- Uganda: Kagera Basin (UG02)
- Tanzania: Usambara (TZ01)

Country: Kenya

CCAFS Sampling Frame: Nyando - Katuk Odeyo



CCAFS Site Name (ID): Nyando (KE01)

CCAFS Sampling Frame Name (ID): Katuk Odeyo (01)

Road

River

Settlement

CCAFS VBS / OBS Village

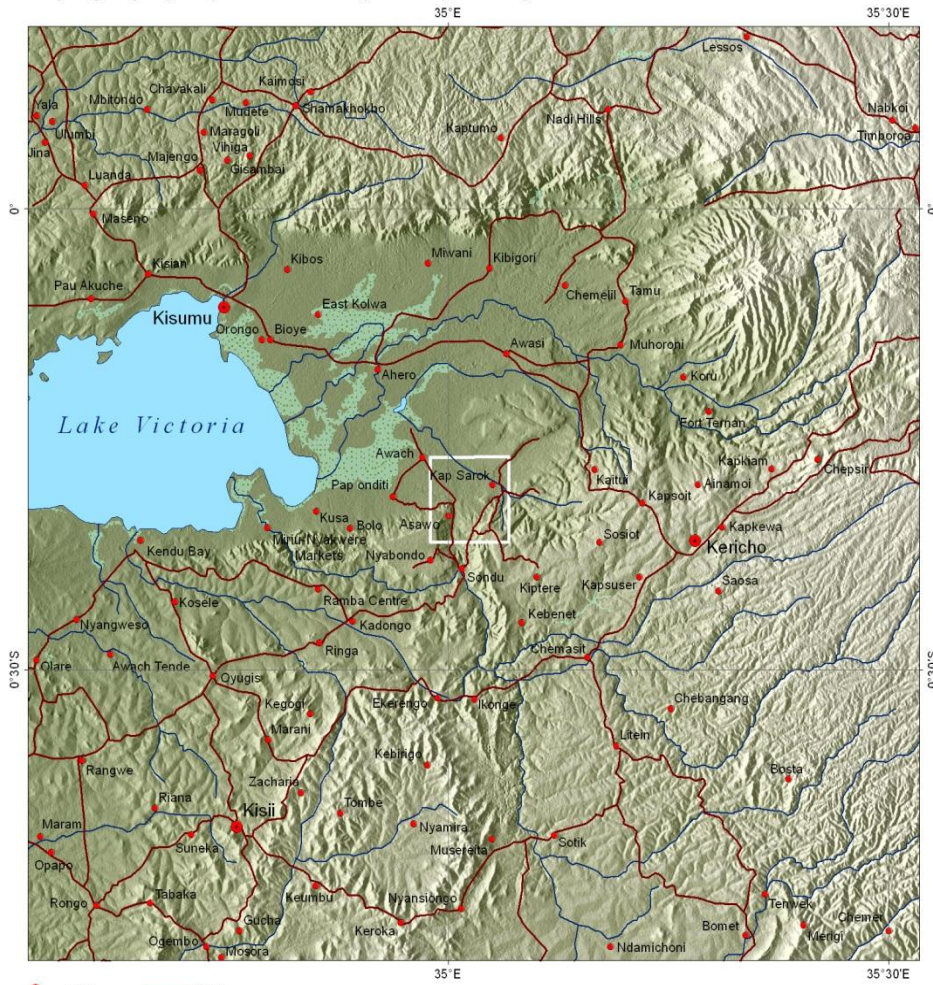
CCAFS HBS Village

Coordinates of the CCAFS Sampling frame

35.068E 0.289S
35.068E 0.361S
34.978E 0.361S
34.978E 0.289S

□ Site location

Topography Nyando Site (KE01), Kenya



● Town

● Settlement

— Road

— River

Wetland

Scale 1:750,000

0 7.5 15 30 45 Kilometers

1 cm = 7.5 km



Sampling frame size: 10km x 10km

Country	
Kenya	
Site Name	Site ID
Nyando	KE01
Sampling Frame Name	Sampling Frame ID
Katuk Odeyo	01
Location	Sampling Frame Coordinates (UTM)
Lower Nyando Basin, Western Kenya	1 35.068 -0.269 2 35.068 -0.361 3 34.978 -0.361 4 34.978 -0.269
Elevation	Climate
Elevation varies from 1,100 m near Lake Victoria to over 2,500 m in the headwaters	- Humid to sub-humid - Average annual rainfall: 900- 1,200 mm - Highly variable, bimodal with peaks Apr-June/Sept-Nov - Climate change/variability already evident: droughts, floods increased with negative impacts on agriculture
General Biophysical Characteristics	General Socio-economic Characteristics
- Soil texture: loams to clays - Lowlands: sandy-clay to silty-loamy soils; mid slope clayey/silty-loams, upland zones loamy soils - Tinderet forest in NE, Mau Forest in Kericho in S are upper Nyando tributaries - Vegetation: mainly shrubs and grasses	The social, economic, and health effects of high poverty rates include loss of labor productivity and labor shortages due to poor health and nutrition status, as well as changes in agricultural practices and productivity.
Farming and Livelihood Systems	
The site is characterised by a mixed rainfed crop-livestock and largely subsistence farming system .Main land uses are cultivation and pasture. Cultivation of crops is the main livelihood but returns have become poorer and poorer over the years due to unreliable weather conditions and soil exhaustion. The community has resorted to hiring land from the neighbouring community for cultivation and pasture.	
Key Challenges	
Challenges include soil erosion, declining soil fertility, drought stress, and flooding in the lower basin during seasonal rainfall events. These are compounded by high poverty rates and low farm labor productivity.The growing population has resulted in less land for both cultivation and pasture.	
Current CCAFS Activities & Outputs (2012 onwards)	
On-going participatory action research under climate smart villages. <ul style="list-style-type: none"> Improving land management practices, incorporating fruit trees to improve nutrition and enhance soil carbon content. 	

- Testing maize/sorghum varieties developed by KARI and CIMMYT that better tolerate drought conditions and are less susceptible to damage by striga weed infestations.
- Including new legumes (e.g. pigeon pea) from ICRISAT that fix soil nitrogen. Better methods for harvesting/storing roots and tubers to reduce pests and diseases damage due to humidity
- Through farmer groups, practicing new ways of producing, treating and storing seeds on-farm.
- Upgrading farmer skills/knowledge on beekeeping, using 175 improved hives in 10 villages.
- Improving local goat/sheep, introducing heat tolerant Gala goats, fast maturing Dorper sheep.
- Introducing confined ranges for local indigenous chicken and using 400 selected hens and cockerels to multiply over 3,000 birds in 250 households.
- Transforming community saving/credit scheme into agric. innovation fund that has generated more than US\$ 15,000, providing loans to self-help groups to trial new farming enterprises such as greenhouse vegetable production and a community-run farm input supply service.
- Partnering with research and seed suppliers to build capacity for farmer-led demonstration gardens that will be used as learning sites for climate smart practices in 7 villages.
- Linking beekeepers with Honey Care Africa to learn new/improved methods for extracting high quality honey that attracts high market value.
- Supporting farmers to share knowledge on how to reduce soil and nutrient losses, increase carbon and tree cover on-farm while managing 22 group nurseries initiated by ICRAF with a capacity to supply 50,000 tree seedlings; work with 55 climate champion farmers, who through collective action, constructed 40 water storage pans to increase water access during drought.
- Institutions: Farmers capacitated in participatory action learning for adaptation, risk, mitigation through partnership with extension services, research institutions, development partners.

Completed CCAFS Outputs

- Household, village and organizational baseline surveys conducted in 2010-2012
<http://ccafs.cgiar.org/resources/baseline-surveys>
- Case study - Empowering a local community to address climate risks and food insecurity in Lower Nyando, Kenya.
http://irishaid.ie/media/irishaid/allwebsitemedia/30whatwedo/HNCJ-conference-papers_final_small.pdf#page=37

Other Research Activities (2012 onwards)

Reading University's Walker Institute, Maseno University and Kenya Meteorological Department: climate information services to generate information to support farmer decisions on crop interventions

Other Research Outputs

- ICRAF: Western Kenya Integrated Ecosystem Management Project (WKIEMP), World Bank, GEF;
- PRESA: Pro-Poor Rewards for Environmental Services in Africa;
- CARE-CCAFS-ICRAF: Making Carbon Finance for Sustainable Agriculture Work for the Poor;
- ILRI: Household Characterization Survey Using the Impact Lite tool.

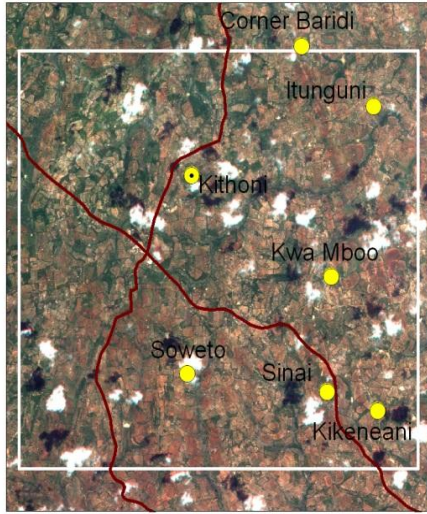
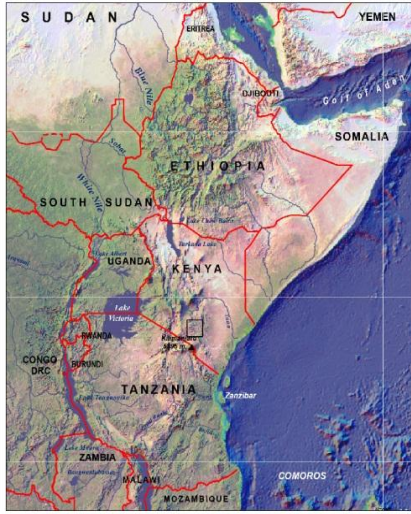
Key CCAFS Partners

Kenya Agricultural Research Institute (KARI) Kibos, VI-Agroforestry, World Neighbors, Ministry of

Agriculture (MoA), Ministry of Livestock and Development (MoLD), ICRAF-Kisumu, CARE-Kenya, ILRI, World Neighbors, Arid Lands Information Network (ALIN), Kenya Forest Service (KFS), Friends of Katuk Odeyo (FOKO), Katuk Farmer's Self Help Group (KAFA), Kapsokale CBO, North East Community Development Programme (NECODEP), Magos farm Enterprises, and Honey Care Africa

Country: Kenya

CCAFS Sampling Frame: Makueni - Wote



CCAFS Site Name (ID): Makueni (KE02)
 CCAFS Sampling Frame Name (ID): Wote (02)

Road

CCAFS VBS / OBS Village

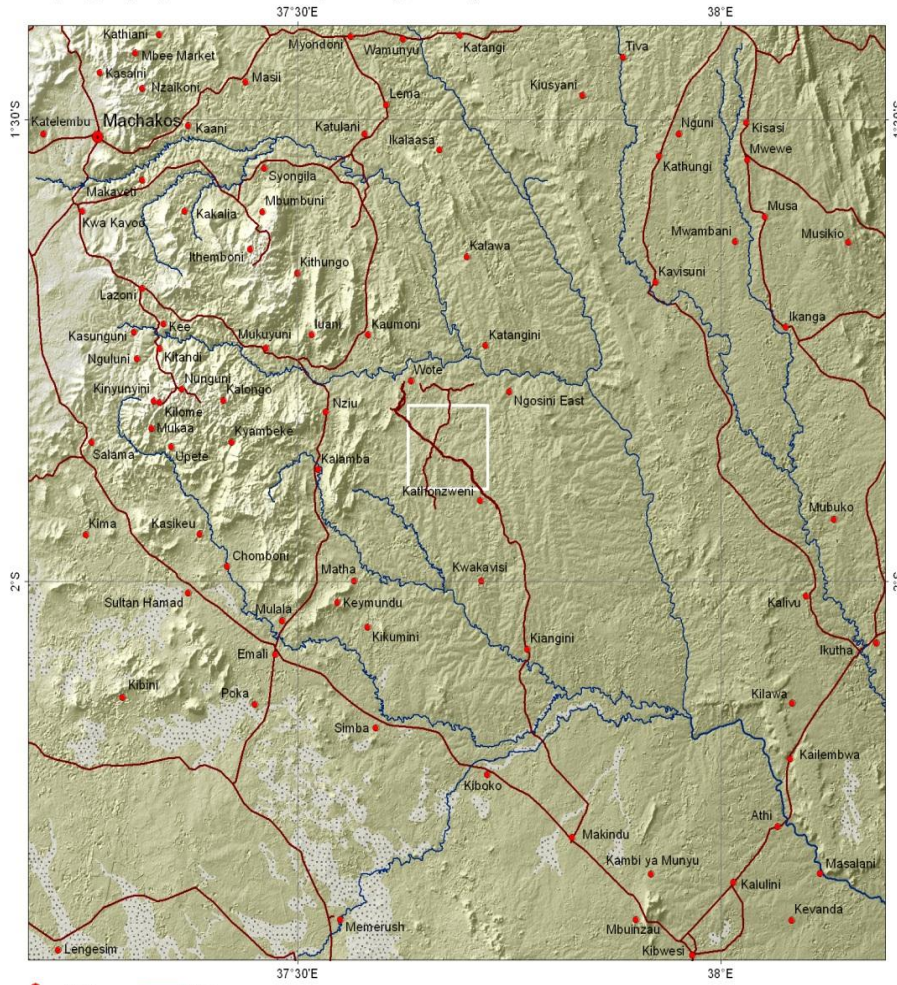
CCAFS HBS Village

Coordinates of the CCAFS Sampling frame

37.724E	1.809S
37.724E	1.900S
37.630E	1.900S
37.630E	1.809S

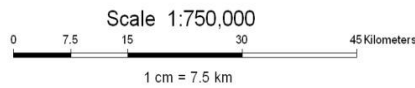
Site location

Topography Wote Site (KE02), Kenya



● Town
 ● Settlement

— Road
 — River
 Wetland



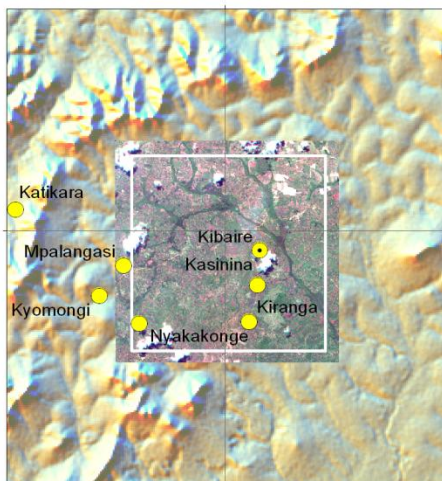
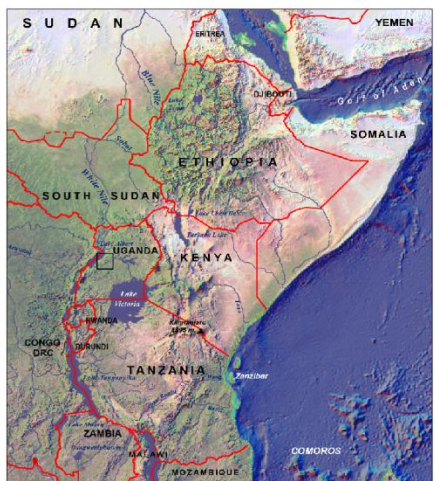
Sampling frame size: 10km x 10km

