

# PARTICIPATORY GENDER-SENSITIVE APPROACHES FOR ADDRESSING KEY CLIMATE CHANGE-RELATED RESEARCH ISSUES: EVIDENCE FROM BANGLADESH, GHANA AND UGANDA

Working Paper No. 19

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

*Moushumi Chaudhury,  
Patti Kristjanson,  
Florence Kyagazze,  
Jesse Naab and  
Sharmin Neelormi*



Working Paper



# **Participatory gender-sensitive approaches for addressing key climate change-related research issues**

*Evidence from Bangladesh, Ghana and Uganda*

Working Paper No. 19

CGIAR RESEARCH PROGRAM ON CLIMATE CHANGE,  
AGRICULTURE AND FOOD SECURITY (CCAFS)

MOUSHUMI CHAUDHURY, PATTI KRISTJANSON, FLORENCE KYAGAZZE,  
JESSE NAAB AND SHARMIND NEELORMI

**Correct citation:** Chaudhury M, Kristjanson P, Kyagazze F, Naab J B, Neelormi S. 2012. Participatory gender-sensitive approaches for addressing key climate change-related research issues: evidence from Bangladesh, Ghana, and Uganda. Working Paper 19. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).

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

Published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).

CAAFS Coordinating Unit - Department of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: [ccafs@life.ku.dk](mailto:ccafs@life.ku.dk)

Creative Commons License



This Working Paper is licensed under a Creative Commons Attribution – Non Commercial–No Derivs 3.0 Unported License.

Articles appearing in this publication may be freely quoted and reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

© 2012 CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).  
CAAFS Working Paper No. 19

#### DISCLAIMER:

This Working Paper has been prepared as an output for the Integration for Decision Making Theme/project under the CCAFS program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS. All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

## Abstract

Getting a better understanding of how climate variability affects rural men and women differently, and in different regions, is challenging. Since their ability to respond to change and take action that will make them more resilient and able to adapt to a changing climate (alongside all the other social and economic change they are dealing with) differs, we need to focus more research efforts on enhancing this understanding and linking this knowledge with actions aimed at enhancing livelihoods and food security. The global CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the Food and Agriculture Organization (FAO) joined forces to examine how well existing participatory gender-sensitive research approaches address some key climate change-related research issues that CCAFS has prioritized. Bringing together gender experts and experienced agricultural research teams from Bangladesh, Ghana, and Uganda, multiple methods were tested in the field, and refined through the lessons learned, to help inform future action research and development efforts towards enhancing communities' and individuals' (particularly women's) access to, and use of, information and knowledge to help them adapt to climate variability through more resilient livelihoods and agro-ecosystems.

CCAFS research teams have developed an adaptation tool called 'climate analogues', an approach aimed at helping people visualize what their climate and environment is likely to look like in the future. The idea behind the analogue tool is to connect a particular location with places that have climates similar (analogous) to what climate scientists predict the climate will be like in 2030 and beyond in that location. The climate analogue approach can enable farmers to better visualize and understand what their agricultural future might look like and what kinds of changes and options they need to be considering now. The results of the pilot studies in three regions suggest that farmer-to-farmer visits to analogue sites will be more challenging and problematic for women than for men, and for the elderly. For men and women who are unable to travel, more innovative means of communicating the ideas behind climate analogues and what information can be gained from them could be explored, such as through mobile phones or films. The findings also suggest that information on climate change adaptation strategies could be effectively shared in central locations that are already commonly visited by both men and women, such as in market places, hospitals, schools and water collection points.

The pilot studies also explored if, how, and what weather-related information is being accessed by different groups. Although listening to the radio is a popular way to receive formal weather forecasts, the tendency is for most adult men and both younger and adult women to rely primarily on indigenous knowledge of weather patterns. This trend seems to be slowly changing among young men, especially in the Bangladesh and Uganda sites, who rely on a combination of radio and cell phones for weather-related information and forecasts. Although seasonal forecasts can inform improved risk management and longer-run adaptation practices, none of the study participants, male or female, were yet accessing or using seasonal weather forecasts.

Climate smart agricultural practices, that is, those that sustainably increase productivity and resilience (adaptation), reduce or remove greenhouse gases (mitigation), and enhance achievement of national food security and development goals for different groups were also examined. Farmers are already pursuing a variety of agricultural practices that help them deal with weather variability and a changing climate. The focus group discussions highlighted two major reasons for choosing such practices. These are the need to improve soil conditions/fertility and a desire to diversify income sources. Men and women both contribute to improving farm productivity, but labour is differentiated by gender in most cases. In terms of catalysing new climate smart agricultural practices, these diverse case studies show that non-governmental organizations and government extension agents play key roles in providing agricultural and natural resource management information to both men and women. Women in all three sites had no decision-making ability with respect to cash crops such as rice in the Bangladesh sites because the female domain is the homestead gardens for primarily subsistence purposes. In the Uganda site, women do not have decision-making power over coffee and banana due to insecure land tenure. However, in the Ghana site, women do have more say over improved crop varieties but less so when it comes to staple crops, such as cereals and legumes. Financial distribution of benefits from selling cash crops does take place in the household, both directly and indirectly.

## **Keywords**

Gender; climate variability; adaptation; participatory action research; climate analogues, weather information, climate smart agriculture, Bangladesh; Ghana; Uganda

## About the authors

Moushumi Chaudhury is a social scientist and science officer with the CGIAR Research Program on Climate Change, Agriculture and Food Security ([www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)). Her research focuses on developing approaches, tools and strategies aimed at enhancing linkages between the knowledge co-produced by researchers, farmers, community organizations, development practitioners and others, and actions that lead to sustainable agricultural practices that enhance livelihoods and resilience to a changing climate. Her expertise and experience includes conducting research and policy analysis on climate change adaptation and mitigation, early warning systems, renewable energy, ecosystem services, gender, and the MDGs for various international research institutes and UN agencies. She can be contacted at: [M.Chaudhury@cgiar.org](mailto:M.Chaudhury@cgiar.org).

Patti Kristjanson is an agricultural economist and research leader of CCAFS, based at the World Agroforestry Centre in Nairobi. Her expertise includes poverty and livelihood analyses, impact assessment, agricultural system analyses and innovative research approaches for linking knowledge with action. She has 25 years of experience leading and managing multidisciplinary teams from international and national agricultural research centres, in collaboration with universities, donors, private and public sectors across Africa and Asia ([p.kristjanson@cgiar.org](mailto:p.kristjanson@cgiar.org)).

