Adaptation Actions in Africa: Evidence that Gender Matters

Working Paper No. 83

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

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Abstract

This paper presents the initial data analyses of the CCAFS gender survey implemented in four sites in Africa. Using descriptive statistics we show gender differences in terms of perceptions of climate change, awareness and adoption of climate smart agricultural (CSA) practices, and types and sources of agro-climatic information in the four sites. We find that both men and women are experiencing changes in long-run weather patterns and that they are changing their behaviours in response; albeit relatively minor shifts in existing agricultural practices. For example, the most prevalent changes reported include switching crop varieties, switching types of crops and changing planting dates. As expected, women are less aware of many CSA practices. Encouragingly, this same pattern does not hold when it comes to adoption; in many cases, in East Africa in particular, women, when aware, are more likely than or just as likely as men to adopt CSA practices. In West Africa, overall, the adoption of these practices was much lower. In addition, we see that access to information from different sources varies greatly between men and women and among the sites; however, promisingly, those with access to information report using it to make changes to their agricultural practices. Our findings suggest that targeting women with climate and agricultural information is likely to result in uptake of new agricultural practices for adaptation.

Keywords

Gender; Climate Change; Climate Smart Agriculture; Climate Information; Adaptation.

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Contents

List of Tables and Figures

Acronyms

CSA	Climate Smart Agriculture
CARE	Cooperative for Assistance and Relief Everywhere
CGIAR	Consultative Group on International Agriculture Research
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
IFAD	International Fund for Agricultural Development
ILRI	International Livestock Research Institute
PIM	CGIAR Research program on Policies, Institutions and Markets

Introduction

Crop and climate models predict, with some degree of certainty, how climate change will impact yields of various crops in different regions. However, the expected regional impacts are not locally specific and cannot anticipate how individuals at the local level will be affected by climate change. Given the complexity and heterogeneity at the local level, and among individuals in certain contexts, it is difficult to predict the impact of climate change on individuals' lives. Nonetheless, previous research about gender and agriculture and about gender and natural disasters provides insight into how different groups and types of people experience the impacts of climate change differently depending on their position in society, which is determined by gender, race, class, ethnicity, religion, age, etc. (Blaikie et al 1994; Ray-Bennett 2009; and Beuchelt and Badstue 2013).

The impact of climate change on individuals, families and communities can vary considerably, depending on local cultural and gender norms regarding who does what and who controls the benefits from different activities (CARE 2010). Therefore, appropriate climate change adaptation strategies, including adoption of CSA[1] practices and use of climate information, will be distinct for different groups of people, including for men and women.

This paper highlights some key gender-related findings regarding climate change perceptions, adaptation strategies and information needs across sites in Africa where the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is working. Although it is often assumed that gender refers only to women, a meaningful gender analysis also considers men and the differences between men and women. Gender is about relationships and power dynamics; it refers to socially constructed differences between men and women and is an acquired identity that is learned, changes over time and varies widely within and across cultures (INSTRAW 2004). Gender informs differences in roles and responsibilities, access to and control over resources, and decision-making power. However, other social factors as race, class, ethnicity, religion, age, etc., also influence a person's position in society, as well as the power dynamics that these imply (Kaijser and Kronsell, 2014; Davis, 2008). While recognizing the importance of these various social factors, this paper primarily focuses on identifying differences between men and women, and when possible discussing other social factors (i.e. by ethnicity and religion).

[1] Agriculture is considered to be "climate-smart" when it contributes to increasing food security, adaptation and mitigation in a sustainable way (Neufeldt et al., 2013).

This paper is organized in four main sections. The first describes the survey approach and data as well as the CCAFS sites where the data was collected. The second explores perceptions of climate change and its effects on men and women. The third focuses on gender differences in awareness and adoption of climate-smart agricultural (CSA) practices. The fourth section examines gender differences in access to various types and sources of climate information. In the conclusion, we identify areas of further scientific inquiry and ways to link theory to practice through influencing policy and program development.