Country													
Kenya													
Site Name	Site ID												
Makueni	KE02												
Sampling Frame Name	Sampling Frame ID												
Wote	02												
Location	Sampling Frame Coordinates (UTM)												
Wote division, Makueni County. The Machakos to Wote road traverses the block from northwest to southeast	<table border="1"> <tr> <td>1</td> <td>37.724</td> <td>-1.809</td> </tr> <tr> <td>2</td> <td>37.724</td> <td>-1.9</td> </tr> <tr> <td>3</td> <td>37.63</td> <td>-1.9</td> </tr> <tr> <td>4</td> <td>37.63</td> <td>-1.809</td> </tr> </table>	1	37.724	-1.809	2	37.724	-1.9	3	37.63	-1.9	4	37.63	-1.809
1	37.724	-1.809											
2	37.724	-1.9											
3	37.63	-1.9											
4	37.63	-1.809											
Elevation	Climate												
900-1000m	The site is characterized by high variability in annual and seasonal rainfall that amounts to 520 mm per year. Rainfall is distributed over two rainy seasons: long rains (LR) occurring in March-May, short rains (SR) in October-December. SR season is generally considered more reliable than LR season and receives slightly higher rainfall than the LR season.												
General Biophysical Characteristics	General Socio-economic Characteristics												
The site lies in the Arid and Semi-Arid zone in Eastern Kenya and is classified into agro-ecological zones (AEZ); IV, V and VI. The dominant soils types are Lixisols, Luvisols and Acrisols.	Makueni County has a population of 884,527 (2009 census), majority of them being smallholder farmers.												
Farming and Livelihood Systems													
The main farming systems comprise a blend of crop-livestock systems, growing food crops such as maize, cowpea and pigeon pea. Almost all the farmers grow maize, even in areas designated as unsuitable for it. Other crops grown in order of importance are cow peas, beans, pigeon peas and green grams. Other sources of income include beekeeping, small-scale trade, livestock keeping and fruit farming. The farmers' largely rely on rain fed agriculture which is unpredictable leading to uncertainty and risks associated with climate change. This situation has been aggravated by weak government extension services.													
Key Challenges													
Increasing population, immigration from the congested wetter areas and sedentary agrarian and agro-pastoral practices not matched to the available land and water resources. Water stress and erosion													
Current CCAFS Activities & Outputs (2012 onwards)													
<ul style="list-style-type: none"> Adaptation to climate change: This brings together research and development partners testing 													

<p>interventions and finding local solutions together with farmers. These include:</p> <ul style="list-style-type: none"> • Testing sorghum, maize and legumes varieties that have been developed by ICRISAT, CIMMYT and KARI, that tolerate soil moisture stress and pests, and are disease resistant • Policies and institutions: Farmers capacitated in participatory action learning for adaptation, risk management and mitigation through partnership with government extension services, research institutions, and development partners. Learning events like village planting demonstrations, and farmer fair day held at the end of the season. This addresses on-farm production constraints, while emerging lessons on barriers to adaptation are used to inform policy processes at the district level
<p>Completed CCAFS Outputs</p>
<ul style="list-style-type: none"> • Household, village and organizational baseline surveys conducted in 2010- 2012 http://ccafs.cgiar.org/resources/baseline-surveys • Pilot local language radio program to help farmer cope with climate variability in Eastern Kenya – Mbaitu FM. http://ccafs.cgiar.org/blog/pilot-radio-project-tunes-what-farmers-have-say • Report on climate related risks and opportunities for agricultural adaptation in semi-arid Eastern Kenya: http://cgspace.cgiar.org/handle/10568/24695 • Report on enhancing climate resilience through soil water technologies to increase agricultural productivity in semi-arid Eastern Kenya • Report on testing the design and communication of downscaled, probabilistic seasonal forecasts; and evaluating their impact on farmers’ management and livelihood outcomes, by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and KARI Katumani Station
<p>Other Research Activities (2012 onwards)</p>
<p>Climate change mitigation: Quantification of GHG Emissions to inform mitigation interventions in East African agricultural systems</p>
<p>Other Research Outputs</p>
<ul style="list-style-type: none"> • KARI-McGill Food Security Project – Innovations for Resilient Farming in Eastern Kenya http://www.kari.org/karimcgill/makueni-county • Natural Resources Policy Research Programme of the Department for International Development (DFID)- study on Policy requirements for farmer investment in semi-arid Africa
<p>Key CCAFS Partners</p>
<p>Kenya Agricultural Research Institute (KARI) - Katumani Station, Kenya National Federation of Agricultural Producers (KENFAP), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Eastern Broadcasting Corporation (EBC), Ministry of Agriculture (MoA), Ministry of Livestock and Development (MoLD), International Livestock Research Institute (ILRI)</p>

Country: Uganda

CCAFS Sampling Frame: Albertine Rift - Hoima



CCAFS Site Name (ID):
Albertine Rift (UG01)
CCAFS Sampling Frame
Name (ID): Hoima (03)

CCAFS VBS / OBS Village

CCAFS HBS Village

Coordinates of the CCAFS
Sampling frame
31.546E 1.445N
31.546E 1.535N
31.457E 1.535N
31.457E 1.445N

□ Site location

Topography Albertine Rift Site (UG01), Uganda

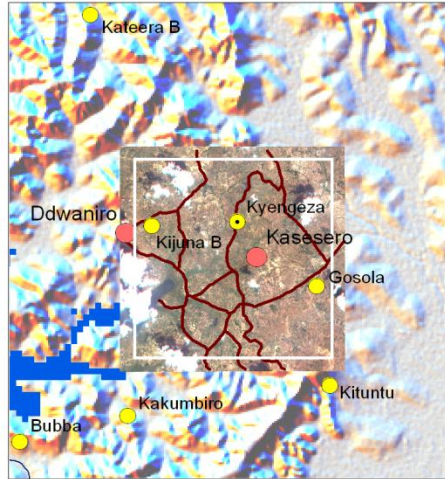


Country		
Uganda		
Site Name	Site ID	
Albertine Rift	UG01	
Sampling Frame Name	Sampling Frame ID	
Hoima	01	
Location	Sampling Frame Coordinates (UTM)	
Albertine Rift, Western Uganda close to Hoima and Kabarole towns	1	31.546 1.535
	2	31.546 1.445
	3	31.457 1.445
	4	31.457 1.535
Elevation	Climate	
The Lake Albert crescent agro ecological zone (AEZ) is characterised by hills and midlands with altitude ranging from 620m asl at the lakeshores to 1600m asl in the hilly parts	The Albertine Rift site in Southwest Uganda is in the Western part of the Great Rift Valley, close to Hoima and Kabarole towns. Hoima has an average rainfall of 1400 mm per year, with bimodal peaks in April to May and August to November	
General Biophysical Characteristics	General Socio-economic Characteristics	
The district is generally undulating with relatively flat low lying area alternating with broad hills. The vegetation is mainly savannah with short and tall grasses and shrubs. The zone has three sub agro ecological zones which include; western mid altitude, semuliki flats and moist northern farmlands	The major source of livelihood is agriculture. Over 90% of the households derive their livelihood from agriculture with crop enterprise leading followed by livestock. Other enterprises which are practiced to a small extent include fish farming and bee keeping (apiary). Off farm income sources include; petty trade, renting out labour, local beer brewing and a few cases of government and non-governmental employment.	
Farming and Livelihood Systems		
The farming system is highland agroforestry, mid-hill coffee/tea, and small-scale mixed farming/commercial to dry land small-scale agriculture/ agro pastoralism along Lake Albert.		
Key Challenges		
The major resource challenges are soil erosion and declining soil fertility		
Current CCAFS Activities & Outputs (2012 onwards)		
<ul style="list-style-type: none"> Adaptation to climate change: This brings together research and development partners testing interventions and finding local solutions together with farmers. These include: Testing of bean varieties develop by CIAT Pan-Africa Bean Research Alliance (CIAT-PABRA) for 		

<p>tolerance to drought conditions, pests and disease resistant</p> <ul style="list-style-type: none"> • Policies and institutions: Farmers capacitated in participatory action learning for adaptation and risk management through partnership with government extension services, research institutions, and development partners, and farmers organizations. Learning events like village planting and processing of farm produce demonstration, and farmer fair day held at the end of the season to address farm level production constraints.
<p>Completed CCAFS Outputs</p>
<ul style="list-style-type: none"> • Household, village and organizational baseline surveys conducted in 2010 - 2012 http://ccafs.cgiar.org/resources/baseline-surveys • Detailed site characterization report available (December 2010). • Empowering communities to use scientific climate and weather information integrated with indigenous knowledge to build resilient livelihoods with National Agricultural Research Organization (NARO)
<p>Other Research Activities (2012 onwards)</p>
<ul style="list-style-type: none"> • CIAT (AFSIS): Land Degradation Surveillance Framework (LDSF) survey in Hoima • IITA: Carbon Sequestration through Improved Productivity and Profitability of Smallholder Coffee Systems in East Africa Project. • IFPRI: Potential for engaging farmers in carbon sequestration through soil fertility management. • CIAT Tropical Soil Biology and Fertility Institute (TSBF): Northeast of Hoima District, linking farmers to markets for organic agriculture (small scale cash cropping ginger, pineapple, etc) with export interest. Local partner Africa 2000 Network. • World Agroforestry and African Highlands Initiative (AHI): Pro-poor Rewards for Environmental Services in Africa (PRESA), information on economic activities and land management in region. • Africa Rice: Working with Hoima ZARDI to develop rice varieties. Socio-economic data available from Hoima and Kabaale (2009-2010). • Bulindi Zonal Agriculture Research and Development Institute, Hoima (ZARDI) of the National Agriculture Research Organization (NARO): New varieties and technologies are tested on station, technologies released and up-scaled in collaboration with NAADS, other research organizations (ASARECA, etc) and NGOs (Sasakawa Group 2000, AfricaNet 2000, etc). • Wildlife Conservation Society (WCS): Strengths in GIS, corridor planning and development, setting conservation priorities. • USAID Predict project: Agro-ecosystem modeling along forest margins.
<p>Other Research Outputs</p>
<ul style="list-style-type: none"> • CIAT (AFSIS): Land Degradation Surveillance Framework (LDSF) survey in Hoima
<p>Key CCAFS Partners</p>
<p>National Agriculture Advisory Service (NAADS), Makerere University, National Agricultural Research Organisation (NARO)-Kawanda, NARO-Bulindi Zonal Agricultural Research and Development Institute (ZARDI), Hoima District Farmers Association (HODFA), International Center for Tropical Agriculture -Pan-Africa Bean Research Alliance (CIAT-PABRA), District Agricultural Office</p>

Country: Uganda

CCAFS Sampling Frame: Kagera Basin - Rakai



CCAFS Site Name (ID):
Kagera Basin (UG02)

CCAFS Sampling Frame
Name (ID): Rakai (04)

- Road
- Settlement
- CCAFS VBS / OBS Village
- CCAFS HBS Village

Coordinates of the CCAFS
Sampling frame

31.484E	0.621S
31.484E	0.713S
31.394E	0.713S
31.394E	0.621S

□ Site location

Topography Kagera Basin Site (UG02), Uganda



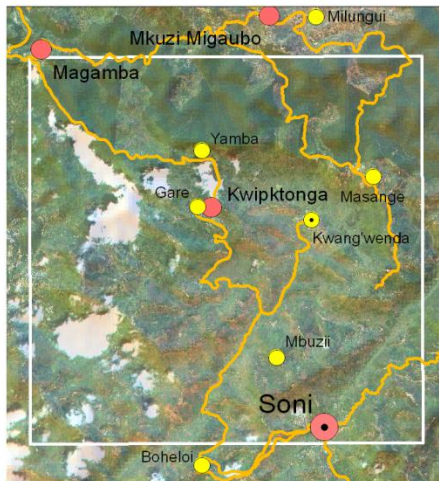
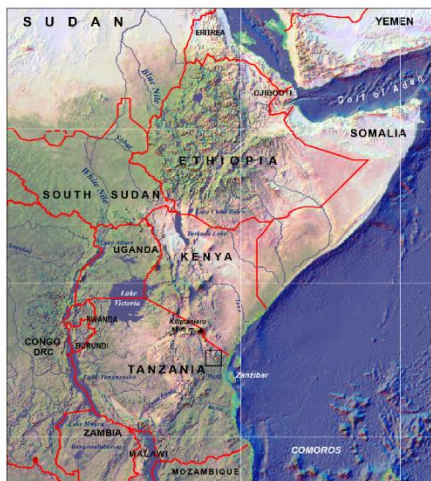
Sampling frame size:
10km x 10km

Country	
Uganda	
Site Name	Site ID
Kagera Basin	UG02
Sampling Frame Name	Sampling Frame ID
Rakai	04
Location	Sampling Frame Coordinates (UTM)
Rakai and Isingiro Districts, Southeastern Uganda, easy access from Kampala, Isingiro, Mbarara towns	1 31.484 -0.621
	2 31.484 -0.713
	3 31.394 -0.713
	4 31.394 -0.621
Elevation	Climate
1,280m asl	Rakai has steep rainfall gradient, high (> 1400 mm) along Lake Victoria, rapidly declining to low in Western Rakai and Isingiro (< 1000 mm). Rakai District is known for increasing climatic variability, Isingiro for vulnerable dryland agro pastoralism.
General Biophysical Characteristics	General Socio-economic Characteristics
The Kagera River Basin provides a major catchment (approximately 10% of the water of the downstream Nile Basin and 75% of the upstream of the Lake Victoria Basin). The main soil types are Ferralsols (red soils), Acrisols and Luvisols (sandy loam to clay loam soils), Gleysols and Planosols (clay soils), Andosols (volcanic soils). The basin vegetation includes a complex of forest and woodland, savannah shrub and grasslands and wetlands.	Staples and coffee are purchased by middle men and sold at local markets and Kampala. Land ownership contentious as few people hold land titles. The first case of HIV in Uganda was diagnosed in Rakai. Subsequently long-term health programs originally focused on HIV but broadened into health and nutrition.
Farming and Livelihood Systems	
The site has rain fed annual smallholder farming systems along the lake, mid-hill perennial mixed coffee agro-forestry in the centre, and large areas of highly vulnerable smallholder agro pastoralism in the western half of Rakai and Isingiro. Many farmers have resorted to planting with each rain, leading to losses of seeds and labor. Communities tend to survive more on perennials and cassava. Cattle migrate into the site from Tanzania, resulting in heavy grazing pressure. The main staples grown include: maize, bananas, cassava, beans, potato, and sweet potato. The cash crops include: coffee, tobacco, sugar cane.	
Key Challenges	
Region experiences heavy deforestation for charcoal and firewood, reduced river flow and water stress.	
Current CCAFS Activities & Outputs (2012 onwards)	
<ul style="list-style-type: none"> Adaptation to climate change: This brings together research and development partners testing 	