Florence Birungi Kyazze is a lecturer in the Department of Extension and Innovation Studies, Makerere University. She is charged with the responsibilities of teaching and supervising students on statistical methodologies, social research methods, program development, gender and evaluation. Florence has also worked with the National Cereals Program as a senior social scientist to conduct extensive social research in gender, value chain analysis, curriculum development, community mobilization, and participatory approaches. She is also a senior advisor and researcher for Women's Initiative in Development and Para-legal Activities Association and a member for the Association for International Agricultural and Extension Education ([fbirungikyazze@agric.mak.ac.ug](mailto:fbirungikyazze@agric.mak.ac.ug)).

Jesse B. Naab is a Senior Research Scientist at Savanna Agricultural Research Institute in Ghana. His areas of specialty include agriculture and soil science. He has wide experience in farming systems research using participatory technology development approaches and in the use of the Decision Support System for Agro-technology Transfer (DSSAT) model to assess carbon sequestration by cropping systems, yield gaps and risks associated with biotic and abiotic stresses. He is currently the leader of the Farming Systems Research Team in North Western Ghana ([jessenaab@gmail.com](mailto:jessenaab@gmail.com)).

Sharmin Neelormi is an Associate Professor in the Department of Economics, Jahangirnagar University, Bangladesh. She is engaged in research and advocacy on various issues such as sustainable socio-economic development, climate change vulnerability, impacts assessments and adaptation with a special focus on community-based activities and disaster risk reduction. She is also engaged in one of the pioneering mitigation efforts in Bangladesh. Her major focus has been gender and she has played an active role in climate change negotiations of UNFCCC bringing gender to the forefront. She is a focal point for the Gender CC-Women for Climate Justice for Asia ([neelormi1@yahoo.com](mailto:neelormi1@yahoo.com)).

## Acknowledgements

We are grateful to the research teams that have helped collect the information from the sites where the Training Guide on Gender and Climate Change Research in Agriculture and Food Security for Rural Development was tested. Researchers were Sharmind Neelormi and Ahsan Ahmed (Bangladesh team); Jesse B. Naab and Helen Koranteng (Ghana team); and Florence Birungi Kyazze and Brian Owoyesigire (Uganda team). We also thank Marja Lisa Tapio Bistrom, Yianna Lambrou, Sibyl Nelson and Hannah Tranberg, at the UN Food and Agriculture Organization for collaborating with CCAFS to design and test the Training Guide. We acknowledge the support of the European Union and the International Fund for Agricultural Development.



# Contents

Abstract.....	i
Acknowledgements.....	iv
Acronyms.....	vi
1.0.Introduction.....	1
2.0.Why Consider Gender in Climate Change Research for Development? .....	2
3.0.Research Findings on Climate Analogues, Weather Information, and Climate Smart Agriculture Practices .....	4
3.1.Climate Analogues .....	4
3.2.Weather Information.....	7
3.3.Climate Smart Agricultural Practices.....	11
4.0.Future Areas of Research.....	16
Appendix 1: Sample Size .....	17
References.....	18

## Acronyms

CCAFS	CGIAR Research Program on Climate Change, Agriculture, and Food Security
CGIAR	Consultative Group on International Agricultural Research
CSA	Climate Smart Agriculture
FAO	United Nations Food and Agriculture Organization
ICT	Information and Communication Technology
IK	Indigenous Knowledge
NGO	Non-governmental Organization
PAR	Participatory Action Research
UNDP	United Nations Development Program

## 1.0. Introduction

Current climate variability and future climate change does and will impact men and women differently, due to differences in social positioning and the various roles men and women play. This relates to the fact that their responses to the impacts of climate variability and change also differ, especially when it comes to safeguarding their food security and livelihoods. To date, however, there has been little focus on how men and women manage risks and adapt to challenges brought about by a changing climate. Much research into agricultural and farming systems has looked at soil, water and land management strategies and technologies that can improve productivity. Very little emphasis has been placed on understanding the different adaptive strategies men and women apply in order to secure their livelihoods in the face of climate change. If climate change research and development interventions are to be targeted to men and women, we need to understand both men and women's adaptation strategies.

To address this research challenge, the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCFAS), and the UN Food and Agriculture Organization (FAO) recently joined forces to explore, test and refine a range of existing participatory research tools felt to be particularly useful for addressing several gender and climate change initial research priorities identified by CCAFS research leaders. This led to the development of a training guide entitled "Gender and Climate Change Research in Agriculture and Food Security for Rural Development". This publication, consisting of several modules, includes participatory research approaches for examining a wide range of questions regarding if and how farming practices are being modified to deal with a changing environment, and the constraints and opportunities these changes pose for both men and women. It also covers three main research priorities relating to the climate change, agricultural development and food security 'nexus': (1) facilitating farmer exchange visits and other approaches for sharing adaptation strategies in 'climate analogue'<sup>1</sup> areas; (2) assessing how to facilitate the use of daily and seasonal weather forecasts for farmers and how to make access to forecasts more equitable; and (3) understanding and catalysing gender-sensitive, climate-smart agricultural practices.

Research teams from Bangladesh, Ghana, and Uganda helped select and further develop a range of participatory approaches along with the CCAFS and FAO researcher/trainer team. Particular attention was paid to the sampling frame and training to help ensure the guiding questions were asked in the same way, and reported in the same format, in order to allow cross-site comparison of results. The teams tested the approaches in a pilot study that covered one CCAFS site within each of the three countries, and came together again shortly afterwards to report on the results of the field test and further improve and refine the training materials based upon their experiences.

This paper reports on the results and lessons learned from this pilot test in the villages of Chandipur in Bangladesh, Kyengeza in Uganda, and Doggoh in Ghana. We are particularly interested in using the findings to inform the design of further 'action research' aimed at benefiting rural men and women in terms of enhancing food security and adaptation to a changing climate.