Data and Setting

Most of the data presented in this paper comes from the CCAFS gender survey,[2] an intra-household survey that collected information in 2012 from both an adult male and female decision-maker[3] in each of the sampled households in four sites in Africa: Nyando and Wote in Kenya, Rakai in Uganda, and Kaffrine in Senegal. This survey built upon an earlier farm characterization survey (called IMPACT-Lite[4]) and thus used the same sample of 200 farm households in each site, which encompass a 10 by 10 km block of land[5]. The sample was chosen to represent the different agricultural production systems in each site (Rufino, et al., 2012). While the sample may not be representative of all of Africa, it does represent diverse sites in terms of climate, agro-ecological zones, production systems, socio-economic, and cultural variability. And, as such, it provides insights about gender differences related to climate change in Africa. The data from the survey is analysed here using descriptive statistics and proportion tests to check for statistically significant differences between men's and women's reporting by site. In addition to the CCAFS gender survey, information from initial site household and village baseline surveys (see CCAFS 2013 and 2014), as well as qualitative research and personal observations by the authors, are also used.

Three of the sites (Nyando and Wote, Kenya and Rakai, Uganda) are in East Africa and the Kaffrine site in Senegal is located in West Africa. These sites, in general, have high levels of poverty and population pressure. The sites are comprised mainly of smallholder farmers that rely on rain fed agriculture and most are mixed crop-livestock systems. Annual rainfall varies across the sites. In the West African site of Kaffrine, Senegal there is one short rainy season per year, while in the East African sites there are two

[2] The survey instrument and data is available online at http://hdl.handle.net/1902.1/22584. (CCAFS; IFPRI; ILRI, 2013).
[3] By interviewing both a male and female in each household, the typical male bias of interviewing the (male) household head is avoided. See Deere, Alvarado, and Twyman, 2012.
[4] Silvestri, S. et al. 2014)
[5] Forch et al. (2013) describe the CCAFS sites.

rainy seasons but rainfall varies both across and within the sites. In Wote rainfall averages 520 mm per year while Nyando gets 900 to 1200 mm and in Rakai rainfall varies significantly within the site from more than 1400 mm near Lake Victoria to under 1000 mm per year in the western area (Forch et al. 2013).

Several socio-economic and gender differences also characterize the sites. Several ethnic groups live within most of the sites; there are ten different ethnic groups in Rakai and two in Nyando. Religion also influences gender norms in the sites. In the East African sites, three religious groups are typically found--Catholics, Protestants, and Muslims--whereas in the Kaffrine site in Senegal the predominant religion in Islam. The CCAFS household baseline provides data about who in the household does most of the on- and off-farm work (i.e. collecting fuel wood, fruits, fishing, etc. for household consumption or for selling). Across the sites women tend to do most of the fuel wood collection. In other tasks, we find differences across the sites. For example, in Nyando women are reported to do most of the off-farm work in 65% of the households. Whereas in Rakai off-farm work is primarily done by men and in Wote and Kaffrine it is shared by both men and women. Furthermore, on-farm work is primarily done by women in Nyando. In Wote and Kaffrine, on-farm work is shared in most households. And, in Rakai we find that on-farm, men and women share in the food production responsibilities, men are primarily responsible for cash crops and cattle, and women are primarily responsible for fuel wood and manure collection (Kyazze and Kristjanson 2011, Mango et al. 2011, Yacine et al. 2011, and Mwangangi et al. 2012). Furthermore, women's property rights to land vary across the sites. Wote has the highest proportion of women with property rights to land (53%) compared to the other sites (25% in Nyando, 23% in Rakai and 0.4% in Kaffrine).[6]

Gendered Perceptions of Climate Change and Its Differentiated Impacts

Climate change is experienced in the form of climate variability (i.e. changes in weather patterns) and weather-related shocks or disasters at the local level. Thus, the survey asked respondents about their perceptions of both shocks/extreme events (i.e. droughts and floods) that they experienced in the last five years and observed changes in weather patterns over their lifetime (i.e. changes in temperature and precipitation that do not necessarily lead to shocks).