<p>interventions and finding local solutions together with farmers. These include:</p> <ul style="list-style-type: none"> • Testing of bean varieties develop by CIAT Pan-Africa Bean Research Alliance (CIAT-PABRA) for tolerance to drought conditions, pests and disease resistant • Policies and institutions: Farmers capacitated in participatory action learning for adaptation and risk management through partnership with government extension services, research institutions, and development partners, and farmers organizations. Learning events like village planting and processing of farm produce demonstration, and farmer fair day held at the end of the season to address farm level production constraints. The emerging lessons and best practices feed into the policy process at the country level
<p>Completed CCAFS Outputs</p>
<ul style="list-style-type: none"> • Household, village and organizational baseline surveys conducted in 2010 - 2012 http://ccafs.cgiar.org/resources/baseline-surveys • Detailed site characterization report available (Dec 2010). • Empowering communities to use scientific climate and weather information integrated with indigenous knowledge to build resilient livelihoods; by the National Agricultural Research Organization (NARO)
<p>Other Research Activities (2012 onwards)</p>
<ul style="list-style-type: none"> • ILRI: Quantification of GHG Emissions to Inform Mitigation interventions in East African Agricultural Systems; by ILRI • National Agriculture Research Organization (NARO) Zonal Agriculture Research and Development Institute (ZARDI) in Mbarara: New varieties and technologies are tested on station, technologies released and up-scaled in collaboration with NAADS, other research organizations and NGOs. • IITA: Carbon Sequestration through Improved Productivity and Profitability of Smallholder Coffee Systems in East Africa Project. Baseline survey in Rakai with associated plots, farming systems, banana/coffee farming, soil samples, plant samples. • Rakai Health Services Program (MRC/UVRI): 30 years of health and nutrition status data with a longitudinal panel of 13,000 households in Rakai district. • Lake Victoria Environmental Management Project (LVEMP): Soil maps, erosion hazards, land use/land change. • Ministry of Water and Environment Meteorological Service: Meteorological data, climate information and forecasting.
<p>Other Research Outputs</p>
<p>ILRI: Household Characterization Survey Using the Impact Lite tool</p>
<p>Key CCAFS Partners</p>
<p>National Agricultural Research Organisation (NARO)-Kawanda, National Livestock Resources Research Institute (NaLIRRI), District Agricultural Office, CIAT-PABRA</p>

Country: Tanzania

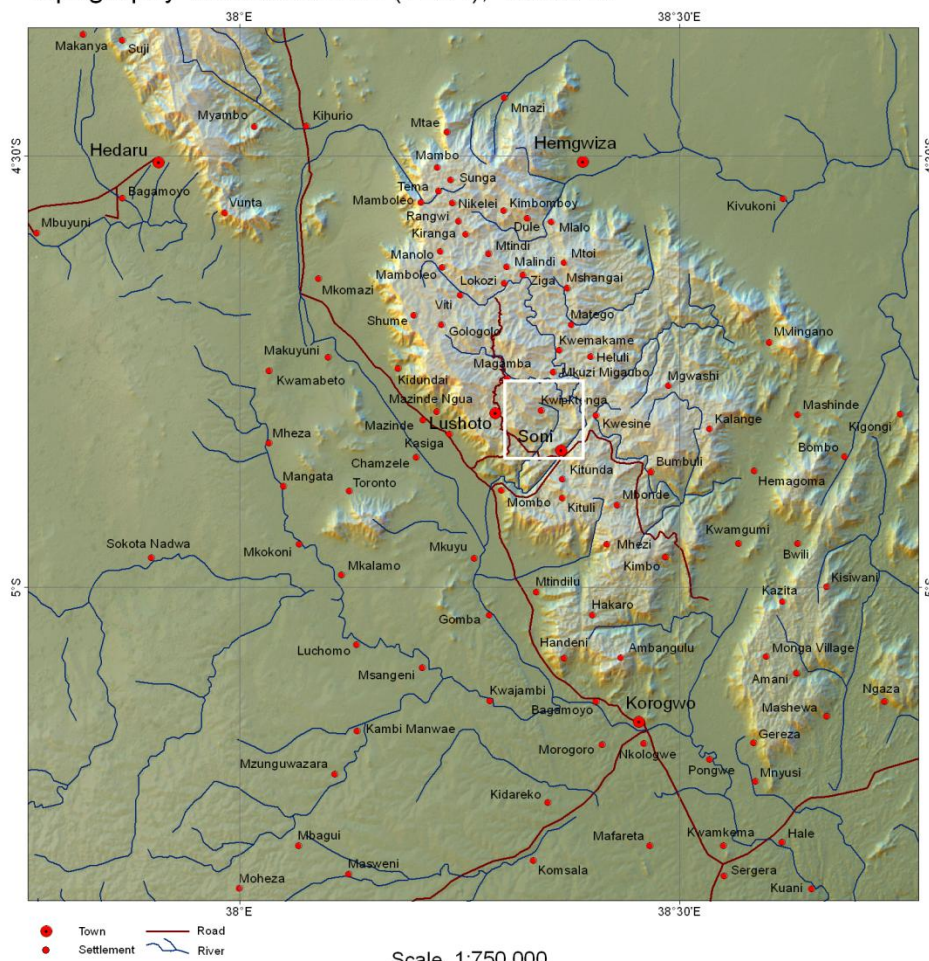
CCAFS Sampling Frame: Usambara - Lushoto



- CCAFS Site Name (ID):
Usambara (TZ01)
- CCAFS Sampling Frame
Name (ID): Lushoto (05)
- Town
 - Settlement
 - Road
 - CCAFS VBS / OBS Village
 - CCAFS HBS Village
- Coordinates of the CCAFS
Sampling frame**
- 38.417E 4.790S
 - 38.417E 4.850S
 - 38.301E 4.850S
 - 38.301E 4.790S

□ Site location

Topography Usambara Site (TZ01), Tanzania



Sampling frame size:
10km x 10km

Country	
Tanzania	
Site Name	Site ID
Usambara	TZ01
Sampling Frame Name	Sampling Frame ID
Lushoto	05
Location	Sampling Frame Coordinates (UTM)
Lushoto District in West Usambaras, Northeastern Tanzania, close to Lushoto town	1 38.417 -4.790 2 38.417 -4.850 3 38.301 -4.850 4 38.301 -4.790
Elevation	Climate
900 – 2250m asl	Lushoto is the most densely populated rural district in Tanzania with an average land size of about 2 acres per household. The CCAFS Lushoto site is in a mid to high altitude ecology, with bimodal rainfall patterns (1200–1300 mm per year) and wet seasons in March–May and Oct-Dec
General Biophysical Characteristics	General Socio-economic Characteristics
Site covers two agro-climatic zones: Humid Warm Zone and Humid Cold Zone. Soil types range from Chromic Luvisols to Rhodicferralsols, and luvicphaezems	Usambara mountains with excellent climatic conditions attract not only farming communities but also tourists and provide natural resource products to populations and industries in and outside West Usambara.
Farming and Livelihood Systems	
The site has diverse micro eco-zones within a relatively small area; mixed crop-livestock and intensive farming systems in higher elevation and agro-pastoral farming systems in lower elevation. It is part of the Eastern Arc Mountains of East Africa and is a global hotspot for biodiversity.	
Key Challenges	
The main challenge is high levels of soil erosion due to the steep slope terrain and high population. Land is a limiting factor due to increasing population and poor land productivity. Lack of by-laws or the ability to enforce them, which is necessary to enhance conservation efforts, has led to the failure of implementing measures to improve environmental services	
Current CCAFS Activities & Outputs (2012 onwards)	
<ul style="list-style-type: none"> Climate information services partnership between Sokoine University of Agriculture (SUA) and Tanzania Meteorological Agency (TMA).SUA-TMA is integrating indigenous knowledge and scientific weather and climate forecasting for risk management in the CCAFS site. Testing early maturing cassava, and Irish and sweat potato varieties developed by CIP and IITA for disease resistance 	

- Testing early maturing and pest tolerant maize and beans varieties developed by CIYMMT and CIAT-PABRA
- Climate mitigation groups to share knowledge on how to reduce soil and nutrient losses from crop land, increase carbon and tree cover on-farm while managing 5 tree nurseries initiated by TAFORI, with a capacity to supply over 20,000 tree seedling.
- Policies and institutions: Farmers capacitated in participatory action learning for adaptation, risk management and mitigation through farmer-to-farmer exchange visit under the 'Farms of the Future' project. The exchange group from Lushoto was exposed to a wide range of ongoing community adaptation and risk management strategies. <http://ccafs.cgiar.org/blog/one-mans-future-another-mans-present-farms-future-hits-tanzania>.
- Shared learning to overcome farm level constraints. Occurs when agricultural extension staff interact with farmers who are members of the experimentation network and savings and credit cooperative societies, and those involved in the weather forecasting using indigenous knowledge. Planting, soil and water conservation demonstrations, and farmer fair events at the end of the season are done.
- Champion farmers participating in national farmer fair events, and lessons learnt on overcoming barriers to adaptation used to inform policy processes at the district and national levels

Completed CCAFS Outputs

- Household, village and organizational baseline surveys conducted in 2010 - 2012 <http://ccafs.cgiar.org/resources/baseline-surveys>
- Integration of indigenous knowledge (IK) and scientific weather and climate forecasting; by Sokoine University of Agriculture (SUA) and Tanzania Meteorological Agency (TMA)

Other Research Activities (2012 onwards)

- Land Degradation Surveillance Framework (LDSF) survey in Lushoto done in conjunction with AFSIS
- ILRI: Household Characterization Survey Using the Impact Lite tool.
- ILRI: Quantification of GHG Emissions to Inform Mitigation interventions in East African Agricultural Systems

Other Research Outputs

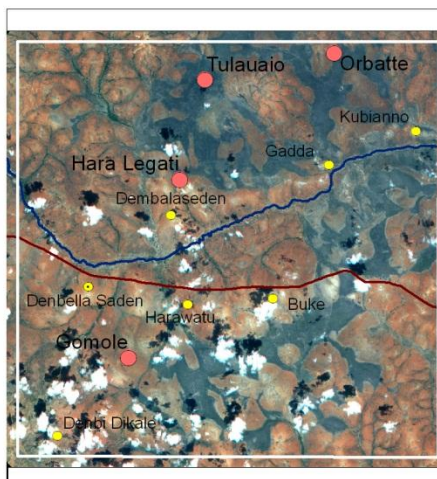
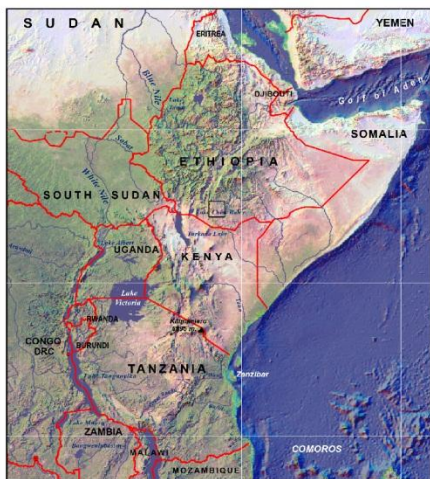
- Land Degradation Surveillance Framework (LDSF) survey in Lushoto done in conjunction with AFSIS <http://ccafs.cgiar.org/blog/healthy-soil-tanzania-new-project>
- ICRAF - African Highlands Initiative (AHI): Pro-poor Rewards for Environmental Services in Africa (PRESA)
- In 2009, Selian Agricultural Research Institute carried out research to take stock of rewards for environmental services initiatives.

Key CCAFS Partners

Selian Agricultural Research Institute (SARI), Ministry of Agriculture and Livestock Development, Tanzania Forestry Research Institute (TAFORI), Sokoine University of Agriculture (SUA), Lushoto District Agriculture and Livestock Development Office (DALDO), Tanzania Meteorological Agency (TMA).

Country: Ethiopia

CCAFS Sampling Frame: Borana - Yabero



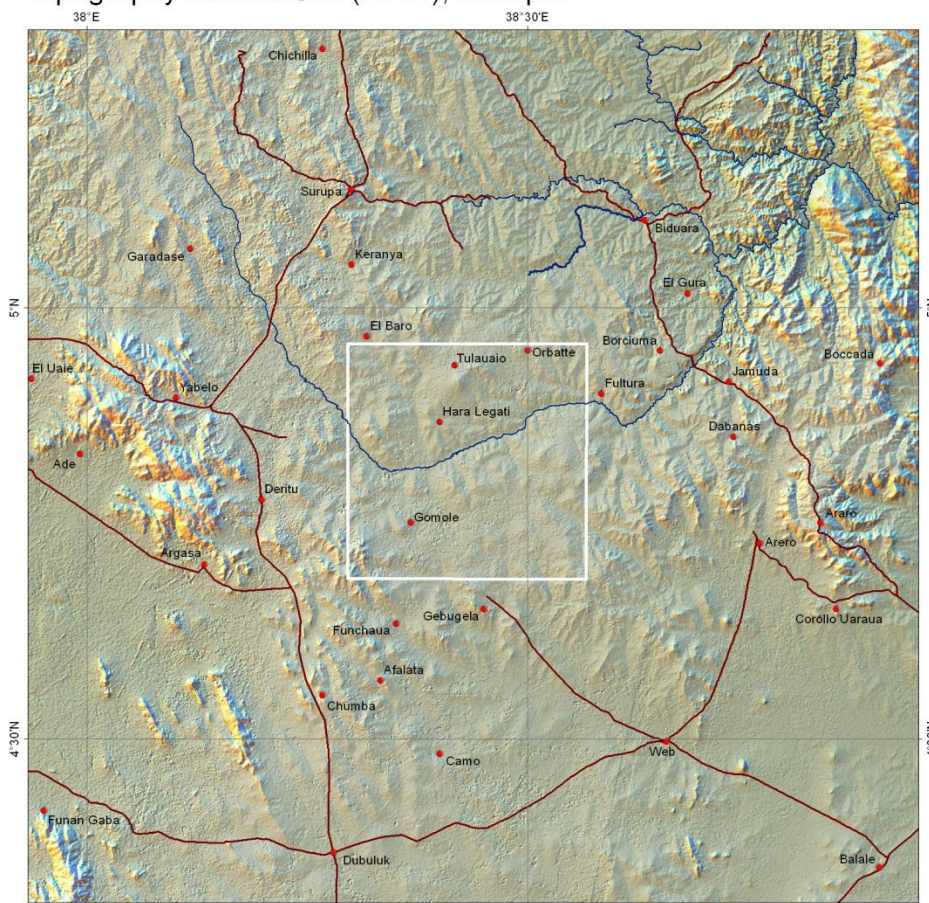
CCAFS Site Name (ID): Borana (ET01)
 CCAFS Sampling Frame Name (ID): Yabero (06)

Road
 River
 Settlement
 CCAFS VBS / OBS Village
 CCAFS HBS Village

Coordinates of the CCAFS Sampling frame
 38.296E 4.957N
 38.567E 4.957N
 38.567E 4.686N
 38.296E 4.686N

□ Site location

Topography Borana Site (ET01), Ethiopia



Sampling frame size: 30km x 30km

● Settlement
 — Road
 — River



Country	
Ethiopia	
Site Name	Site ID
Borana	ET01
Sampling Frame Name	Sampling Frame ID
Yabero	06
Location	Sampling Frame Coordinates (UTM)
Yabelo, Dire, Dilo, Arero Woredas, Eastern part of Borana Zone in southern Ethiopia, close to Yabelo town	1 38.567 4.957
	2 38.567 4.686
	3 38.296 4.686
	4 38.296 4.957
Elevation	Climate
1000 – 2000m asl	The Borana site in Southern Ethiopia is semi-arid, with bimodal rainfall patterns (500–600 mm per year) with distribution peaks in March-April-May and September-October-November. Borana is extremely drought-prone with increased rainfall variability and shorter cycles of inter-annual droughts during the last decade.
General Biophysical Characteristics	General Socio-economic Characteristics
The main soils of the region comprise 53% red sandy loam soil, 30% black clay and volcanic light coloured silty clay and 17% silt and vertisols. Four major vegetation types have been described: Evergreen and semi-evergreen bush land and thickets, rangeland dominated by Acacia and Commiphora trees and dwarf shrub grassland	Borana pastoralists who live in southern Ethiopia, CCAFS learning site, make their living mainly from livestock keeping, cattle, shoats and camels. Recently, crop cultivation and poultry production are making their ways into the system
Farming and Livelihood Systems	
The site is mainly pastoral farming system with pockets of rain fed farming in the lowlands. The Borana traditionally managed variability of natural resources (water and pasture) through a complex system of Natural Resource Management (NRM) revolving around clusters of hand-dug deep wells, guided by strong customary institutions for NRM and conflict resolution. Livelihoods are vulnerable, as traditional safety nets are weakened by climate-related and other drivers of change. The Borana engage in more opportunistic cropping along water courses and when/where rainfall permits, some are shifting herd composition to camels. Many pastoralists are pushed to other livelihoods; accumulation of herd wealth by a few and increasing number of very destitute households has resulted in increasing inequality.	
Key Challenges	
The major resource challenges are water stress and frequent drought	