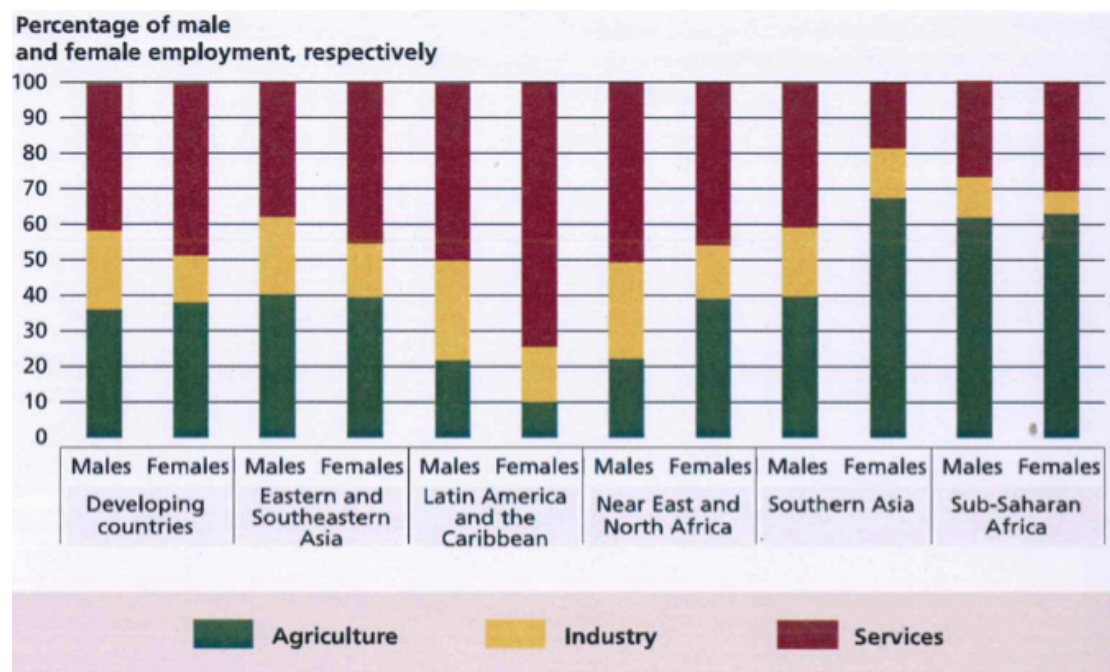
<sup>1</sup> Please refer to section 3.1 for the definition of 'climate analogues'.

Section 2 describes the importance and need for conducting research on gender, climate change, agriculture, and food security. Section 3 identifies lessons learned from the pilot studies, focusing on developing gender-sensitive climate analogue approaches, equitable dissemination and use of weather information, and sustainable climate smart agriculture practices. This section will provide key lessons that inform the design of further participatory action research with implementing partners that work closely with agricultural communities on the ground, such as NGOs, development organizations and government agencies. Section 4 suggests remaining research needs aimed at closing the gender gap.

## 2.0. Why Consider Gender in Climate Change Research for Development?

Gender refers to socially constructed roles and identities associated with men and women and the relationship between men and women (UNDP 2010). Gender roles are shaped by ideological, religious, ethnic, economic, and cultural factors but can change depending on circumstances (Quisumbing 1996). The context-specific relationship between men and women can affect the distribution of resources, wealth, work, decision-making, political power, and rights and entitlements (UN 1999). Many research for development efforts focusing on climate change issues do not take gender considerations into account. This is due to many reasons (Terry 2009). One reason is that the scientific exploration for solutions to climate change has been largely based on searching for technical fixes, such as new crop varieties or energy-saving technologies, without paying attention to social dimensions of climate change, including gender. Another reason is because gender is a complex issue, and a challenging area to research.

**Figure 1. Percentage of males and females in employment**



Source: FAO 2010-2011

We know that rural women often face higher levels of poverty and have less education than men do, and may be socially and physically restricted due to cultural norms as well. This means they are likely to be less resilient to a changing climate alongside all the other huge and rapid economic, social and environmental changes they have been facing. Even though women contribute significantly to agriculture, (see Figure 1) where they make up almost 50% of the workforce, their relative lack of access to land, information and extension services, credit, improved agricultural technologies (FAO 2010-11; Quisumbing and Pandolfell 2009) and skills (Rao 2005) limits their access to the physical, natural, human, and financial capital assets that help enhance livelihood resilience (Scoones 2005). Although evidence exists that there is a gender gap, this gap persists, alongside a belief by many decision-makers across the developing world that women are merely home producers or “assistants” in the farm household, and not farmers in their own right and key economic agents (Merha and Rojas 2008).

There is also evidence from many developing countries that climate-related shocks have had much greater negative impacts on women than men, and on asset-poor households. For example, in Ethiopia, droughts were found to have a more severe effect on female-headed and poorer households (Dercon et al. 2005). In the Philippines, droughts had the greatest adverse impact on households with less land and assets (Quisumbing and McNiven 2010).

FAO argues for serious efforts towards closing the gender gap, arguing ‘if women had the same access to productive resources as men, they could increase yields on their farms by 20-30 percent. This could raise total agricultural output in developing countries by 2.5-4 percent, which could in turn reduce the number of hungry people in the world by 12-17 percent (FAO 2010-11 p. 5).’ Research shows that when women start to have decision-making power, access and some control over earnings from agriculture, a greater proportion of the income is allocated to food, child nutrition and education (Bhagowalia et al. 2010; Hazarika and Guha-Khasnobis 2008; Smith et al. 2003).

It is important to note, however, that although most of the literature on gender and climate change in relation to agricultural development states that women are more vulnerable than men because of their lack of resources and entitlements, not all men and women are equally vulnerable to climate change (Arora-Jonsson 2011). In many instances, women can be more resilient to climate change depending on their status with regards to income and access to social networks. Women are also not necessarily victims of climate change but can contribute to finding solutions on how to cope with climate change (Nelson and Stathers 2011). Therefore, gender roles and abilities should not be homogenized. Generalizing about women’s and men’s roles and responsibilities is also not advised because it does not allow for nuanced understanding of vulnerabilities to climate variability and change by different types of men and women. And gender identities are dynamic as identity is based on interplay with other factors such as class and ethnicity (Carr 2008).

### **3.0 Research Findings on Climate Analogues, Weather Information, and Climate Smart Agriculture Practices**

Data in the pilot research studies in the three sites was collected primarily through focus group discussions. Men, women and in some cases, youths, were part of separate discussion/focus groups. A total of 348 respondents across the three sites participated in the study (see Appendix 1 for sample size details).

#### **3.1 Climate Analogues**

‘Climate analogues’ is an approach that can help people visualize what their climate and environment is likely to look like in the future. The idea behind the analogue tool is to connect a particular location with places that have climates similar (analogous) to what climate scientists predict the climate will be like in 2030 and beyond in that location. The climate analogue approach can be used to help rural communities adapt to their changing climate by enabling farmers to better visualize and understand what their agricultural future might look like and what kinds of changes and options they need to be considering now. This approach could be used to initiate farmer-to-farmer exchanges of knowledge, for example, by encouraging farmers to visit climate analogue sites, or share knowledge with those in climate analogue areas through the use of videos or other information and communication technologies (ICTs).

The main objective on the session on climate analogues was to field test the methods jointly developed with experts from CCAFS, FAO, and the local implementing partners to assess how well they address the questions surrounding how best to go about facilitating and organizing farmer to farmer exchanges between climate analogue sites and designing the complementary research. This entailed understanding the conditions under which men and women are mobile enough to visit neighbouring analogous sites, for a start. This information will be used to inform the development of appropriate adaptation interventions and actions making use of the new scientific approaches on climate analogues.