[6] Based on authors' calculations using data from Silvestri et al. (2014).

Differences in perceptions of climate shocks, such as droughts and floods, experienced during the last five years are mainly seen between sites; however, there are also some gender differences within sites (Table 1). The most common shock reported in the East Africa sites (Nyando, Wote, and Rakai) is drought. In the West Africa site (Kaffrine, Senegal), the most common shocks experienced are storms and floods. In terms of gender disparities, there are no overarching patterns across the sites with respect to perceived changes in weather-related shocks over the last five years,[7] but within sites, we do find some differences. For example, in the Kenyan site of Nyando, more women than men report having experienced floods and storms, while more men than women report dealing with droughts and erratic rainfall. In Rakai, the Ugandan site, droughts are reported by the majority of both men and women, but women are more likely to report them than men. Men, on the other hand, are more likely than women to report storms. Women may be more likely to report droughts since they are responsible for collecting water and for on-farm vegetable production (Kyazze and Kristjanson, 2011).

Although few gender differences with respect to perceived climate shocks are noted in Wote (eastern Kenya) and Kaffrine (Senegal), we cannot infer that men and women experience such shocks in the same way. For example, shocks may have different impacts on men's and women's labour or their asset base. Quisumbing et al. (2011) discuss how different kinds of shocks (including weather shocks) impact men's and women's assets. They find negative impacts on men's assets as a result of weather shocks in Bangladesh and on women's assets in Uganda. Similarly we can expect that, although both men and women are experiencing similar extreme climate events, the impact of such changes depends on their roles (CARE 2010).

In each site, the majority of respondents (both men and women) reported that they have observed changes in weather patterns over their lifetimes. In all sites, changes in rainfall patterns have been experienced by the vast majority of respondents, and with the exception of Wote, significantly fewer women reported observing such changes. The least likely change observed related to floods, except in Kaffrine, where a change in the occurrence of droughts was perceived by very few respondents. In general, the data suggest that fewer women perceive long-run changes in weather patterns, although more women than men reported changes related to drought and temperatures in Rakai. And in Nyando, significantly more women reported a perceived change in temperatures in their lifetime.

[7] The question asked which shocks had significantly affected the household (in terms of income or livelihood) during the last five years. Five shocks could be listed by each respondent.

Table 1. Percent of men and women reporting climate shocks and long-term weather patterns

	Nyando		Wote		Rakai		Kaffrine	
	Men	Women	Men	Women	Men	Women	Men	Women
	n=200	n=200	n=176	n=175	n=155	n=187	n=200	n=323*
Experienced the following events as shocks (in the last 5 years):								
Flood	17	42	1	0	2	2	20	20
Drought	64	50	99	99	70	87	1	1
Storm	2	12	0	0	21	13	24	23
Erratic Rainfall	22	6	9	3	1	2	9	11
Frost	0	0	0	0	1	0	0	0
Cold spell	0	1	7	0	0	0	0	0
Heat	1	0	4	2	0	1	1	1
Fire	0	0	0	0	0	1	4	2
Observed the following changes related to weather patterns (during lifetime)								
Observed any change in climate or weather during lifetime	96	86	99	99	97	96	86	65
Observed a change in temperature	44	54	77	53	6	29	41	31
Observed a change in rain	93	70	99	97	84	71	75	51
Observed a change in droughts	68	42	96	79	36	80	6	3
Observed a change in floods	13	6	0	1	6	10	14	13
Made change in agricultural, livestock or livelihood practice in response to climate change								
Made change	64	57	93	96	83	76	48	30

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Notes:

*In Kaffrine, 200 households were interviewed; however, multiple wives were interviewed in polygamous households for a total of 323 women interviewed in the site.