<p>Current CCAFS Activities & Outputs (2012 onwards)</p> <p>Climate risk Management: Empowering women farmers through:</p> <ul style="list-style-type: none"> • Assessing climate change/ variability related risks and opportunities using participatory rural appraisal in pastoral and agro pastoral systems • Adaptation to climate change through: integrated research under climate smart villages by testing adaptation interventions for vulnerable pastoralist communities
<p>Completed CCAFS Outputs</p> <ul style="list-style-type: none"> • Household, village and organizational baseline surveys conducted in 2010 - 2012 http://ccafs.cgiar.org/resources/baseline-surveys • Report on pastoralists and agro pastoralists’ indigenous weather forecasting system and its effectiveness in Borana, Southern Ethiopia. • Report on social innovation and rangeland enclosure to adapt to a changing climate to achieve feed and food security: A case study on climate risk management in Borana CCAFS Learning Site
<p>Other Research Activities (2012 onwards)</p> <ul style="list-style-type: none"> • ILRI: Index Based Livestock Insurance Project (IBLI) • IFPRI: Evaluation of Pastoral Pilot Productive Safety Net Program (PSNP) • PARIMA: long-term Global Livestock CRSP research program until 2010: data is publicly available
<p>Other Research Outputs</p> <p>IBLI: herd dynamics through 10 year recalls starting late 2010; will produce extensive baseline surveys, to be repeated annually for four years to robustly estimate the welfare impacts of insurance across several key indicators; 220 household willingness to pay survey exists</p>
<p>Key CCAFS Partners</p> <p>Managing Risk for Improved Livelihood (MARIL), National Meteorological Agency (NMA), Yabelo Agricultural Research Station (part of Oromia Agricultural Research Station); CARE-Ethiopia, Yabello District local government (Department of Environmental management)</p>

CCAFS Site Portfolios and Maps for West Africa (WA)

Country	Site	Site ID	Sampling frame	Sampling frame ID
Burkina Faso	Yatenga	BF01	Tougou	07
Ghana	Lawra-Jirapa	GH01	Lawra	08
Mali	Segou	MA01	Cinzana	09
Niger	Kollo	NI01	Fakara	11
Senegal	Kaffrine	SE01	Kaffrine	12

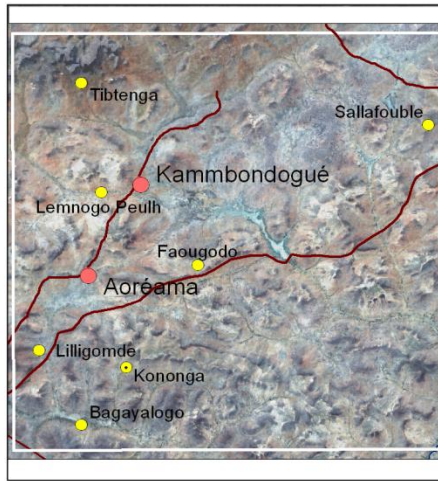
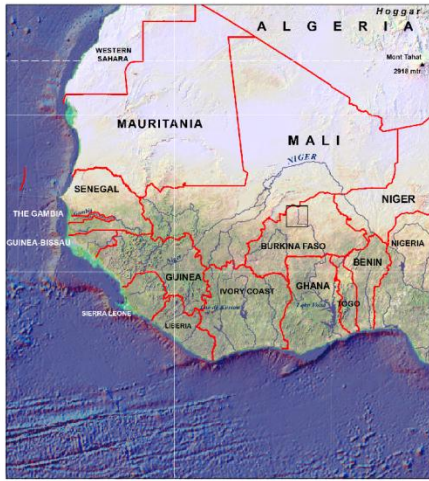
CCAFS Sites: West Africa



- CCAFS Sites
- Burkina Faso: Yatenga (BF01)
- Ghana: Lawra-Jirapa (GH01)
- Mali: Segou (MA01)
- Niger: Kollo (NI01)
- Senegal: Kaffrine (SE01)

Country: Burkina Faso

CCAFS Sampling Frame: Yatenga - Tougou



CCAFS Site Name (ID): Yatenga (BF01)

CCAFS Sampling Frame Name (ID): Tougou (07)

- Road
- Settlement
- CCAFS VBS / OBS Village
- CCAFS HBS Village

Coordinates of the CCAFS Sampling frame

2.113W	13.828N
2.113W	13.554N
2.391W	13.554N
2.391W	13.828N

□ Site location

Topography Yatenga Site (BF01), Burkina Faso

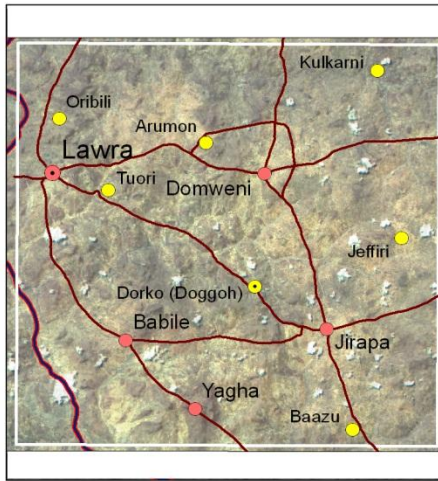


Country	
Burkina Faso	
Site Name	Site ID
Yatenga	BF01
Sampling Frame Name	Sampling Frame ID
Tougou	07
Location	Sampling Frame Coordinates (UTM)
Yatenga Province lies on the Central Plateau of Burkina Faso, and is one of the four provinces of the North region. Ouahigouya is the regional capital located about 180 km north-western Ouagadougou	1 -2.113 13.828 2 -2.113 13.554 3 -2.391 13.554 4 -2.391 13.828
Elevation	Climate
300-350m asl	Ranges from sudano sahelian to Sahelian type with a dry period from October to May and a raining season from June to September. Average annual rainfall ranges from 400 to 700 mm/yr. Intra and inter year rainfall variation.
General Biophysical Characteristics	General Socio-economic Characteristics
<p>Land area: 6990 km².</p> <p>High rainfall variability, very drought prone, and low levels of soil fertility are the major biophysical constraints. Nearly 70% of the land is unsuited for agriculture purposes. Soil erosion is widespread</p>	<p>The Yatenga province is made of 13 Departments. Population was estimated to 547 952 hab (2006). Approx. 90 % of farmers are engaged in subsistence farming (cereals production) and extensive livestock production (small ruminants).</p>
Farming and Livelihood Systems	
<ul style="list-style-type: none"> • Small-scale farming systems, predominantly agro-sylvo-pastoral based on extensive cereals (millet, maize and sorghum production). • Extensive livestock system (small ruminants) • Incomes sources: agriculture, livestock sales, small businesses (arts and crafts, traditional, small shops), • Collection and sales of firewood, trees fruits (<i>Adansonia digitata</i>), trees leaves (<i>Moringa Oleifera</i>) • Remittance 	
Key Challenges	
<ul style="list-style-type: none"> • Eroded and barren land • Poor fertile soils • land degradation (erosion) and desertification • Climate variability (high rainfall variability (intra and inter years)) 	

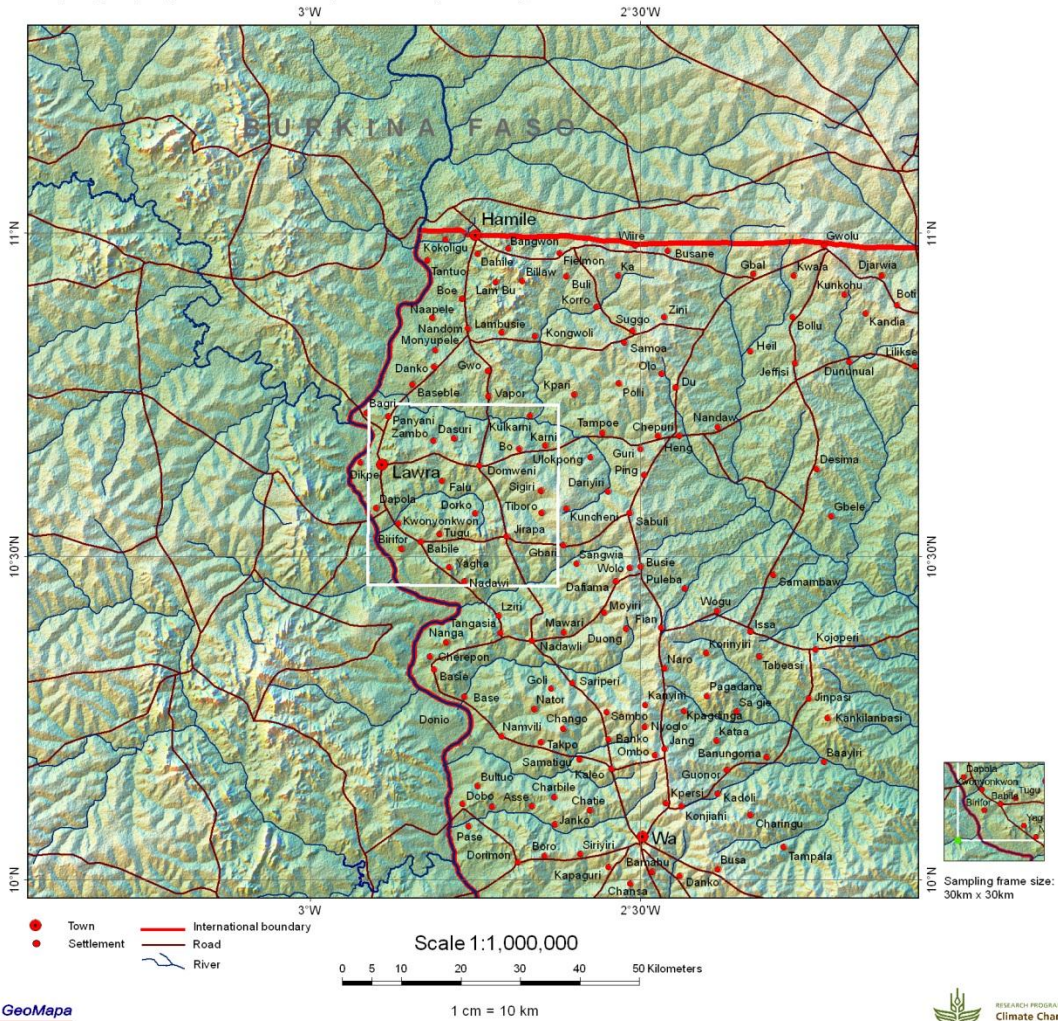
<ul style="list-style-type: none"> • Food insecurity and rural poverty
<p>Current CCAFS Activities & Outputs (2012 onwards)</p>
<ul style="list-style-type: none"> • Participatory action research to promote climate smart agriculture - ICRAF • Tailoring climate information to the needs of small-scale farmers – INERA, DNM, AGRHYMET • Sustainable agricultural intensification - ICRAF • Impact Pathways and Gender Integration for Climate Change, Agriculture and Food Security Program, in the Yatenga Province of Burkina Faso – IUCN • Harvesting Adaptation Outcomes of Climate Change, Agriculture and Food Security (PHAO-CCAFS) Programme in West Africa: Burkina Faso, Ghana, Mali, Niger and Senegal - IUCN • Farms of the future: understanding social and cultural barriers to climate change adaptation through farmers exchange, INERA • IMPACTlite for detailed household characterization - ILRI
<p>Completed CCAFS Outputs</p>
<ul style="list-style-type: none"> • Detailed household baseline data (IMPACTlite) - data • Village baseline study: site analysis for Yatenga, Burkina Faso – report (http://cgspace.cgiar.org/handle/10568/25193) • Summary of household baseline survey: Tougou, Burkina Faso – report (http://cgspace.cgiar.org/handle/10568/21100)
<p>Other Research Activities (2012 onwards)</p>
<ul style="list-style-type: none"> • Participatory action research to promote climate smart agriculture: to test and validate in partnership with rural communities and other stakeholders, sustainable agricultural intensification technologies that integrates range of innovative adaptation and mitigation strategies - ICRAF • Tailoring climate information to the needs of small-scale farmers – INERA, Direction Nationale de la Météorologie du Burkina Faso, AGRHYMET, INERA. • Farms of the future: understanding social and cultural barriers to climate change adaptation through farmers exchange: INERA
<p>Other Research Outputs</p>
<p>Key CCAFS Partners</p>
<ul style="list-style-type: none"> • INERA • IUCN • Direction de la Météorologie Nationale du Burkina Faso • ICRAF • CONEDD

Country: Ghana

CCAFS Sampling Frame: Lawra-Jirapa



Topography Lawra-Jirapa Site (GH01), Ghana



Country													
Ghana													
Site Name	Site ID												
Lawra-Jirapa	GH01												
Sampling Frame Name	Sampling Frame ID												
Lawra	08												
Location	Sampling Frame Coordinates (UTM)												
Upper West Region, one of the five districts that make up the Upper West Region. Lawra-Jirapa lies in the north western corner of the Upper West Region in Ghana	<table border="1"> <tr> <td>1</td> <td>-2.624</td> <td>10.735</td> </tr> <tr> <td>2</td> <td>-2.624</td> <td>10.455</td> </tr> <tr> <td>3</td> <td>-2.911</td> <td>10.455</td> </tr> <tr> <td>4</td> <td>-2.911</td> <td>10.735</td> </tr> </table>	1	-2.624	10.735	2	-2.624	10.455	3	-2.911	10.455	4	-2.911	10.735
1	-2.624	10.735											
2	-2.624	10.455											
3	-2.911	10.455											
4	-2.911	10.735											
Elevation	Climate												
180-300m asl	Tropical continental type with mean annual temperature between 27°C and 36°C. The period between February and April is the hottest. Between April and October, the Tropical Maritime Air Mass, which blows over the area, gives it the only wet season in the year. Has high rainfall variability												
General Biophysical Characteristics	General Socio-economic Characteristics												
Land area is 6990 km ² with Savannah as the agro-ecological zone. District is gently rolling with four hills, ranging from 180-300m asl. It is drained by one main river - Black Volta. Extensive lateritic cover, land use practices over the years, type of rainfall and relief enhance run-offs. Soils are mostly laterite soils, developed from birimian and granite rocks which underlie the area. General nature of soils, coupled with traditional land use practices and type of rainfall, tend to have adverse effect on crop production.	<p>The Upper West region's total population is 576,583 of whom 276,445 (47.9%) are males and 300,138 (52.1%), females. The region's population is predominantly rural (82.5%).</p> <p>Lawra has a literacy level (28.3%), with males at 34.2 per cent and females at 23.7 per cent. Unemployment is higher for males than for females in both urban and rural areas. Agriculture is the major industrial activity.</p>												
Farming and Livelihood Systems													
Small-scale mixed crop-livestock farming systems. Agriculture is the major economic activity. Crops include: yam, cassava, groundnuts, sorghum, cowpea, soybean, maize, peanuts. Small ruminants (sheep, goats), pigs, guinea fowls are raised. Incomes sources include: agriculture, livestock sales, small businesses (small shops), remittances, farm labour, cotton													
Key Challenges													
Major biophysical constraints to agricultural production include :													