In order to assess the relative mobility of different groups and better understand the reasons behind that movement, gender-disaggregated focus groups and village resource maps were the participatory research tools used. There were a total of 103 respondents across the three sites. Most respondents were adult women (48) and adult men (23). In all cases, non-technical language was used to discuss issues such as transportation, weather conditions, distance to villages, and barriers and opportunities to travelling that would hinder or help the flow of information by visiting an analogous village. It should be noted that when communicating to respondents about climate analogues, actual analogue sites were not used. Instead, those conducting the research explained the concept of farmer-to-farmer exchanges and climate analogues in a hypothetical manner. For instance, in the case of Ghana, discussions revolved around a hypothetical visit to a neighbouring village that is currently drier than the one the respondents resided in. This approach raised an unanticipated issue, however, in Bangladesh, where the hypothetical analogue village that the researchers chose to discuss was actually a real village that the respondents were hesitant to visit and learn from, since it was known to have poor shrimp farming practices that led to high salinity levels. In other words, people prefer to learn from successes than failures, and expressed a desire to see situations where local communities are successfully dealing with their potential climate, rather than suffering from it. So how

farmer-to-farmer exchanges to climate analogue sites are promoted and communicated, along with the criteria used in selecting such sites, are all critical.

In terms of communicating the new and somewhat abstract concept of a climate analogue location to farmers, the pilot studies found that the use of non-technical language to communicate and discuss concepts of climate analogue locations is critical. The potential for farmer-to-farmer exchanges to such sites are best communicated as a good learning opportunity for farmers. The issue of potentially visiting sites where people are worse off (e.g. due to hotter, drier conditions), is a sensitive one. Giving examples of how farmers in the worse off analogue sites are successfully adapting to difficult conditions will help when designing research approaches that focus on exchanging adaptation strategies.

**Reasons for travelling.** Table 1 below shows the findings regarding the major reasons behind traveling for men and women in these pilot villages of Bangladesh, Uganda and Ghana villages. In Bangladesh, the reasons why men travel and the reasons why women travel are very different. Men travel to look for employment, learn about agricultural techniques, and to socialize. Women travel to collect water, drop off their children to school, and to shop. Our results suggest that around 40% of men in Chandipur, Bangladesh here actively seek to learn about agricultural practices, especially regarding strategies for protecting crops during a cyclone, and they travel once or twice a year for this reason. Although the men actively seek to learn about agricultural practices being pursued elsewhere, women in Chandipur, Bangladesh also reported being keen to travel to learn about agricultural practices.

In Doggoh, Ghana and Kyengeza, Uganda both men and women reported being interested in learning about agriculture from a nearby village, and travelling for that purpose. However, across all three sites, we found that the primary reasons that women travel outside their communities are to collect water, visit a doctor, trade, and accompany their children to school (Table 1).

**Table 1. Reasons for travelling**

Pilot Site	Men	Women	Common Reasons for Travel by Site
Chandipur, Bangladesh	To work; socialize; gather information use of different techniques used in agriculture under hazardous conditions	To accompany their children to school; visit relatives; shop; visit health centres; trade; fetch water; learn about homestead practices	To learn about agricultural practices
Doggoh, Ghana	To observe farming practices	To fetch water; look for traditional doctors	To trade; search for food and work; attend family functions; look for a spouse; visit children; pray; observe farming practices
Kyengeza, Uganda	Young men seek market information; older men seek information on less labour intensive crops	To farm or to collect water	To learn about agricultural practices; trade; look for better schools; visit hospital and relatives
Common Reasons for Travel by Gender	Some interest in learning about agriculture	Fetching water and visiting a doctor	



**Information sharing.** In all three sites, information collected on agricultural practices from a neighbouring village by adult men and women is informally shared with family members. In the Ugandan case, however, the male youth group reported sharing more information and actively seeking to learn about agricultural practices from other places compared to the group of older men who were more hesitant to share information and travel.

Sharing of information was linked to changes in practices, according to study participants. For instance, women in Ghana stated that from visits they learned about and then adopted practices such as composting and forming social groups to boost their social networks and economic activity. The men in Ghana have started to plant more trees after visiting another village. In the case of Uganda, women have established clonal coffee nurseries and men have adopted mulching. In Bangladesh, men have become more aware of alternative crop varieties.

Although being able to travel to other villages can have positive impacts such as the adoption of climate-smart practices, there are several factors that can deter mobility. These are outlined in Table 2.

**Table 2. Factors constraining mobility**

<b>Pilot sites</b>	<b>Men</b>	<b>Women</b>	<b>Common Factors by Site</b>
Chandipur, Bangladesh	Lack of finances; rain	Distances are too far (maximum distance is 2km); cultural norms do not allow young unmarried women to travel; elderly women do not travel due to poor health; unwillingness to ride public buses; rain; lack of finances	Lack of finances; rainy season
Doggoh, Ghana	Lack of access to transport and finances; security harassment; floods	Distances for women are too far (maximum distance is 8km); access to transport and finances are not available; rains; childrearing responsibilities prevent travel	Access to transport; lack of finances; rainy season
Kyengeza, Uganda	Access to transport	Obligations at home (childrearing, taking care of elderly); cultural taboo against riding bikes; lack of permission from husband to travel; high transportation costs; lack of water along travel routes; poor road conditions; robbery; muddy conditions	Access to transport
Common Factors by Gender	Men are very mobile. The only limiting factor is finances and access to transport	Distances to neighbouring village is too far; cultural norms; rainy season; lack of finance and transport.	



Constraints to mobility that are frequently mentioned by both men and women include lack of money to spend on travel, poor weather conditions (typically heavy rains), and large distances to cover. Table 2 shows that men cite limited financial resources for accessing a bicycle or a bus as a means of transport as a key mobility constraint. When men travel in Kyengeza, Uganda, it is mostly during harvesting periods of the year (i.e. June, July, December and January). Interestingly, mobile phones give men in Doggoh, Ghana the choice not to travel, as they are beginning to receive market price information on their phones. Some men are, however, unable to benefit from phone text messages since they are not written in the local language.

Women face more travel barriers compared to men,. Not only is distance to a neighbouring village a factor, but cultural barriers, such as not being able to ride a bicycle in Kyengeza, Uganda or go outside as an unmarried girl in Chandipur, Bangladesh, restricts travelling. For women who do travel, the frequency of their travels is difficult to generalize since the extent to which they travel typically depends on their need to trade, weather conditions, and/or need for water.