No statistically significant difference

More women than men report shock or weather change

More men than women report shock or weather change

Several gender differences are noted in perceived climate changes. Because of the distinct work men and women do, largely dictated by gender norms, men and women perceive climate change differently and they are impacted by it in different ways (Brody et al. 2008). Such differences have implications for policy and programs. Agricultural research for development interventions seeking to address climate change effects should carefully identify the gender differences in the target group (Brody et al. 2008 and CARE 2010). For example, if women perceive droughts or less rainfall because they walk farther to collect water and have less water for producing subsistence crops while men feel the effects in terms of lower agricultural production of cash crops, programs and policies will have to take all of these impacts

into consideration to promote appropriate adaptation strategies that address the various needs of both men and women. By understanding how climate change will impact men and women differently (based on their distinct roles and access to resources), programs and policies can be designed to promote adaptation strategies that address such impacts in a gender equitable manner.

Gender differences in making changes to adapt to climate change

Just as men's and women's perceptions and experiences of climate change can differ, so can their responses to it. Adaptation strategies adopted by men and women also depend on their access to and/or control over resources and their participation in decision-making processes. In this section, we first discuss survey results showing whether men and women in each site have made changes in their agricultural practices to adapt to climate change and the most common changes reported (as well as why changes were not made). Next we discuss the findings regarding gendered awareness and adoption of CSA practices.

When asked specifically if they had made a change in their agricultural, livestock or livelihood practices in response to climate change, many respondents said that they had done so (Table 1). More differences across sites are noted than differences by gender within the sites. In Wote, nearly all respondents reported making a change in response to climate or weather events (96% of women and 93% of men); it is also the site with the highest number of respondents reporting observed climate changes (99% for both men and women). In Nyando, just over half reported making a change (64% of men and 57% of women). In Rakai, more men (83%) than women (76%) reported making a change. In Kaffrine fewer men and women than in the other sites reported altering their practices as a result of perceived changes in climate; however, statistically more men (46%) than women (33%) reported making a change.

As shown in Table 2, the most common changes made by both men and women across the four sites are typically related to crop production adjustments and include implementing soil and water conservation practices, changing crop variety, changing type of crop, changing planting date, and planting trees on farm.[8] It is interesting to observe that both men and women highlight agroforestry practices as an

[8] It is unclear if the decision to implement a change was made solely by the farmer or if such decisions were made by a group. As a reviewer commented, in some places where water is scarce, there are water management structures that are controlled by a group. When a dry year is

adaptation strategy, as agroforestry has traditionally been an activity where women's participation has been impeded by existing gender norms related to roles, decision-making and access to resources (Kiptot and Franzel 2012).

Several gender differences across the sites can be seen. For example, setting up food storage facilities lies within the top five changes made by women in Rakai and men in Kaffrine. Social norms in the sites related to what men and women should do undoubtedly influence the fact that setting up storage facilities is listed by women in one site and men in another. Men in Kaffrine have higher participation in on-farm agricultural production, focusing on food production, than women in the site who have a higher level of participation in off-farm work, including collection of firewood and water (Yacine et al. 2011). This suggests that men are more engaged in decision making around food security for households as the primary producers of food crops. Furthermore, men emphasize that food security is related to food availability (Goudou 2012); so, having food storage facilities could increase food availability for the household throughout the year. Women, on the other hand, view food security in terms of having the ability to purchase food, so food storage facilities would not be valued as much as having cash for purchases. In Rakai, among the Baganda, which comprise 80% of those surveyed according to Kyazze and Kristjanson (2011), men often migrate, meaning that food storage facilities may be more important to the women who are left to care and provide directly for their families while the men who remain are focusing on other adaptation strategies.

Similarly, water harvesting is mentioned by women in Nyando and men in Rakai as a practice taken up in response to climate change. In Nyando, individual farmers and farmer groups made up of about 20 members are involved in constructing water pans to store runoff and for use during drier periods. The farmer groups jointly own the water pans in selected farms.