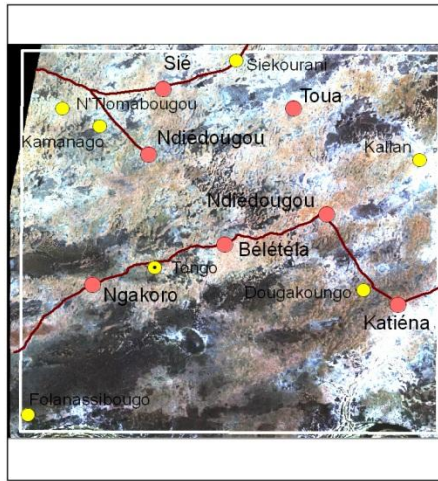
<ul style="list-style-type: none"> • Highly variable climatic conditions, particularly seasonal rainfall, while main socio-economic constraints are a high poverty level • Land degradation • Food insecurity and rural poverty • High population pressure on natural resources
<p>Current CCAFS Activities & Outputs (2012 onwards)</p>
<ul style="list-style-type: none"> • Participatory action research to promote climate smart agriculture - ICRAF • Sustainable agricultural intensification - ICRAF • Harvesting Adaptation Outcomes of Climate Change, Agriculture and Food Security (PHAO-CCAFS) Programme in West Africa: Burkina Faso, Ghana, Mali, Niger and Senegal - IUCN • Farms of the future: understanding social and cultural barriers to climate change adaptation through farmers exchange, CSIR/SARI, LACERD • IMPACTlite detailed household characterization – ILRI • Estimation of GHG from agricultural fields in north western Ghana – CSIR/SARI • Estimation of GHG emissions in Ghana: Quantification Methods and Measurements under different land use systems in the Greater Accra region – CSIR/SARI
<p>Completed CCAFS Outputs</p>
<ul style="list-style-type: none"> • Detailed household baseline data (IMPACTlite) - data • Village baseline study: site analysis report for Lawra, Ghana – report (http://cgspace.cgiar.org/handle/10568/24838) • Summary of household baseline survey: Lawra-Jirapa, Ghana – report (http://cgspace.cgiar.org/handle/10568/21102) • Using a gender lens to explore farmers' adaptation options in the face of climate change: Results of a pilot study in Ghana – working paper (http://cgspace.cgiar.org/handle/10568/21087)
<p>Other Research Activities (2012 onwards)</p>
<ul style="list-style-type: none"> • ICRAF- Participatory action research to promote climate smart agriculture: to test and validate in partnership with rural communities and other stakeholders, sustainable agricultural intensification technologies that integrates range of innovative adaptation and mitigation strategies • CSIR/SARI- Estimation of GHG from agricultural fields in north western Ghana • CSIR/SARI- Estimation of GHG emissions in Ghana: Quantification Methods and Measurements under different land use systems in the Greater Accra region. • CSIR/SARI, LACERD -Farms of the future: understanding social and cultural barriers to climate change adaptation through farmers’ exchange.
<p>Other Research Outputs</p>
<p>Key CCAFS Partners</p>
<p>CSIR/SARI, CSIR/ARI, LACERD</p>

Country: Mali

CCAFS Sampling Frame: Segou - Cinzana



□ Site location



CCAFS Site Name (ID): Segou (MA01)
 CCAFS Sampling Frame Name (ID): Cinzana (09)

Road
 Settlement

CCAFS VBS / OBS Village
 CCAFS HBS Village

Coordinates of the CCAFS Sampling frame
 5.613W 13.228N
 5.911W 13.228N
 5.911W 13.509N
 5.613W 13.509N

Topography Segou Site (MA01), Mali



Sampling frame size: 30km x 30km

Country													
Mali													
Site Name	Site ID												
Segou	MA01												
Sampling Frame Name	Sampling Frame ID												
Cinzana	09												
Location	Sampling Frame Coordinates (UTM)												
About 235 Km northeast of Bamako, the capital of Mali. Fourth region of Mali with about 60.947 km ² of land area (about 5% of the total land area of Mali).	<table border="1"> <tr> <td>1</td> <td>-5.613</td> <td>13.509</td> </tr> <tr> <td>2</td> <td>-5.613</td> <td>13.228</td> </tr> <tr> <td>3</td> <td>-5.911</td> <td>13.228</td> </tr> <tr> <td>4</td> <td>-5.911</td> <td>13.509</td> </tr> </table>	1	-5.613	13.509	2	-5.613	13.228	3	-5.911	13.228	4	-5.911	13.509
1	-5.613	13.509											
2	-5.613	13.228											
3	-5.911	13.228											
4	-5.911	13.509											
Elevation	Climate												
280-300m asl	Semi-arid climate, characterized by two seasons: a rainy (June to September) and a dry season (October to May). Average yearly rainfall is about 513 mm. Rainfall is characterized by a strong inter-annual variability and intensity												
General Biophysical Characteristics	General Socio-economic Characteristics												
<ul style="list-style-type: none"> • High rainfall variability • Sandy and clayey soils • Poor fertile soils • Land degradation 	2.338.349 inhabitants (Census 2009). High population density (25 hbts/km ² , but high variability based upon agro-ecological zone in the region. Has high poverty level and predominantly young population												
Farming and Livelihood Systems													
Extensive small-scale mixed crop-livestock farming systems. Agriculture is the mainstay of the economy of the region, and employs more than 80% of the active population. Main crops grown include: millet, sorghum, maize, fonio, rice. Extensive livestock rearing (small ruminants and cattle). Income sources include: small businesses, remittances, farm labour, rice production, cash crops (cotton, groundnuts, sugar cane, Sesame, Soybean).													
Key Challenges													
<ul style="list-style-type: none"> • High climate variability (rainfall variability, erratic) • Poor soil fertility, • Land degradation • Food insecurity and rural poverty • High population pressure on natural resources 													
Current CCAFS Activities & Outputs (2012 onwards)													
<ul style="list-style-type: none"> • ICRAF: Participatory action research to promote climate smart agriculture which aims to test and validate in partnership with rural communities and other stakeholders, a scalable climate-smart village model for agricultural development that integrates a range of innovative climate risk management strategies 													

- IUCN: Harvesting Adaptation Outcomes of Climate Change, Agriculture and Food Security (PHAO-CCAFS) Programme in West Africa: Burkina Faso, Ghana, Mali, Niger and Senegal which will enable scientists, grant makers, and managers to identify, formulate, verify, and make sense of behavioral changes of their interventions on climate change, agriculture and food security
- ILRI: Integrated Modelling Platform for Mixed Animal Crop Systems (IMPACTlite) for detailed household characterization that aims to collect household-level data detailed enough to capture within-site variability on key performance and livelihood indicators that could be used for a range of analysis including the modeling of impact of adaptation and mitigation strategies on livelihoods, food security and the environment
- AEDD: National platform for exchange between researchers and policy-makers on agriculture adaptation to climate change that seeks to enhance climate change adaptation in the agricultural sector in rural communities through exchange between researchers and policy-makers on agriculture adaptation to climate change
- INSAH: Scaling up the farms of the future approach for strengthening smallholders' adaptive capacity to climate change. This will strengthen the capacity of stakeholders (researchers, extension, NGOs, development partners, farmers and farmers organization) to better adapt to climate change
- AGRHYMET, INERA: Tailoring climate information to the needs of small-scale farmers which aims to train the hydrologists and agro meteorologists from West African National Meteorological and Hydrological Services (NMHS) as well as AGRHYMET scientists to produce seasonal forecasts of the rainy season characteristics that are more useful to users.

Completed CCAFS Outputs

- Detailed household baseline data (IMPACTlite) – data
- Village Baseline Study: Site Analysis Report for Segou – Cinzana, Mali (MA0109) (<http://cgspace.cgiar.org/handle/10568/27651>)
- Summary of household baseline survey results: Cinzana, Mali (<http://cgspace.cgiar.org/handle/10568/21105>)

Other Research Activities (2012 onwards)

- IER: Development of a standardized carbon measurement method in two agro ecological zone in Mali that aims to develop a standard collaborative measurement method of greenhouse gases (development of biomass equations for instance)

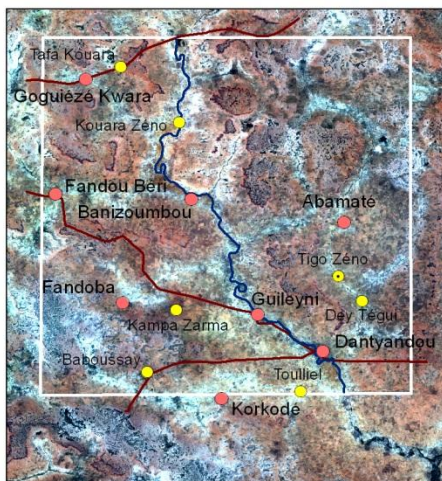
Other Research Outputs

Key CCAFS Partners

IER, AMEDD, ICRISAT, ICRAF, AEDD, Agence Mali Meteo

Country: Niger

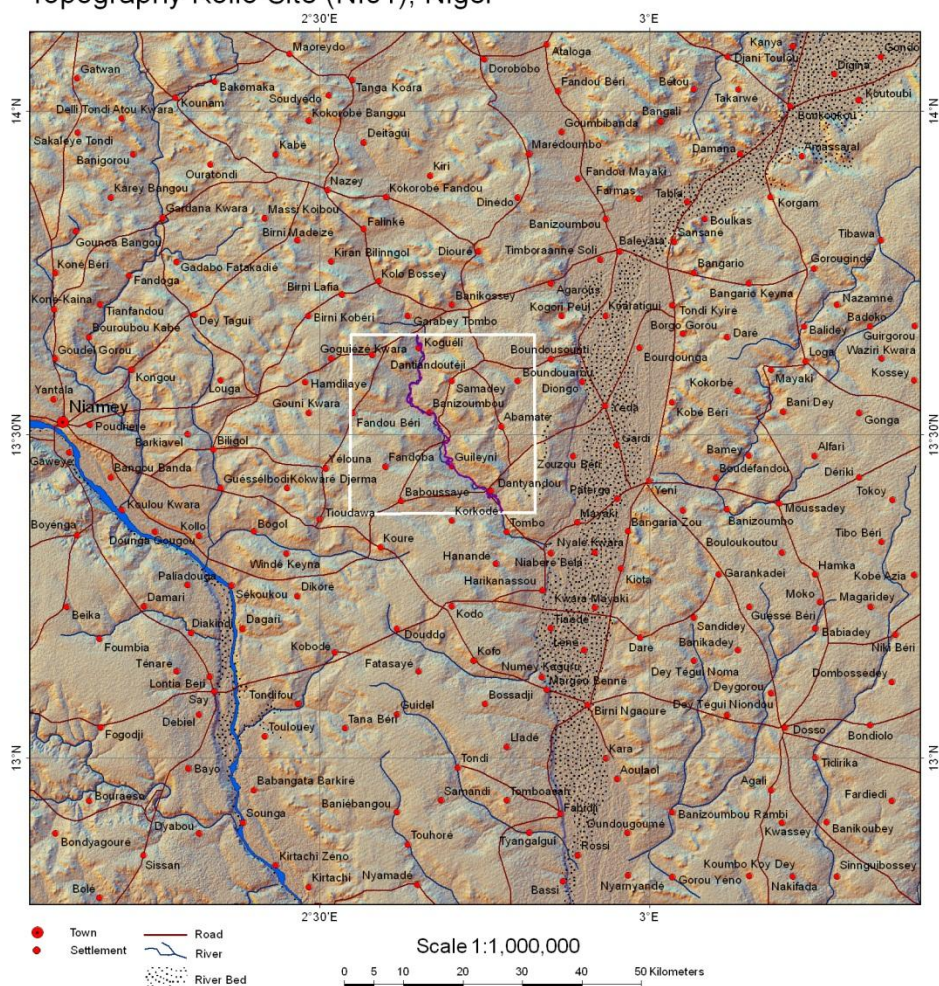
CCAFS Sampling Frame: Kollo - Fakara



- CCAFS Site Name (ID): Kollo (NI01)
- CCAFS Sampling Frame Name (ID): Fakara (11)
- Road
- River
- Settlement
- CCAFS VBS / OBS Village
- CCAFS HBS Village
- Coordinates of the CCAFS Sampling frame
- 2.826E 13.379N
- 2.826E 13.654N
- 2.547E 13.654N
- 2.547E 13.379N

□ Site location

Topography Kollo Site (NI01), Niger

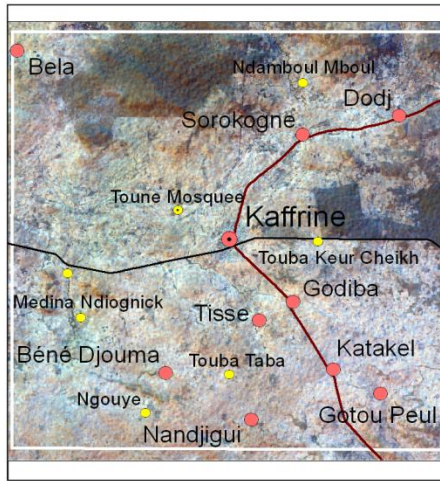
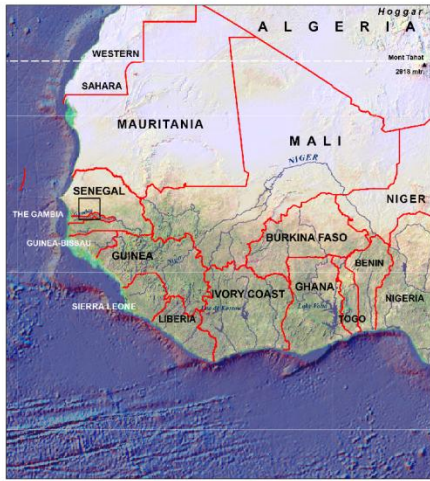


Country		
Niger		
Site Name	Site ID	
Kollo	NI01	
Sampling Frame Name	Sampling Frame ID	
Fakara	11	
Location	Sampling Frame Coordinates (UTM)	
Located in the Department of Tillabery, the Fakara is located at 60-100 km to the east of Niamey, the capital of Niger	1	2.826 13.654
	2	2.826 13.379
	3	2.547 13.379
	4	2.547 13.654
Elevation	Climate	
200m asl	Semi-arid climate, characterized by two seasons: a rainy (June to September) and a dry season (October to May) with an average annual rainfall between 300 to 600 mm. Fakara is part of central Sahel bio-climatic zone. Rainfall distribution is strictly monomodal, centred in August, with rainy seasons lasting 4 to 5 months.	
General Biophysical Characteristics	General Socio-economic Characteristics	
High rainfall variability. Soils predominantly sandy with inherent low fertility. Topography, geomorphology and soils are inherited from a long history of climate fluctuation during the quaternary: from hyper-arid to sub-humid. The landscape topography is dominated by the horizontal surface of the low sandstone plateau. Land degradation is frequent	High levels of poverty	
Farming and Livelihood Systems		
Agriculture is the mainstay of the economy of more than 80% of small holder farmers. The agricultural system is characterized by the cohabitation of two agrarian cultures, the Jerma crop-farmer culture, and the Fulani pastoralist culture. The present farming system is largely subsistence oriented, based on millet staple (mainly millet and some sorghum) associated with a range of secondary crops, either dual purpose legumes (cowpea, bambara nut, ground nut) or cash crops (sesame, sorrel)		
Key Challenges		
High climate variability (rainfall variability, erratic, droughts), poor soil fertility, land degradation, food insecurity and rural poverty, High population pressure on natural resources, low inputs and the inherent poor soil fertility generally limits yields and explains the periodic fallowing traditionally practiced to restore soil fertility		