### **Key gender implications for sharing and using climate analogue information**

The case studies suggest that farmer-to-farmer visits will be more challenging and problematic for women than for men, and for the elderly compared to younger people. For men and women who are unable to travel, more innovative means of communicating the ideas behind climate analogues and what information can be gained from them (e.g. learning about potential farming options that will enhance food security and resilience to a changing climate) could be explored. Exchange of some types of information may be possible through mobile phones, but which types of information can be effectively communicated and used, how information should be communicated, and by whom, remains research questions. Another possibility that could to be explored is the use of films (e.g. short you-tube videos if internet connections exist or through a public viewing of a film projected through a laptop), which may be a more powerful communication medium since farmers will be able to visually understand different strategies their analogue neighbours use. The pilot study findings also suggest that information on climate change adaptation strategies could be provided in certain central locations that are already commonly visited by both men and women, such as in market places, hospitals, schools and water collection points.

## **3.2 Weather Information**

Farmers everywhere are very aware of the weather, watching it and the environment around them closely, and using their experience to adapt their agricultural practices accordingly. Differential access to this information could play a role in their ability to adapt to the increasing variability in weather conditions already occurring in many places. Therefore, it is important to document and address any gender- or age-based differences in access to and use of weather information, as well as to understand different information needs. Thus in order to address the research objective to better understand approaches and strategies for making weather information more useful and equitably accessible to rural women and men, we explored which types of weather information are currently available to women, men and youths in the Bangladesh, Uganda and Ghana sites, how they receive this information, if they are using it (and for what), and if not, what information they would like to receive.

Gender and age-disaggregated focus group discussions and seasonal calendars were used to explore these issues. In order to test the usefulness of existing weather information, daily and seasonal forecasts, available from the national meteorological offices in their countries, were shared and discussed with the different groups. Among the 160 participants in this exercise across the three sites, broken into four groups, there were 41 adult women, 38 adult men, 48 young men and 33 young women. Youth groups were a focus because of the assumption that they are more likely to be (or become) users of newer technologies to receive weather information, such as cell phones and computers.

**Channels for forecasts.** Before testing the relevance of formal daily and seasonal forecasts to the lives of different groups of farmers, it was important to first discuss weather information without the use of formal forecasts generated by meteorological offices. In many cases, we found weather information is based largely upon informal indigenous knowledge (IK), for both men and women as shown in Table 3 below.

When the formal forecasts were presented and discussed, many group participants struggled to understand them. In many cases, farmers were not familiar with the various symbols depicting weather conditions such as rainfall or sunshine, for example. Many do not have access to television or newspapers where they would see such visual symbols and become familiar with them. Thus communication challenges loom large if improved weather information is to reach, be perceived as useful, and used by both men and women farmers.

**Table 3. Comparison of daily and seasonal communication channels**

Pilot Sites	Daily Forecast Communication Channels				Seasonal Forecast Communication Channels			
	Men	Women	Female Youth	Male Youth	Men	Women	Female Youth	Male Youth
<b>Chandipur, Bangladesh</b>	IK* for elderly; Radio	Radio; IK	Friends; Radio; IK	Radio, Newspaper; School	Radio; TV	N/A <sup>2</sup>	N/A	N/A
<b>Doggoh, Ghana</b>	IK; Radio; Friends	IK; through male husbands	Radio; IK	Radio; IK	N/A	N/A	N/A	N/A
<b>Kyengeza, Uganda<sup>3</sup></b>	80% by Radio; IK	80% by IK	Radio; IK; Cell phones	80% use Radios; 20% use Cell phones	IK, radio	IK	Radio, cell phones	Friends, IK from elders

<sup>2</sup> N/A refers to factors that are not applicable. For instance, women in Bangladesh do not use seasonal forecasts, and therefore, seasonal forecasts are not applicable.

<sup>3</sup> Researchers in Uganda chose to analyze the data quantitatively unlike in Bangladesh and Ghana. Trainers who trained the research teams did not specify if the data collected should be presented quantitatively or qualitatively. Therefore, this discrepancy exists in presenting the information collected.

The different groups were asked what the most important communication channels were for receiving formal daily and seasonal weather forecast information. Table 3 shows that indigenous knowledge (IK) is relied upon heavily by both men and women, as well as by young people, although boys in Chandipur, Bangladesh and Kyengeza, Uganda did not mention it. Reliance on radios is widespread. Newspapers were mentioned by boys in Chandipur, and cell phones were cited by boys and girls in Kyengeza.

**Daily weather forecasts.** In Chandipur, Bangladesh, women and girls make use of the daily weather forecast information they receive on the radio or hear from their friends primarily to determine when it is possible to collect water, especially during the monsoon when the rains make it more difficult to do so. They also rely on indigenous knowledge.

Among men in Chandipur, 60% use daily forecasts, especially during planting seasons. Only 50% of the male youth, however, use the daily forecasts since many are not involved in agriculture. Nevertheless, they prefer receiving daily forecasts by mobile phones and in the local language. Among the male youth who use daily forecasts, they have found forecasts particularly useful to learn about extreme weather events.

Turning to Doggoh, Ghana, we also see that IK plays an important role, and radios are a key source of weather information. Women primarily rely on IK, but also get weather information when discussing farming activities with their husbands, since most women do not own radios.

Both male and female youths in Doggoh receive weather-related information on the radio, but they too also rely on IK. They, however, have more trust in forecasts heard on the radio than do the adults.

In the case of Kyengeza, Uganda, everyone has access to daily weather forecasts, but not everyone makes use of them. Apparently only around 20% of men actually use daily weather forecasts to help them decide whether to cultivate or not, since many find such forecasts not location-specific enough. Eighty percent of men listen to weather forecasts on the radio. Both men and women reported finding the forecasts unreliable, however. Eighty percent of women said they rely primarily on IK for indications of what is likely to happen with the weather.

The male youth group in Kyengeza said they are more likely to use the daily forecasts. According to them, 50% of households use daily forecasts and 80% rely on the radio to help them plan agricultural activities. For the 20% of young men who use cell phones, they reported that these weather forecasts were not useful, as they are not reported in the local language.

Young women in Kyengeza also rely on the radio and cell phone for information in general. Although they say that the weather information received through the SMS format is too general to be very useful to them, they feel it is from a “trusted source” since it is coming from the “Prime Minister’s Office”. However, in practice, most still rely on IK and not formal weather forecasts.

**Seasonal weather forecasts.** Most seasonal weather forecasts developed by national meteorological departments include forecast information beyond seasonal rainfall totals, such as the start and duration of the rainfall season, rainfall frequency or distribution, and temperature. We found that few farmers across the three sites included in the pilot study are yet to receive such formal seasonal weather forecasts, with the exception of Chandipur, Bangladesh, where the men’s group said that they are receiving seasonal forecasts via the radio as well as television, and these forecasts are useful to both farmers and fishermen.

In Kyengeza, Uganda, when an example of a seasonal forecast was presented to the groups, women, and particularly young women, did not understand the meaning or potential use of it, even after some prompting from the focus group facilitators. They did not seem to know how to interpret it, nor use it to plan for their agricultural activities. Although the female youth groups did not fully grasp the potential usefulness of the seasonal forecasts, they were asked if they would trust such information if provided on the radio. Seventy percent of them claimed they would not because weather forecasts are unreliable in general.