Women in Kaffrine report distinct kinds of responses to climate change when compared to men or women in the other sites. These women mention community tree planting, setting up non-farm businesses and changing field locations. The community and non-farm adaptations are quite different from the others that focus on crop production changes. Another difference is noted in Rakai, where both men and women list increasing land used for agricultural production, which is likely not possible in the other sites because of high land pressure.

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predicted, people are not allowed to plant vegetables that require a lot of water. This of course will impact the results and has gendered implications in terms of women's participation in such groups that make these decisions.

Table 2. Top five most common changes made by men and women to adapt to climate changes (percent of those who reported making an agricultural, livestock, or livelihood change in response to climate change)

	Women	Men
Nyando, Kenya	n = 200	n = 200
	Soil and water Conservation (19)	Planting trees on farm (39)
	Change crop variety (18)	Change crop variety (39)
	Change planting date (14)	Change planting date (34)
	Change crop type (11)	Change crop type (25)
	Water harvesting (10)	Soil and water conservation (14)
	Planting trees on farm (10)	
Wote, Kenya	n = 175	n = 176
	Change crop type (53)	Soil and water conservation (74)
	Soil and water conservation (47)	Change crop variety (55)
	Change planting date (36)	Change crop type (44)
	Change crop variety (27)	Planting trees on farm (40)
	Planting trees on farm (26)	Change planting date (29)
Rakai, Uganda	n = 187	n = 155
	Increase land in production (54)	Planting trees on farm (53)
	Planting trees on farm (26)	Change crop type (22)
	Set up food storage facilities (16%)	Increase land in production (21)
	Change crop type (11)	Change crop variety (10)
	Soil and water conservation (5)	Water harvesting (4)
Kaffrine, Senegal	n = 323	n = 200
	Soil and water conservation (5)	Soil and water conservation (12)
	Plant trees in community (4)	Change crop variety (4)
	Change planting dates (3)	Change crop type (4)
	Set up non-farm business activity (2)	Change planting date (4)
	Change field location (2)	Set up food storage facilities (4)

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Several men and women, however, reported that they had not made any agricultural, livestock or livelihood practice changes in response to a changing climate. As shown in Table 3, the two most common answers given in response to why changes have not been made are that they don't know what to do or that they don't have enough money to implement changes. Other frequently cited reasons are that they don't see the need, they don't have enough information about climate change, and they don't have enough labour to implement changes.

Responses from men in Wote differed somewhat compared to the other groups. They also said not knowing what to do or not having enough money were key reasons, plus they needed to see neighbours implementing the practice before making the change, and that they think the practice might fail and therefore do not want to assume the risk. This may suggest different attitudes about risk; perhaps men in Wote who have not made any changes are more risk averse than in the other sites (or compared to women within the site).

Table 3. Top five most common reasons given by men and women for why changes were not made (percent of those who reported not making an agricultural, livestock, or livelihood change in response to climate change)

	Women	Men
Nyando, Kenya	n = 86	n = 72
	Not enough money (58)	Don't know what to do (47)
	Don't know what to do (36)	Not enough money (30)
	Not enough information about climate change (4)	Don't see the need (9)
	Not enough labor (1)	Not enough labor (9)
	Don't see the need to make changes (1)	Not enough information about climate change (4)
	Think the practice/change might fail (1)	
Wote, Kenya	n = 7	n = 13
	Don't know what to do (42)	Don't know what to do (36)
	Don't see the need (29)	Not enough money (36)
		Need to see it being implemented by neighbors (14)
	Not enough money (14)	
	Not enough labor (14)	Think the practice/change might fail (14)
Rakai, Uganda	n = 45	n = 26
	Don't know what to do (24)	Not enough money (35)
	Not enough money (22)	Don't know what to do (31)
	Don't see the need (16)	Not enough labor (12)
	Not enough labor (13)	Not enough information about climate change (8)
	Land being used by a more profitable activity (9)	
Kaffrine, Senegal	n = 165	n = 95
	Don't know what to do (62)	Don't know what to do (56)
	Not enough money (36)	Not enough money (40)
	Not enough information about climate change (1)	Not enough information about climate change (3)
	Not enough labor (1)	Not enough labor (1)