<p>Current CCAFS Activities & Outputs (2012 onwards)</p> <ul style="list-style-type: none"> • ICRAF: Participatory action research to promote climate smart agriculture which aims to test and validate in partnership with rural communities and other stakeholders, a scalable climate-smart village model for agricultural development that integrates a range of innovative climate risk management strategies • IUCN: Harvesting adaptation outcomes of Climate Change, Agriculture and Food Security (PHAO-CCAFS) Programme in West Africa: Burkina Faso, Ghana, Mali, Niger and Senegal which will enable scientists, grant makers, and managers to identify, formulate, verify, and make sense of behavioral changes of their interventions on climate change, agriculture and food security • ILRI: Integrated Modelling Platform for Mixed Animal Crop Systems (IMPACTlite) for detailed household characterization that aims to collect household-level data detailed enough to capture within-site variability on key performance and livelihood indicators that could be used for a range of analysis including the modeling of impact of adaptation and mitigation strategies on livelihoods, food security and the environment • CNEDD: National platform for exchange between researchers and policy-makers on agriculture adaptation to climate change which seeks to enhance climate change adaptation in the agricultural sector in rural communities through exchange between researchers and policy-makers on agriculture adaptation to climate change • AGRHYMET: Crop and rangeland production forecasting methodology development and evaluation which aims to provide reliable and timely information on crop and rangeland production, weather data • INSAH: Scaling up the farms of the future approach for strengthening smallholders' adaptive capacity to climate change. This will strengthen the capacity of stakeholders (researchers, extension, NGOs, development partners, and farmer organization) to better adapt to climate change.
<p>Completed CCAFS Outputs</p> <ul style="list-style-type: none"> • Detailed household baseline data (IMPACTlite) – data • Crop and rangeland data • Summary of household baseline survey results: Fakara, Niger (http://cgspace.cgiar.org/handle/10568/21134) • Village Baseline Study: Site Analysis Report for Kollo – Fakara, Niger (NI0111) (http://cgspace.cgiar.org/handle/10568/27646)
<p>Other Research Activities (2012 onwards)</p>
<p>Other Research Outputs</p>
<p>Key CCAFS Partners</p>
<p>INRAN, CNEDD, AGRHYMET, NHMS</p>

Country: Senegal

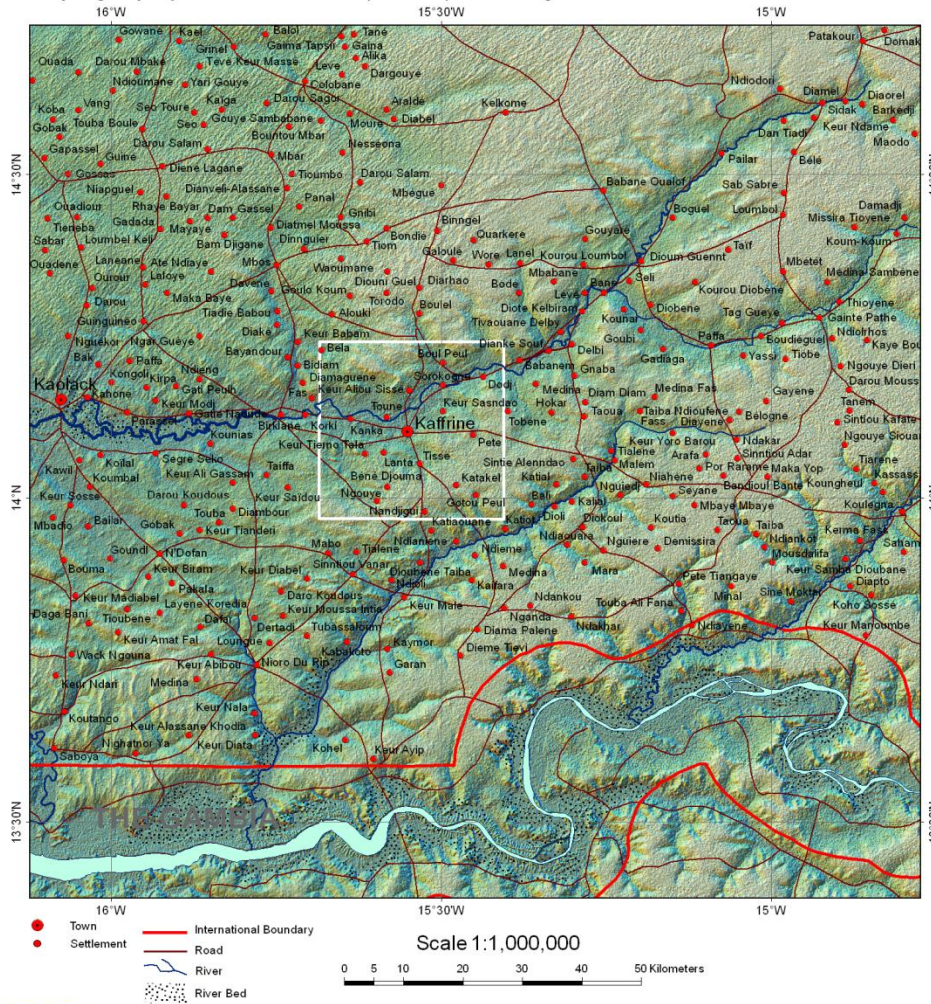
CCAFS Sampling Frame: Kaffrine



- CCAFS Site Name (ID): Kaffrine (SE01)
- CCAFS Sampling Frame Name (ID): Kaffrine (12)
- Road
- Railway
- Town
- Settlement
- CCAFS VBS / OBS Village
- CCAFS HBS Village
- Coordinates of the CCAFS Sampling frame
 - 15.407W 13.968N
 - 15.407W 14.242N
 - 15.686W 14.242N
 - 15.686W 13.968N

□ Site location

Topography Kaffrine Site (SE01), Senegal



Sampling frame size: 30km x 30km

Country		
Senegal		
Site Name	Site ID	
Kaffrine	SE01	
Sampling Frame Name	Sampling Frame ID	
Kaffrine	12	
Location	Sampling Frame Coordinates (UTM)	
District of Kaffrine, in the peanut basin in Senegal	1 -15.407	14.242
	2 -15.407	13.968
	3 -15.686	13.968
	4 -15.686	14.242
Elevation	Climate	
15-50m asl	The area is in the transition zone from the Sahelian towards the Sudan Savannah zone. The climate is Sudano-Sahelian with a rainy season of short duration ranging from June to July to October and a long dry season from 8 to 9 months. The monthly average temperatures minimum and maximum are respectively 18.2 ° C (January) and 40.7 ° C (April). The average annual temperature is 29.6 °C	
General Biophysical Characteristics	General Socio-economic Characteristics	
<ul style="list-style-type: none"> • High rainfall variability • Savannah agro-ecological zone, • Deep sandy soils - "Dior". 	<ul style="list-style-type: none"> • High population density • High levels of poverty 	
Farming and Livelihood Systems		
<p>Extensive small-scale mixed crop-livestock farming systems. Agriculture is the major economic activity. Predominant cropping systems are based on pearl millet, peanut and cowpea, all generally not intensified and cropped without agricultural input. In the south, peanut is intensified using inputs, and maize, sorghum, lowland rice and sesame are also cropped. Small Jatropha and fruit areas. Some agro-pastoralism. Income sources: agriculture, livestock sales, small businesses (small shops), remittances, farm labour.</p>		
Key Challenges		
<ul style="list-style-type: none"> • High climate variability (rainfall variability, erratic) • Poor soil fertility, • No attractive markets • High poverty levels with low access to capital. • Land degradation • Food insecurity and rural poverty • High population pressure on natural resources 		

<p>Current CCAFS Activities & Outputs (2012 onwards)</p> <ul style="list-style-type: none"> • Participatory action research to promote climate smart agriculture – ICRAF • Consolidating seasonal forecasts communicating workshop and evaluation – ANACIM • Sustainable agricultural intensification - ICRAF • Harvesting Adaptation Outcomes of Climate Change, Agriculture and Food Security (PHAO-CCAFS) Programme in West Africa: Burkina Faso, Ghana, Mali, Niger and Senegal - IUCN • IMPACTlite for detailed household characterization – ILRI • National platforms for exchange between researchers and policy-makers on agriculture adaptation to climate change – Ministry of Agriculture
<p>Completed CCAFS Outputs</p> <ul style="list-style-type: none"> • Detailed household baseline data (IMPACTlite) - data • Village baseline study: site analysis report for Kaffrine – report (http://cgspace.cgiar.org/handle/10568/25194) • Summary of household baseline survey: Kaffrine, Senegal – report (http://cgspace.cgiar.org/handle/10568/21132) • Ndiaye O. <i>et al.</i> 2012. Using probabilistic seasonal forecasting to improve farmers’ decision in Kaffrine, Senegal. In: Banaitiene, N. (ed.) Risk Management, Current Issues and Challenges, p497-504, Chap 21 DOI: 10.5772/2568.
<p>Other Research Activities (2012 onwards)</p> <ul style="list-style-type: none"> • http://www.youtube.com/watch?feature=player_embedded&v=FAT26-WWffs • http://ccafs.cgiar.org/blog/putting-climate-forecasts-farmers-hands • http://ccafs.cgiar.org/blog/following-last-year%E2%80%99s-climate-forecast-workshop-%E2%80%93-what-happened-next
<p>Other Research Outputs</p>
<p>Key CCAFS Partners</p>
<p>ISRA, CORAF/WECARD, ANACIM, IPAR, CSE</p>

CCAFS Site Portfolios and Maps for South Asia (SA)

Country	Site	Site ID	Sampling frame	Sampling frame ID
Bangladesh	Khulna	BA04	Morrelganj	16
India	Bihar	IN16	Vaishali	40
India	Haryana	IN17	Karnal	41
Nepal	Mid-Western Terrai	NE03	Rupandehi	36

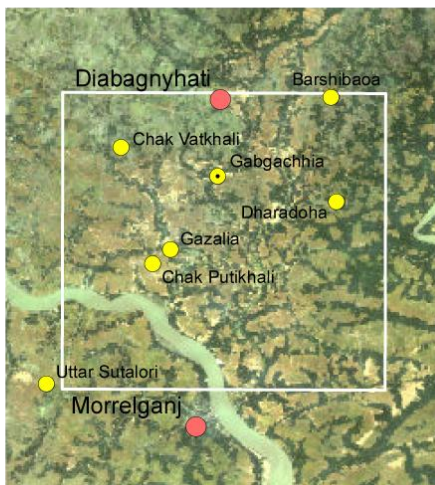
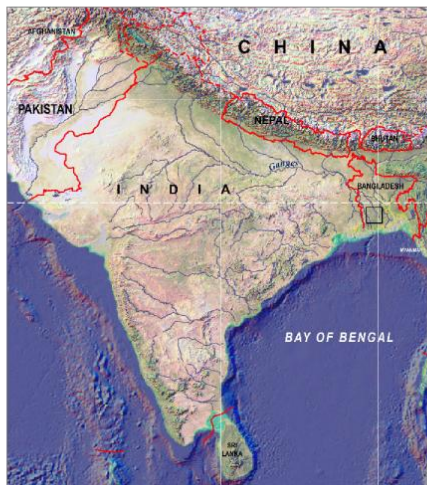
CCAFS Sites: South Asia



- CCAFS Sites
- Bangladesh: Khulna (BA04)
- India: Bihar (IN16)
- India: Haryana (IN17)
- Nepal: Mid-Western Terai (NE03)

Country: Bangladesh

CCAFS Sampling Frame: Morrelganj



CCAFS Site Name (ID):
Khulna (BA04)

CCAFS Sampling Frame
 Name (ID): **Morrelganj (16)**

Settlement

CCAFS VBS / OBS Village

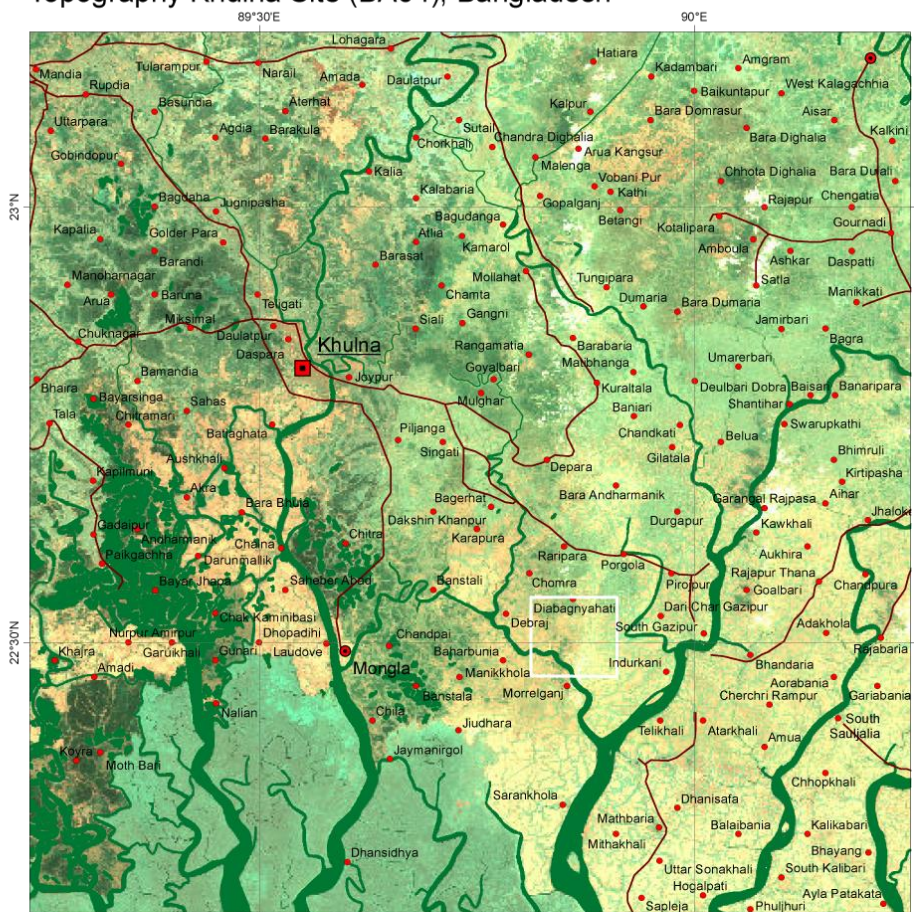
CCAFS HBS Village

Coordinates of the CCAFS
 Sampling Frame

89.911E 22.552N
 89.911E 22.461N
 89.812E 22.461N
 89.812E 22.552N

Site location

Topography Khulna Site (BA04), Bangladesh



District Capital
 Town
 Settlement
 Road
 River
 Wetland



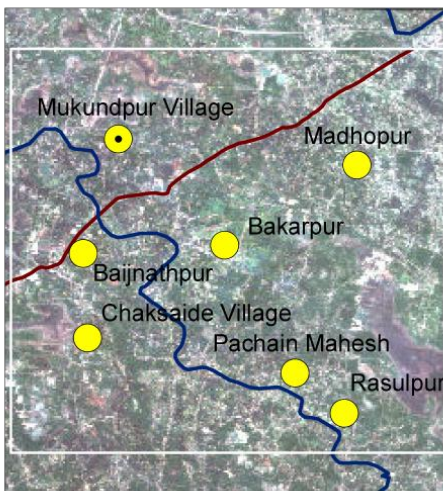
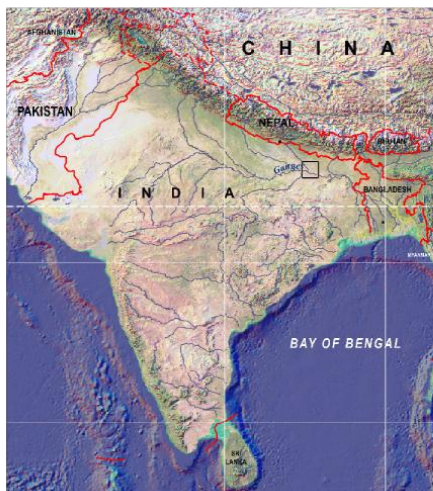
Sampling frame size:
 10km x 10km