The adult men's groups, and the young men's groups, however, were able to interpret the example seasonal forecasts and their implications regarding agricultural activities (they also generally had higher education levels than the women and female youths). Many adult as well as young men in Kyengeza reported deriving and using seasonal forecasts based upon indigenous knowledge (e.g. the wind direction or timing of flowering of certain trees). For example, they plan when to plant early maturing varieties when such signs (or local people that interpret these weather signals) are indicating the likely timing of the start of the short rains. Those that were using irrigation (to produce tomatoes) were less interested in the prospect of receiving seasonal forecasts.

No-one in Doggoh, Ghana had ever come across formal seasonal forecasts. When asked if and how they might use such information, however, all groups felt that it would be helpful for them, particularly for deciding when to plant. Radio was the preferred way of getting this information for all the groups.

***Type of information requested and effective communication channels.*** One of the aims of the pilot studies was to inform the design of inclusive targeting of climate information products and services for rural communities. Although the findings indicate that most do not use formal daily or seasonal forecasts, each group was asked what types of information they would like to have access to, and received through what channels (Table 4).

In Chandipur, Bangladesh, information on rainfall is important for both men and women. The most effective channel for communication for both men and women are radios and announcements in public areas. This could be tea stalls for men and water collection points for women. Female youth, however, will still be at a disadvantage if forecasts are provided in public areas, since girls do not have the freedom to be as mobile as boys to go to public areas. In Doggoh, Ghana, however, the type of information that both men and women are interested in is advice on when to plan farming activities and protect property. Unlike in Chandipur where radio is important, in Doggoh, men and women prefer to receive information through public announcements at church, through extension agents, and/or village assemblymen. Interestingly, the youth in Doggoh would also like to information on how to interpret weather information. In the case of Kyengeza, men, women, and the youth would like information and advice on when to plan farming activities, especially for post-harvest time period. Information on when to travel for water and fuelwood collection is also important. The channels of information, however, differ between men and male youth, and women and female youth. Men and male youth prefer the radio, whereas women and female youth prefer many more mediums. This includes public announcements (through the use of megaphones, village leaders, farm groups) in places such as schools and during religious gathers. Individual letters and print media were also mentioned. A critical aspect of communicating weather information highlighted by all groups in all sites is the need to provide climate information in the local language or dialect. For all sites, use the radio and announcements in public places are key ways of communicating weather information.

**Table 4. Type of information requested & effective communication channels**

Pilot Site	Type of Information Requested		Effective Channels & Places of Communication		
	Male	Female	Male & Female youth	Male (men and boys)	Female (women & girls)
Chandipur, Bangladesh	Rainfall and salinity levels	When it will rain		Radio, TV, public places (i.e. tea stalls, schools)	Radio; areas where water is collected
Doggoh, Ghana	Advice on when to plan farming activities and protect property	When it will rain and advice on when to farm and protect property	advice on when to farm and protect property; how to interpret weather information	Radio; the church; extension agents; assemblymen	Male members of the household; the church; extension agents; assemblymen
Kyengeza, Uganda	Advice on when to plan post-harvest activities; when travel to collect water and collect fuel wood	Advice on when to plan post-harvest activities; when travel to collect water and collect fuel wood	Advice on when to plan post-harvest activities; when travel to collect water and collect fuel wood	Radio with the use of local language	Mega phones; Individual letters; Village leaders; Farmer groups; School children; Religious and social gatherings; Print media through local language

### Summary of key gender considerations with respect to weather information

Most farmers in these very different sites in three countries still rely primarily on indigenous knowledge regarding the weather. Both men and women, however, listen to the radio for daily weather forecasts, but in these areas they are still not receiving seasonal forecasts. Young men in Chandipur, Bangladesh and Kyengeza, Uganda reported getting weather information via radios and cell phones. Trust, however, in the reliability of weather forecasts is an issue for all groups.

## 3.3 Climate Smart Agricultural Practices

Climate smart agriculture (CSA) refers to agricultural practices and systems that sustainably increase productivity and resilience (adaptation), reduce or remove greenhouse gases (mitigation), and enhance achievement of national food security and development goals. But just what are climate-smart practices in different regions and to what degree are they different for women versus men with respect to access and benefits? What institutional arrangements exist, or need to be strengthened, in order to improve equitable access to benefits from climate change-related interventions (e.g. how are benefits/payments shared; how are project activities implemented to promote adaptation by individuals or groups)?

Focus groups discussions were held with women's and men's groups, and interviews with individuals from development projects were carried out to address these questions. Venn diagrams were used to map organizations and their institutional relationships.

A particular tool was also developed called 'Changing Farming Practices'. This was designed to document how a change in a farming practices, such as planting trees or modifying soil management, affects the activities of men and women. The tool also helped to foster discussion on how the change in the farming practice occurred, roles in decision-making and access to any benefits created by the change. In Doggoh, Ghana, using this tool proved to be a challenge because even though farmers make changes in their farming practices, they often did not mention these changes until prompted. For instance the Ghana research team observed new crops such as improved maize, groundnut, cowpea and soybean varieties. However, the respondents maintained that there had been no changes, until prompted by these observations. Therefore, filling in the "Changing Farming Practices" table was not straightforward and researchers had to also use guiding questions provided in the training guide to prompt answers to be able to fill in the table. The importance of using the guiding questions provided in the training guide was also stressed by the Uganda research team. The Uganda team additionally suggested mapping changing practices over a timeline to understand trends. Overall, the combination of these research tools and methods helped identify opportunities for further action-oriented research to catalyse more widespread adoption of climate-smart agricultural practices, particularly by women.

***CSA practices and drivers.*** There are numerous types of agricultural practices in the three sites that can be considered 'climate smart'. Table 5 below lists the current and most popular practices described by participants for each site and identifies whether men or women are involved. Farmers described using such agricultural practices primarily in order to address issues of adaptation and food security, and did not mention mitigation objectives, although many of these practices also help mitigate greenhouse gas emissions.

In most cases, both men and women contribute equally to agricultural work but have different gender roles. For instance, in the case of Chandipur, Bangladesh, women conduct agricultural work near their homes, tending to vegetable gardens and poultry. Women in Kyengeza, Uganda are responsible for setting traps to reduce pests. Compared to Chandipur and Kyengeza, in Doggoh, Ghana, most practices are carried out equally by men and women.