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Climate smart agriculture (CSA) practices are practices that help farmers adapt to climate change while at the same time reducing GHG emissions and increasing productivity.[9] As such they are included as other potential adaptation strategies. Data about awareness and adoption of various CSA practices are presented in Tables 4 and 5. Overall, we find that women tend to be less aware of CSA practices than men (as shown by the few red cells in Table 4). However, if they are aware, they are slightly more likely to adopt (shown in Table 5). These trends also vary by practice and place and are likely related to cultural norms regarding what activities men and women typically do (or those that they should/should not do).

9 Climate smart agricultural practices are defined as agricultural practices that increase productivity, reduce GHG emissions, and increase adaptation to climate change (FAO, 2013). Based on this definition, a practice could be classified as CSA in one place and not another; for example on steep land terracing may be a CSA practice that would improve adaptation, mitigate GHG emissions through reduction of inorganic fertilizer and increase productivity but on flat land there would be no such benefits. While we recognize this consideration we have included the same practices across all the sites to make comparisons. The list of practices is listed in Table 3.n

Table 4. Percent of men and women aware of various CSA practices in each site.

	Nyando, Kenya		Wote, Kenya		Rakai, Uganda		Kaffrine, Senegal	
	Women n = 200	Men n = 200	Women n = 200	Men n = 200	Women n = 200	Men n = 200	Women n = 200	Men n = 200
Agroforestry	52	76	98	100	98	98	93	95
Terraces/bunds	60	81	100	100	100	100	20	45
Water harvesting	39	72	94	95	58	93	7	26
Irrigation	72	77	85	92	100	100	90	94
Zai/Planting pits	11	14	37	25	19	21	0	3
Crop residue mulching	94	88	96	97	100	99	44	66
Composting	20	43	27	48	97	96	10	47
Manure management	88	88	93	85	89	96	65	71
Efficient use of fertilizer	64	73	12	35	53	86	60	80
Improved HYVs	85	62	94	99	96	98	29	67
Improved STVs	18	11	99	99	85	73	2	15
No/min tillage	56	72	7	34	96	54	54	67
Improved grain storage	56	48	98	98	82	98	46	48
Improved stoves	60	74	88	96	99	99	81	66
Improved feed management	33	39	68	74	88	92	34	50
Destocking	27	28	69	63	86	79	38	47
Cover cropping	40	24	13	4	6	25	28	39
Tolerant livestock	14	10	53	30	68	73	8	20
Rangeland management	20	5	31	2	76	99	30	41
IPM	6	4	0	5	83	77	1	6

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Notes:

No statistically significant difference

More women than men aware of practice

More men than women aware of practice

For example, women in Nyando seem to be more aware than men of some practices than in the other sites. In Nyando, women, in accordance with traditional labour patterns across gender, participate more in agricultural production when compared to other sites with over half of the households reporting women being primarily responsible for nearly all on-farm agricultural work compared to 7% of women in Kaffrine and 36% in Wote (Mango et al. 2011; Mwangangi et al. 2012; and Yacine et al. 2011). Their high level of engagement in agricultural production is one possible explanation for their higher awareness of CSA practices when compared to other sites. The exception is the case of agroforestry in Nyando

where women are less aware of such practices, likely because of gender norms regarding access to and control over trees. Among the Luo in Nyando, women have limited access to products from high value timber trees and limited decision-making over hedgerows, a specific agroforestry practice (Kipot and Franzel 2011: 4-5).