Country									
Bangladesh									
Site Name	Site ID								
Khulna	BA04								
Sampling Frame Name	Sampling Frame ID								
Morrelganj	16								
Location	Sampling Frame Coordinates (UTM)								
Bagerhat lies in the southwest coastal area of Bangladesh. Bounded by Gopalganj and Narail districts on the north, the Bay of Bengal on the south, Gopalganj, Pirojpur and Barguna districts on the east and Khulna District on the west, Bagerhat forms a part of greater Khulna division	<table border="1"> <tr> <td>1 89.911</td> <td>22.552</td> </tr> <tr> <td>2 89.911</td> <td>22.461</td> </tr> <tr> <td>3 89.812</td> <td>22.461</td> </tr> <tr> <td>4 89.812</td> <td>22.552</td> </tr> </table>	1 89.911	22.552	2 89.911	22.461	3 89.812	22.461	4 89.812	22.552
1 89.911	22.552								
2 89.911	22.461								
3 89.812	22.461								
4 89.812	22.552								
Elevation	Climate								
0-5 m asl	Annual average maximum temperature of Bagerhat is 33.50°C and minimum is 12.50°C. Annual rainfall is 1710 mm. The deeply flooded areas of the district occupy the lower sites in the landscape and are inundated from one meter to three during monsoon season. The southern part of the Bagerhat is extremely vulnerable to natural calamities like tropical cyclones and floods. Presently, the district is facing severe salinity problem.								
General Biophysical Characteristics	General Socio-economic Characteristics								
The southwest coastal region of Bangladesh including Bagerhat is an active part of Ganges Delta formed by alluvial soil carried in by the upstream flows. Most of the parts in this region (about 70% of the total landmass) are coastal wetlands by nature, which are connected with many estuarine rivers of the Bay of Bengal. The elevation is only few meters and as a result this sub-region is extremely vulnerable to storm surges.	Bagerhat district has a total area of 3959.11 square kilometres. One of the two ports of Bangladesh, Mangla, is here. Rampal and Fakirhat, two upazilla of Bagerhat are known as Qwait of Bangladesh due to their huge production of shrimp and earning a lot of foreign exchange. Literacy rate is 44.3%.								
Farming and Livelihood Systems									
Main crops in the area are paddy, wheat, jute, sugarcane, potato, banana, onion, garlic and spices. Main fruits are mango, jackfruit, banana and papaya. Generally, the cropping pattern is aus/jute followed by winter crops or transplanted aman followed by winter crops. Besides rainy paddy, boro paddy is also grown wherever irrigation facilities are available. Most shrimp culture activities in the Bagerhat are									

carried out in ghers located on land protected from the sea by polders (very large dikes).
Key Challenges
Since Bagerhat as a whole is facing the risks of flooding/submergence; limited access to potable water; water pollution, especially of fishing areas results from the use of commercial pesticides; ground water contaminated by naturally-occurring arsenic, salinity, sea-level rise, droughts, storm and cyclones, farming population is extremely vulnerable. Meeting current household food demand is a key challenge in this area.
Current CCAFS Activities & Outputs (2012 onwards)
Climate smart management of aquatic farm ecosystems in coastal regions of Bangladesh (Smart Farm) Key activities <ul style="list-style-type: none"> • Inventory of current vertical agriculture technologies • Prototype of integrated platform • Fish Habitat Development Rings • Sorjan agriculture/farming systems • Curriculum development and implementation of this in farmers' field school (FFS) for a season covering topics such as soil salinity, light effects, evaporation, irrigation, seed quality and conservation, vertical agriculture structures, rainwater harvesting and fertilizer • Baseline emissions from the site (10 km x 10 km grid)
Completed CCAFS Outputs
The activities are implemented recently (mid of 2012).
Other Research Activities (2012 onwards)
Above-mentioned activities will be continued.
Other Research Outputs
http://www.worldfishcenter.org/resource_centre/WF_3448.pdf
Key CCAFS Partners
WorldFish, IWMI, CIMMYT, IFPRI

Country: India

CCAFS Sampling Frame: Vaishali



CCAFS Site Name (ID): Bihar (IN16)
 CCAFS Sampling Frame Name (ID): Vaishali (40)

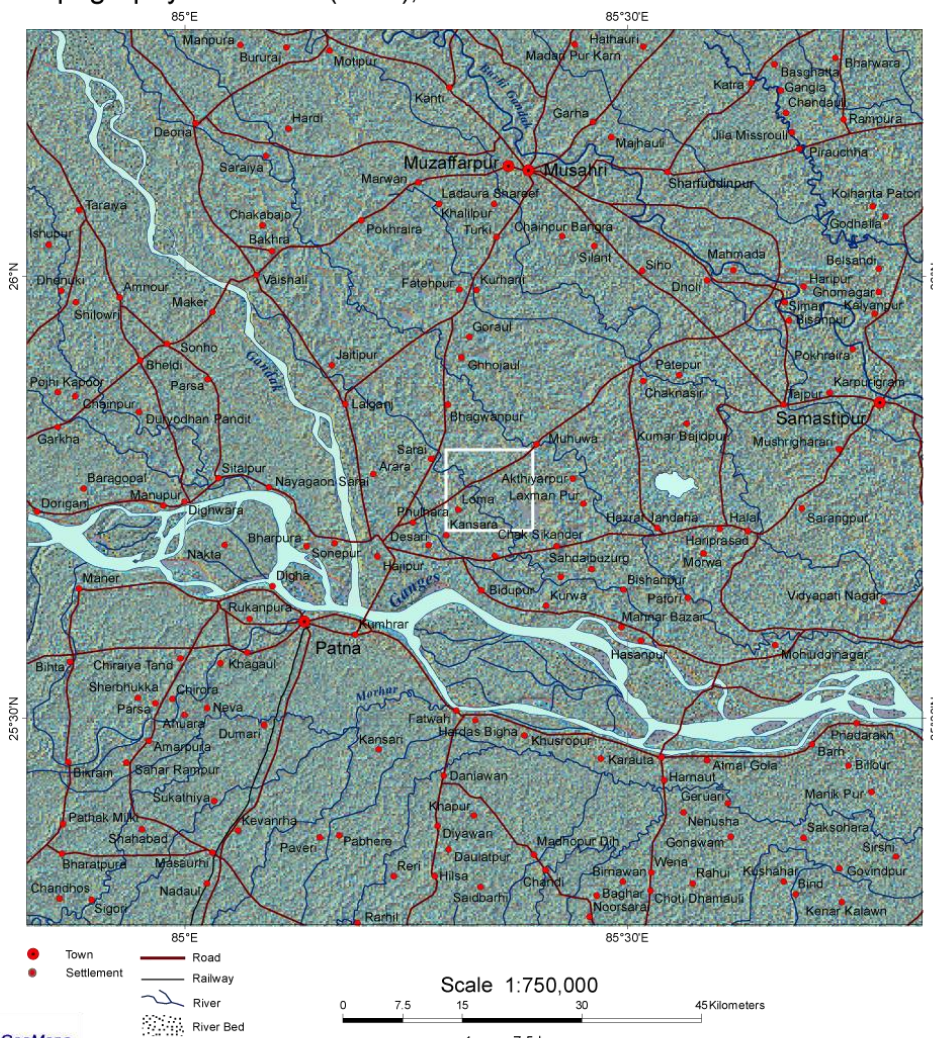
Road
 River

CCAFS VBS / OBS Village
 CCAFS HBS Village

Coordinates of the CCAFS Sampling Frame
 85 393E 25 804N
 85 393E 25 713N
 85 295E 25 713N
 85 295E 25 804N

□ Site location

Topography Bihar Site (IN16), India

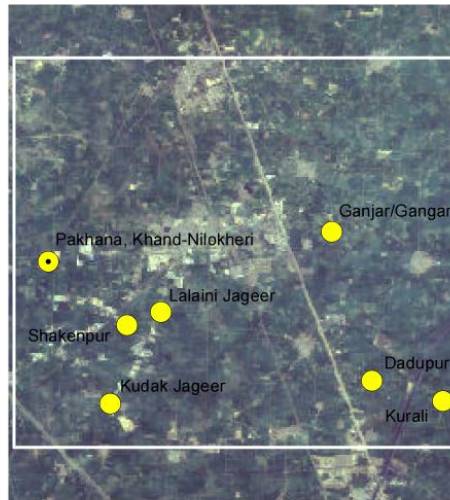


Country													
India													
Site Name	Site ID												
Bihar	IN16												
Sampling Frame Name	Sampling Frame ID												
Vaishali	40												
Location	Sampling Frame Coordinates (UTM)												
Surrounded by river Ganga in south, Gandak in west, the Vaishali district lies in the Bihar State- one of the poorest and least literate states in India. It's district Headquarter is Hajipur. The district is bounded in the north by Muzaffarpur, in the south by Patna (the river Ganga forms a natural boundary), in the east by Samastipur, and in the west by Saran (the river Gandak forming a natural boundary) districts. Patna is the main market hub of Bihar which is almost 25 km from district headquarters of Vaishali.	<table> <tr> <td>1</td> <td>85.393</td> <td>25.804</td> </tr> <tr> <td>2</td> <td>85.393</td> <td>25.713</td> </tr> <tr> <td>3</td> <td>85.295</td> <td>25.713</td> </tr> <tr> <td>4</td> <td>85.295</td> <td>25.804</td> </tr> </table>	1	85.393	25.804	2	85.393	25.713	3	85.295	25.713	4	85.295	25.804
1	85.393	25.804											
2	85.393	25.713											
3	85.295	25.713											
4	85.295	25.804											
Elevation	Climate												
45-60m asl	Bihar is a sub-humid dry region with dry summers and cold winters. The area is characterized by hot dry sub-humid climate with hot summers, cool winters. Minimum winter temperature varies from 4 ^o C to 16 ^o C whereas summer maximum temperature goes as high as 40 ^o C. Average annual rainfall is 1168 mm – 1200 mm												
General Biophysical Characteristics	General Socio-economic Characteristics												
The soils of the area are developed in the alluvium deposited by the Ganga River and its tributaries. Dominantly soils are very deep, imperfectly to poorly drained fine loamy to fine in texture. During the dry period, canal water and groundwater are used to irrigate the crops. The district has several small patches of area which remain submerged for longer periods.	Vaishali district has a population of 2.72 million. The population density is 1335 persons/km ² . It has literacy rate of 51% with 63% males literacy rate while females lagging behind with 37% literacy rate. The population of schedule tribes and schedule caste are 1% and 20% of the total population respectively. Agriculture is the primary source of livelihoods for majority of the farmers, and land holding is very low (<0.5 ha), and land fragmentation is very common												
Farming and Livelihood Systems													
Rice-based cropping system is common. After rainy rice, farmers grow wheat and pulses like gram, lentil and mung, oilseeds like mustard under residual moisture. Cash crops like sugarcane, chillies, potatoes, turmeric are important crops raised under irrigated agriculture. Where assured irrigation facilities are													

<p>available, crop rotation like rice-wheat and rice-sugarcane are common. In the upland situations, maize and arhar are common mixed crops, which are grown in the rainy season. Most of the farmers have integrated farming components, integrating crops with livestock (goats, chicken, cows and buffaloes). A large proportion of the farmers in the district produce food and livestock only for their subsistence.</p>
<p>Key Challenges</p>
<p>Frequent droughts, water logging and flooding, and decreasing annual rainfall are the key challenges in this area. Small land size and land fragmentation, land ownership issues are other challenges entire Bihar has been facing with.</p>
<p>Current CCAFS Activities & Outputs (2012 onwards)</p>
<ul style="list-style-type: none"> • Participatory action research to develop climate smart villages • Several climate smart interventions related to weather, nitrogen, water, knowledge and carbon management implemented in participation with the farming communities. The model includes a portfolio of climate smart interventions including weather insurance, agro-advisories based on weather forecasts, designed diversification including stress tolerant crop and fodder varieties, mung bean incorporation in the cropping pattern as a diversification strategy to meet climatic risks, need-based nitrogen application methods, residue incorporation in the field, agro-forestry plantations, index based insurance and gender empowerment are some of the key interventions implemented since 2012 and continued for few years. • Participatory video documentation and dissemination has been done in late 2012 to scale out the technological information to many farmers in the district.
<p>Completed CCAFS Outputs</p>
<p>http://ccaafs.cgiar.org/blog/Farmers-reaping-benefits-climate-insurance-scheme%20 http://ccaafs.cgiar.org/blog/crop-genetic-diversity-could-enhance-climate-resilience-south-asia http://ccaafs.cgiar.org/blog/changing-farming-practices-south-asia-food-secure-future http://ccaafs.cgiar.org/blog/help-through-participatory-videos-documenting-farmers-experiences-real-time http://ccaafs.cgiar.org/blog/rural-communities-benefit-through-climate-smart-agricultural-interventions http://ccaafs.cgiar.org/blog/climate-smart-villages-india-show-early-signs-success http://ccaafs.cgiar.org/blog/hundreds-elected-women-rural-bihar-get-trained-climate-change-and-food-security http://ccaafs.cgiar.org/blog/Believable-climate-futures-explored-Nepalese-farmers%20</p>
<p>Other Research Activities (2012 onwards)</p>
<p>Above-mentioned activities will be continued:</p>
<p>Other Research Outputs</p>
<p>Key CCAFS Partners</p>
<p>IFFCO Foundation, Indian Kisan Sanchar Limited (IKSL), IFFCO TOKIO, Indian Meteorological Department (IMD), CIMMYT, IWMI, Bioversity International, CIP, IFPRI</p>

Country: India

CCAFS Sampling Frame: Karnal



CCAFS Site Name (ID): Haryana (IN17)

CCAFS Sampling Frame Name (ID): Karnal (41)