**Table 5. Current CSA practices**

Pilot site	Type of technology/ technique	Primary responsibility of men	Primary responsibility of women	Men & women both responsible	Common factors by site
Chandipur, Bangladesh	Planting trees by roadside or pond banks			√	Women contribute more to agriculture work near their homes, whereas men contribute to work in the fields (i.e. row cropping).
	Row cropping	√			
	Organic fertilizer			√	
	Vermi-compost		√		
	Homestead vegetable gardens		√		
	Raising poultry		√		
Doggoh, Ghana	Agroforestry			√	Both men and women are equally involved in agriculture work except for composting, which is primarily women's work.
	Composting			√	
	Non-burning of bushes and crop residue			√	
	Retention and incorporation of crop residue to improve soil fertility			√	
	Planting of improved early maturing			√	
	Intercropping of cereals and legumes			√	
	Cultivation in low land			√	
Uganda	Mulching	√			Men are primarily involved in agriculture. However, planting of improved/ drought resistant seeds and crop rotations are practices conducted by both men and women.
	Improved/drought resistant seeds			√	
	Crop rotation			√	
	Zero grazing	√			
	Pest Management		√	√	
	Intercropping			√	

In Bangladesh, we see some differences in why and when men or women chose to adopt new agricultural practices. For example, men prepare and apply organic fertilizer to crops in the main fields, and women apply it to their kitchen vegetable gardens. National campaigns have helped promote education about land degradation and awareness about the importance of using organic fertilizers. These campaigns have led both men and women to abandon old ways of burning crop residues and spreading the ashes on the topsoil. They now leave the crop residues on the topsoil after harvest, allowing for richer biomass as organic fertilizer.

Planting of trees near ponds and roadsides is also practised by both men and women in Chandipur, Bangladesh because fruits from the trees bring income. Men collect seedlings and women plant them. Women are, however, interested in maintaining the trees as long as possible as insurance in case they need to sell the tree in a time of crisis. Men are not interested in long-term growth of the trees, preferring to cut them down and sell them for timber or other uses as soon as they can obtain cash for them.

To enrich organic matter in the soil, another relatively new practice that women in Chandipur have taken up is vermi-compost (composting with worms) with the help of local NGOs. Once women have prepared the compost, men apply it in their fields and women in their homestead gardens. Women are also involved in raising poultry but it is the men who sell the poultry and poultry products in the market.

Uptake of practices that can be considered ‘climate smart’ were not reported to differ much across men and women in Kyengeza, Uganda. Reduction in soil fertility has been a major driver behind the adoption of mulching, crop rotations, and planting of improved crop varieties in Kyengeza. Mulching is a traditional farming practice to conserve water in coffee and banana plantations, practised primarily by men (60-70% of cases), because mulching material has to be purchased. Women in Kyengeza also practise mulching, but on a smaller scale and not on cash crops such as coffee and banana. Intercropping and crop rotation practices are being adopted by both men and women in part due to population pressure, which has created a shortage of land. This practice has helped reduce pests and protect soil moisture. Changes in land tenure have also influenced agricultural practices. Access to public lands to graze animals, which is practised by men, has minimized over the years as land is now leased to individuals. This has led to a reduction in herd sizes and the adoption of zero grazing practices in some places. Our findings show that both men and women are involved in planting drought-resistant crops. This practice was reported as becoming increasingly popular due to the inability of farmers to predict the weather as well as they could previously.

In Doggoh, Ghana, changing rainfall patterns, declining soil fertility, and labour migration to urban areas are key driving forces that have led men and women to start practicing methods listed in Table 5. Interestingly, men and women were perceived to participate equally, although often taking different roles in CSA practices. For instance, when it comes to planting trees on farms (agroforestry), men acquire the seedlings and plant the trees, while women care for and water them. With regards to composting, men prepare it but women apply it in the farm. When planting improved crop varieties, men till the land and women sow.

In all three very different sites, common factors influencing uptake of climate smart agricultural practices has been a recognition that soil fertility has been declining. The desire to diversify and increase income levels was also expressed by both men and women across all sites. Seeing positive changes in others’ farms had a large influence on some with respect to thinking about new potential CSA practices on their own farms.

**Organizations.** Government extension agents and non-governmental organizations (NGOs) are key drivers of change with respect to adoption of new agricultural practices in Bangladesh. According to female farmers in Chandipur, Bangladesh, these types of organizations have both introduced new methods and taught farmers how to improve their existing farming techniques. For men, however, NGOs and media campaigns on certain farming technologies were described as being the most influential.



In Kyengeza, Uganda, the most influential organizations cited were the Rural Poverty Eradication Program (a private initiative), the District Agricultural Training and Information Centre (DATIC), Community Integrated Development Initiative (CIDI), Community Enterprises Development Organization (CEDO), Rakai Counsellors' Association (RACA), and National Agricultural and Advisory Services (NAADS). These organizations offer a variety of training services including tree planting as well as soil and water conservation. Women farmers actively participate in the farmer training sessions. Although these organizations have influenced female farmers, many women do not put into practice what they have learned due to several constraints, particularly lack of time and permission from their husbands.

In the case of Doggoh, Ghana, extension agents and NGOs had the biggest influence in changing agricultural practices among women farmers. Men, however, stated that it was the Ministry of Forests and Agriculture, as well as NGOs that had influenced their decisions regarding agricultural practices and options.

The three cases show that the government, either through extension agents or an advisory body, has significant influence over what practices male farmers adopt. Non-governmental organizations appear to be more important for women.

***Institutions and decision-making.*** Although farmers are willing and able to make changes to improve farm productivity, women in Chandipur, Bangladesh, with no rights to land, stated that decision-making primarily rests with male members of the household where agriculture in the main fields is concerned. However, women are able to make decisions when it comes to agriculture in their homestead gardens.

In Kyengeza, Uganda, insecure land tenure also prevents women from making decisions regarding agricultural practices, especially with regard to cash crops, such as coffee and banana.

In the case of Doggoh, Ghana, even though women face insecure land tenure, men and women can both make decisions over agricultural practices. Men make decisions with respect to staple food crops, such as cereals and legumes, as well as where and to what extent to plant them. Men stated that women made decisions regarding use of improved crop varieties, because women focus more on securing food availability in times of climate variability in order to prevent hunger.

***Benefit sharing.*** Benefit sharing is highly dependent on the nature of the agricultural practice. In the case of Chandipur, Bangladesh, according to women, men control economic benefits derived from selling vegetables from home gardens and poultry, which are products that women are in charge of. Because many women are not able to visit markets regularly, men sell these products on behalf of women. Financial benefits are, however, redistributed since money earned by selling vegetable and poultry helps to purchase food that the family shares.

In Kyengeza, Uganda, it is the men who receive direct economic benefits from selling cash crops, such as coffee and banana. The women may sell other products that they grow, and do play an active role in trade in food crops. Women also receive non-financial benefits that are redistributed in the household, such as food that is purchased when a cash crop is sold by a male member of the household.