CCAFS VBS / OBS Village



CCAFS HBS Village

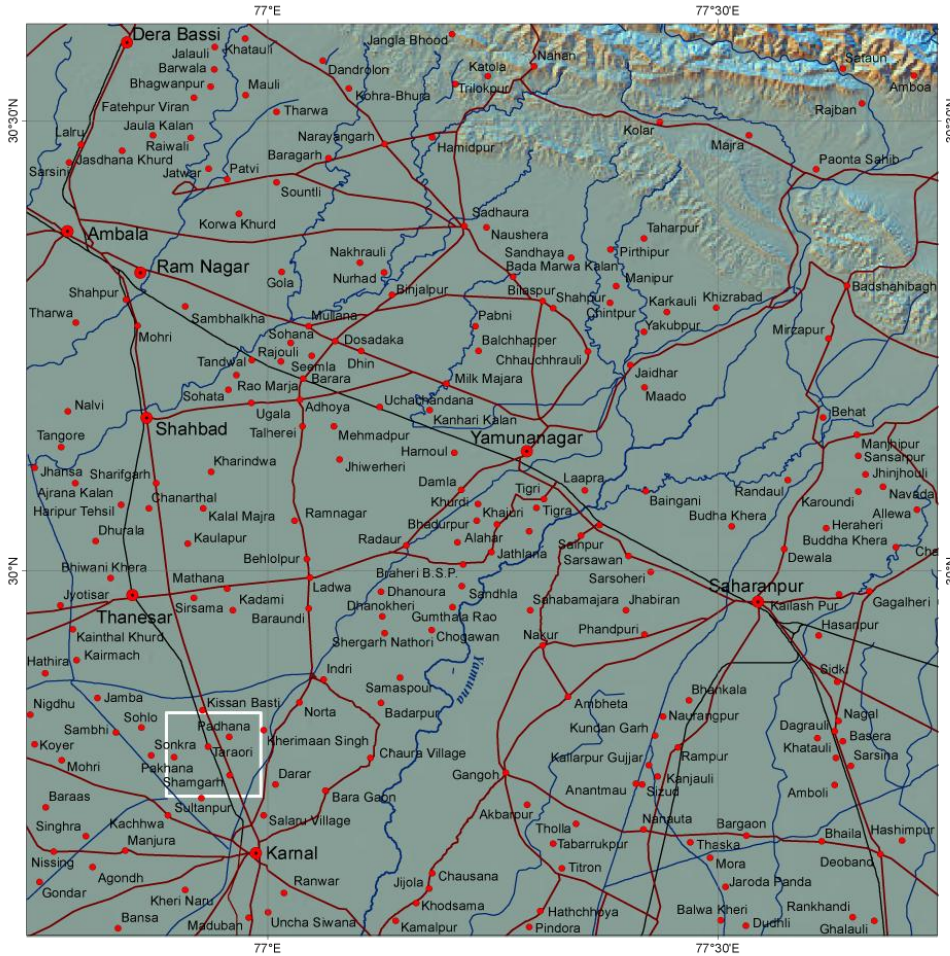


Coordinates of the CCAFS Sampling frame

76.888E 29.842N
76.993E 29.842N
76.993E 29.750N
76.888E 29.750N

□ Site location

Topography Haryana Site (IN17), India



- Town
- Settlement
- Road
- Railway
- River
- - - Canal

Scale 1:750,000



1 cm = 7.5 km



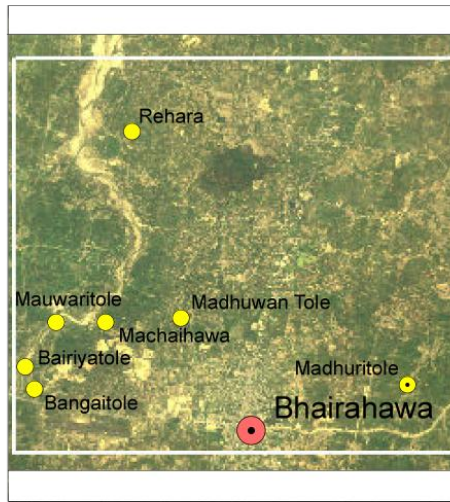
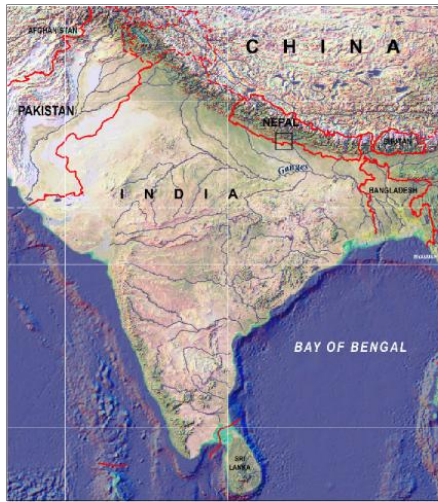
Sampling frame size: 10km x 10km

Country													
India													
Site Name	Site ID												
Haryana	IN17												
Sampling Frame Name	Sampling Frame ID												
Karnal	41												
Location	Sampling Frame Coordinates (UTM)												
Karnal district is a part of the indo-gangetic plain. The district lies in the Haryana State of India. Bordered by Punjab and Himachal Pradesh to the north and Rajasthan to the west and south, Haryana state is one of the most economically developed regions in South Asia and its agricultural and manufacturing industry has experienced sustained growth since 1970s. Karnal is 123 km north of Delhi and 126 km south of Chandigarh.	<table> <tbody> <tr> <td>1</td> <td>76.888</td> <td>29.842</td> </tr> <tr> <td>2</td> <td>76.993</td> <td>29.842</td> </tr> <tr> <td>3</td> <td>76.993</td> <td>29.750</td> </tr> <tr> <td>4</td> <td>76.883</td> <td>29.750</td> </tr> </tbody> </table>	1	76.888	29.842	2	76.993	29.842	3	76.993	29.750	4	76.883	29.750
1	76.888	29.842											
2	76.993	29.842											
3	76.993	29.750											
4	76.883	29.750											
Elevation	Climate												
230-250m asl	The agro-climate of the Karnal is characterized by hot semiarid weather with dry summers and cool winters. The cold season starts by late November and extends to the middle of March. The normal annual rainfall of the district is 696 mm in 33 rainy days per annum. About 82% of the annual rainfall is recorded during the southwest monsoon from June-September. The mean annual temperature is 25 ^o C. The temperature goes as high as 41 ^o C in the summer month of June and the minimum temperature goes up to 6 ^o C in the coldest month of January. Key climatic issues in the region are erratic rainfall and considerable inter dry spell during crop growing season, over-exploitation of groundwater resulting in the lowering of groundwater table, imperfect draining in some places, declining soil fertility owing to over exploitation of the resources and problem of salinity.												
General Biophysical Characteristics	General Socio-economic Characteristics												
The area constitutes alluvial plain without any conspicuous topographical features and forms a part of the vast Indo-Gangetic plain and has a well spread network of western Yamuna canal. Karnal is also	Haryana is one of the wealthiest states in India and has the third highest per capita income in the country. During 1960s, the state contributed heavily to the Green Revolution making India self-sufficient in the food production. Karnal has 1.5 million people (53% males and												

known for its lush greenery.	47% females), 75% literacy rate (84% male and 68% female literacy rates) and population density of 598 people km ² (the most populated district in the state).
Farming and Livelihood Systems	
Rice and wheat are the main crops whereas some farmers also grow maize, gram, mustard, sugarcane, cotton and fodder. The average yield of paddy is almost 5 t/ha and wheat is 4 t/ha. Farmers in this district are highly commercially oriented. Karnal is widely known for its production of very high-quality basmati rice. The cropping intensity in this area is 180% and all arable lands are irrigated.	
Key Challenges	
High temperature during wheat maturity and decreasing irrigation water due to glacial melting are key challenges in this part. The ground-water levels in Haryana have been falling at a rate of almost 50 cm per year. Rice straw burning leading to GHG emissions and air pollution are also important.	
Current CCAFS Activities & Outputs (2012 onwards)	
<ul style="list-style-type: none"> • Participatory action research focusing on conservation agriculture (CA) to develop climate smart villages. • Some key activities implemented and are planned in this site are: conservation agriculture technologies on the farms (zero tillage, residue incorporation, sustainable intensification on the farm, laser land leveling, precision fertilizer application), activities related to increasing water use efficiency, • Index based insurance, • Climate change awareness, • Weather forecasts based agro-advisories, • Baseline emissions from the site (10 km x 10 km grid), • Gender and climate change awareness training in Punjab-Haryana • A series of capacity building training to the farmers, agro-entrepreneurs and marketing functionaries 	
Completed CCAFS Outputs	
http://ccaafs.cgiar.org/blog/Teaching-Indian-farmers-climate-smart-practices-on-the-go%20	
Other Research Activities (2012 onwards)	
Above-mentioned activities will be continued.	
Other Research Outputs	
Key CCAFS Partners	
Indian Kisan Sanchar Limited (IKSL), Indian Meteorological Department (IMD), CIMMYT, IWMI, IFPRI	

Country: Nepal

CCAFS Sampling Frame: Rupandehi



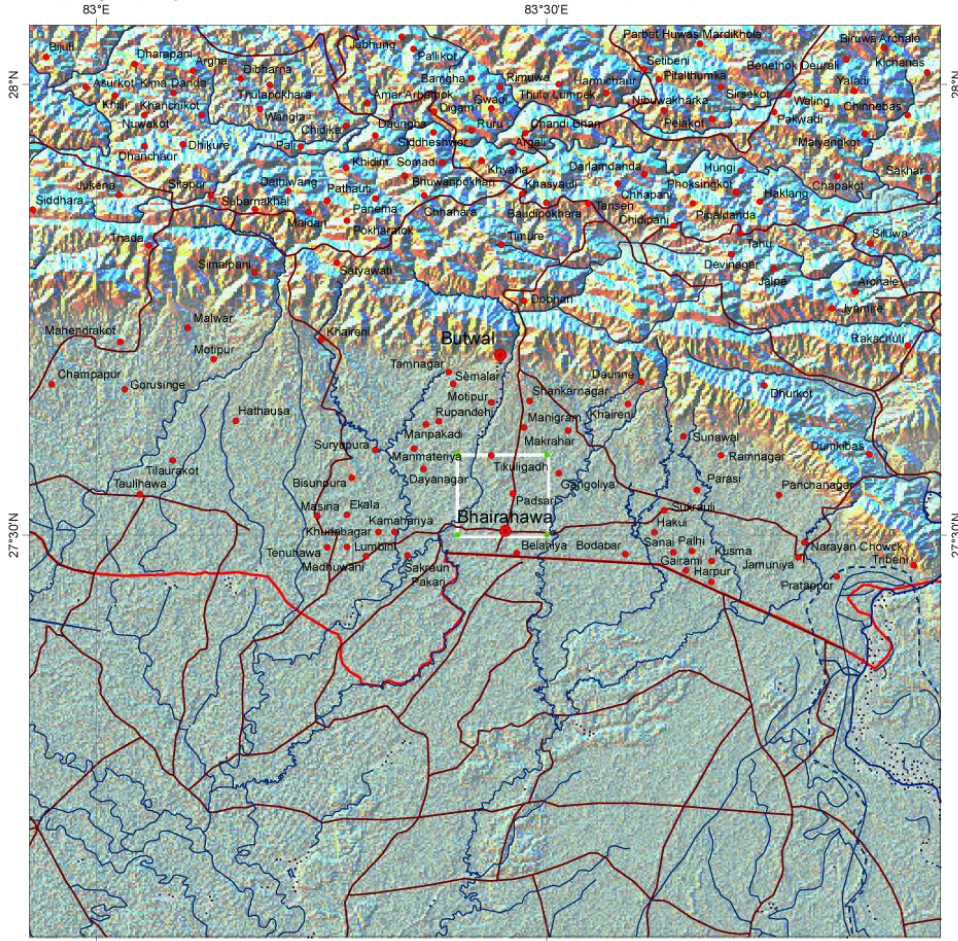
CCAFS Site Name (ID):
Mid-Western Terai (NE03)
CCAFS Sampling Frame
Name (ID): Rupandehi (36)

- City / Town ●
- CCAFS VBS / OBS Village ●
- CCAFS HBS Village ●

Coordinates of the CCAFS
Sampling frame
83.500E 27.589N
83.500E 27.500N
83.401E 27.500N
83.401E 27.589N

Site location

Topography Mid - Western Terai Site (NE03), Nepal



- Town
- Settlement
- International Boundary
- Road
- River
- Canal

Scale 1:750,000

0 7.5 15 30 45 Kilometers

1 cm = 7.5 km



Sampling frame size:
10km x 10km

Country													
Nepal													
Site Name	Site ID												
Mid-Western Terai	NE03												
Sampling Frame Name	Sampling Frame ID												
Rupandehi	36												
Location	Sampling Frame Coordinates (UTM)												
Rupandehi is lowland Terai (southern plain), part of the western development region of Nepal at the foothills of the Himalayas and constitutes the Nepalese segment of the Indo-gangetic plain (IGP). Bhairahawa is district headquarter of Rupandehi	<table border="1"> <tr> <td>1</td> <td>83.500</td> <td>27.589</td> </tr> <tr> <td>2</td> <td>83.500</td> <td>27.500</td> </tr> <tr> <td>3</td> <td>83.401</td> <td>27.500</td> </tr> <tr> <td>4</td> <td>83.401</td> <td>27.589</td> </tr> </table>	1	83.500	27.589	2	83.500	27.500	3	83.401	27.500	4	83.401	27.589
1	83.500	27.589											
2	83.500	27.500											
3	83.401	27.500											
4	83.401	27.589											
Elevation	Climate												
100-1219m asl	Rupandehi district lies in the humid subtropical climate. Average annual rainfall is 1455 mm and average annual min and max temperate are 18 and 31 ⁰ C respectively. Overall rainfall is declining (annually by 6 mm) and average annual temperature shows increasing trend (annually by 0.01 ⁰ C).												
General Biophysical Characteristics	General Socio-economic Characteristics												
Terai including Rupandehi is considered as the food basket of Nepal because of its topography, highly fertile soils, relatively better infrastructure and technological access. <i>Tinau</i> and <i>Rohini</i> are two major rivers that provide the basis of livelihood and water resource for surface irrigation.	The district covers an area of 1360 km ² with a population of around 709000 and population density of 520 people km ⁻² . The population density per ha of agricultural land in the district is 8-11 persons ha ⁻¹ and 20-30% of the population in the district are under the poverty line.												
Farming and Livelihood Systems													
Rice-wheat is common cropping pattern followed with legumes in the rotation. However, in recent years, vegetables and banana fruits crops, sunflower, organic vegetable farming and cereal seed production have also added in the agricultural systems. Most farmers integrate livestock with crop production in the district. Cattle, buffaloes, chicken and goats are common livestock species .This area is a source of food grains to other areas, particularly in the hills and mountains and is food secure.													
Key Challenges													
The area observed almost 24 landslides and flood disasters during the last decade. The district is prone to recurrent climate-related disasters such as floods, droughts, hot and cold waves, and pest and disease epidemics. Flow of irrigation water in the district will be affected much due to rainfall variability and													

<p>increasing glacial melt in the Himalayan region.</p>
<p>Current CCAFS Activities & Outputs (2012 onwards)</p> <ul style="list-style-type: none"> • Innovative Community-based Agricultural Development Initiatives for Increased Climate Resilience of Rural People • Test climate resilient varieties of rice, wheat, and potatoes on the farm • Implement participatory action research together with the farmers’ groups (Climate Smart Village model) • Participatory varietal evaluation (PVE) and acceptance testing in rice, wheat and potatoes under rain fed condition • Screening nurseries for elite rice, wheat, and maize cultivars, established in different production environments with varying stress profiles • Nitrogen management through Leaf Color Chart (LCC) in rice and wheat as well as farmers’ training on use of LCC, fodder production and silage preparation, community seed banks and index based insurance • Enhance the water holding capacity by enlarging one of the existing ponds and evaluate zero/minimum tillage with resource conservation concept • Community-based demonstrations of laser land leveling and paired evaluations of crop performance / irrigation efficiency in leveled and unlevelled fields • Needs-based irrigation scheduling for rice and performance assessment and optimization of directly-sown rice (DSR) in till + no-till • Capacity building of agro-dealers, extension agents and farmers in the area of climate smart agriculture interventions • Measure Baseline emissions from the 10 km x 10 km grid and conduct detailed characterization of the site. • Farms of the future
<p>Completed CCAFS Outputs</p>
<p>The activities have been implemented recently (mid of 2012) and visible outputs start coming from rainy season of 2013 onwards</p>
<p>Other Research Activities (2012 onwards)</p> <ul style="list-style-type: none"> • Dissemination of climate awareness messages for the farmers • Pilot testing of agro-advisories disseminated through ICT • Training of trainers (TOT) on gender and climate smart agriculture • Prioritization of adaptation/mitigation options in agriculture • Pre-season harvest yield forecasting for rice and wheat
<p>Other Research Outputs</p>
<p>http://ccafs.cgiar.org/blog/Believable-climate-futures-explored-Nepalese-farmers%20</p>
<p>Key CCAFS Partners</p>
<p>Nepal Agriculture Research Council (NARC), Gene Bank Nepal, Nepal Development Research Institute (NDRI), Himalayan Climate Change Initiative (HIMCCA), CEAPRED, Department of Hydrology and Meteorology (DHM), CIMMYT, IWMI, Oxford University, IFPRI</p>