While it is unclear how often women in Doggoh, Ghana directly financially benefit from the sale of cash crops, women are able to at least indirectly benefit as assets are redistributed in the family after the sale of farm products.

## **Implications for Climate Smart Agriculture**

Farmers are already involved in many climate smart agriculture practices aimed at enhancing resilience and improving land productivity. The major driving factors cited were a desire to improve soil conditions and diversify their income sources. Men and women both contribute to improving productivity, but labour is differentiated by gender in most cases, so the labour demands of the various practices/options needs to be taken into consideration for new practices to be adopted and for women as well as men to benefit from them. In terms of catalysing CSA practices, non-governmental organizations and government extension agents play a key role in providing agricultural information and advice to both men and women. Thus strengthening their capacities and knowledge base regarding appropriate adaptation and mitigation strategies in different circumstances will be key for enhancing adoption of CSA practices.

## **4. Future Areas of Research**

This paper highlights some of the key strategies needed to build upon new science that includes climate analogues, improved weather forecasts, and climate smart agriculture practices, and link it actions on the ground that lead to enhanced food security and equitable benefits. There is, however, much room for more action-oriented research on the complex issues surrounding the nexus of gender, climate change, agriculture, and food security issues.

As discussed in Section 2, not all women and men are vulnerable in the same way. There may even be cases where women are more resilient compared to men in the face of climate change. This paper does not highlight the strategies required to address gender disparities based on the level and type of vulnerability to climate change. For instance, men and women's level of poverty, power and exposure to climate risks is not accounted for here, and is an area where further research is needed.

Findings throughout the testing of the training guide indicate that research is needed on how best to communicate climate adaptation information and strategies. Although the findings regarding climate analogues suggested alternatives to farmer-to-farmer exchanges through the use of films, for example, other mechanisms to transfer ideas and knowledge on adaptation need to be examined. Use of cell phones may be the answer. However, questions on who has access to cell phones, what language is used, and if such information would be trusted are issues that researchers, communicators, and service providers will need to focus on.

## Appendix 1: Sample Size

### Climate Analogue Exercise (Total: 103)

Country	Female youth	Female adults	Elderly female	Male youth	Male adults	Elderly males
Bangladesh	0	21	3	2	12	5
Ghana	5	6	1	3	4	4
Uganda	2	11	1	3	7	3
<b>Total</b>	<b>7</b>	<b>48</b>	<b>5</b>	<b>8</b>	<b>23</b>	<b>12</b>

### Weather Information Exercise (Total: 79)

Country	Female adults	Elderly female	Male adults	Elderly males
Bangladesh	13	3	11	4
Ghana	9	4	7	4
Uganda	12	0	12	0
<b>Total</b>	<b>34</b>	<b>7</b>	<b>30</b>	<b>8</b>

### Weather Information Exercise: Youth Groups Only (Total: 71)

Country	Female youth	Male youth
Bangladesh (ages 13-22)	3	18
Ghana (age not specified)	12	29
Uganda (ages 20-25)	8	1
<b>Total</b>	<b>23</b>	<b>48</b>

### CSA Practices (Total: 85)

Country	Female youth	Female adults	Elderly female	Male youth	Male adults	Elderly males
Bangladesh	2	13	3	2	12	3
Ghana	3	5	5	2	6	3
Uganda	1	9	4	1	6	5
<b>Total</b>	<b>6</b>	<b>27</b>	<b>12</b>	<b>5</b>	<b>24</b>	<b>11</b>

## References

- Arora-Jonsson S. 2011. Virtue and vulnerability: Discourses on women, gender, and climate change. *Global Environmental Change* 21(2): 744-51.
- Bhagowalia P, Menon P, Quisumbing A, Soundararajan V. 2010. Unpacking the links between women's empowerment and child nutrition: evidence using nationally representative data from Bangladesh. Selected paper prepared for presentation at the AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, USA, 25–27 July, 2010.
- Carr E. 2008. Men's crops and women's crops: the importance of gender to the understanding of agricultural and development outcomes in Ghana's Central Region. *World Development* 36 (5): 900–915.
- Dercon S, Hoddinott J, Woldehanna T. 2005. Shocks and consumption in 15 Ethiopian villages, 1999-2004. *Journal of African Economies* 14(4): 559-585.
- Food and Agriculture Organization of the United Nations. 2010-11. The state of food and agriculture. Women in agriculture: Closing the gender gap for development. Rome: FAO.
- Hazarika G, Guha-Khasnobis B. 2008. Household access to microcredit and children's food security in rural Malawi: a gender perspective. IZA Discussion Paper No. 3793. Bonn, Germany, Institute for the Study of Labor (IZA).
- Mehra R, Rojas M. 2008. Women, food security and agriculture in a global marketplace. Washington, DC: International Center for Research on Women (ICRW).
- Nelson V, Strathers T. 2011. Resilience, power, culture, and climate: a case study from semi-arid Tanzania, and new research directions. *Gender & Development* 17 (1): 81-94.
- Quisumbing AR, McNiven S. 2010. Moving forward, looking back: the impact of migration and remittances on assets, consumption, and credit constraints in the rural Philippines. *Journal of Development Studies* 46 (1): 91-113
- Quisumbing AR, Pandolfell L. 2009. Promising approaches to address the needs of poor female farmers: resources, constraints and interventions. *World Development* 38 (4): 581–592.
- Quisumbing AR. 1996. Male-female differences in agricultural productivity: methodological issues and empirical evidence. *World Development* 24 (10): 1579-1595.
- Rao N. 2006. Land rights, gender equality and household food security: exploring the conceptual links in the case of India. *Food Policy* 31: 180-193.
- Scoones I. 2005. Sustainable rural livelihoods: a framework for analysis. IDS Working Paper 72.
- Smith LC, Ramakrishnan U, Ndiaye A, Haddad L, Martorell R. 2003. The importance of women's status for child nutrition in developing countries. Research Report No. 131. Washington, DC, IFPRI.
- Terry G. 2009. Introduction to climate change and gender justice. In G Terry (ed) Climate Change and Gender Justice. Warwickshire: Practical Action Publishing.

United Nations Development Program. 2010. Gender, Climate Change, and Community Based Adaptation Guidebook. New York: UNDP.

United Nations. 1999. World Survey on the Role of Women in Development. New York: UN.



The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic initiative of the Consultative Group on International Agricultural Research (CGIAR) and the Earth System Science Partnership (ESSP), led by the International Center for Tropical Agriculture (CIAT). CCAFS is the world's most comprehensive global research program to examine and address the critical interactions between climate change, agriculture and food security.

**For more information, visit [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)**

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



Earth System  
Science Partnership