Table 5. Percent of men and women adopting CSA practices in each site (of those who are aware)

	Nyando, Kenya		Wote, Kenya		Rakai, Uganda		Kaffrine, Senegal	
	Women	Men	Women	Men	Women	Men	Women	Men
Agroforestry	33	25	70	93	90	93	96	95
Terraces/bunds	45	41	95	98	56	60	34	23
Water harvesting	37	22	28	31	30	8	4	0
Irrigation	21	14	9	10	21	29	6	6
Zai/Planting pits	48	26	6	7	11	17	0	20
Crop residue mulching	92	67	75	87	100	95	85	82
Composting	63	24	28	30	33	21	16	10
Manure management	79	57	85	84	57	72	96	96
Efficient use of fertilizer	60	56	0	13	34	50	80	74
Improved HYVs	87	82	91	99	22	56	78	59
Improved STVs	60	30	92	99	55	60	67	45
No/min tillage	47	18	8	0	21	48	58	50
Improved grain storage	32	18	66	49	62	48	70	67
Improved stoves	36	34	29	35	37	33	14	17
Improved feed management	42	23	65	36	71	22	83	88
Destocking	43	29	40	25	32	10	20	16
Cover cropping	60	48	38	0	17	5	85	65
Tolerant livestock	43	50	47	65	2	13	0	20
Rangeland management	78	33	41	33	5	1	57	55
IPM	33	14	0	78	75	29	100	83

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Notes:

No statistically significant difference

More women than men adopt practice

More men than women adopt practice

No color—None of the women were aware, so they could not be included in this calculation

Climate information services and gender

While CSA practices can help smallholders adapt to climate change, these farmers also need good climate information from reliable sources at the correct time in order to adopt such practices and/or adopt other adaptation strategies. Because of increased variability in weather patterns, smallholders are finding it difficult to know when to plant, apply fertilizers and/or pesticides, and harvest their produce. Climate information providers must understand the needs and preferences of men and women across religious and ethnic groups in each site in terms of type of information needed by women and men, the sources of information and the best way to disseminate that information, in order to best serve all groups. This section first presents CCAFS site data about men's and women's access to and use of different types of climate information (i.e. about droughts, rainfall, etc.). It then discusses their access to and preferences for different sources of information (i.e. from NGOs, extension agents, etc.).

As shown in Table 6, most men and women have access to information regarding the start of the rains, seasonal forecasts, and crop production. Women in Kaffrine seem to have the lowest access to climate information in general (their highest percent of access was 65% whereas it was 83% or above in the other sites), which may be related to gendered labour roles in which women complete most of the off-farm work (Yacine et al. 2011). In addition, there are some gender differences by site for different types of information. For example, in Nyando, 80% of men and 40% of women report having access to seasonal weather forecasts. Similarly in Wote, 92% of men and only 43% of women report having access to drought information. Further examining the example of Wote, Table 6 highlights the importance of considering gender in access to different types of information. Although twice as many men in Wote have access to information on droughts, women more frequently have access to information on crop and livestock production as well as post-harvest handling as compared to men.

Although access to and use of different types of climate information varies by both site and gender, typically if an individual has access to the information, they use it to take up new agricultural practices that help them adapt to climate change (Table 6). However, this is not the case for droughts among men in Rakai and women in Kaffrine (only 47% and 43% respectively use the information if they have access to it). It is also not the case for short-term weather forecasts in Nyando (for either men or women), nor for men in Wote or women in Rakai. This likely relates to how salient, credible and relevant people perceive the information to be. It could also be related to whether they have access to other resources that are needed to use the information to adapt to or cope with weather events.

Table 6: Percent of men and women who have access to and make use of different types of weather and agricultural information

	Nyando, Kenya		Wote, Kenya		Rakai, Uganda		Kaffrine, Senegal	
	Women	Men	Women	Men	Women	Men	Women	Men
Access to…								
	n=200	n=200	n=175	n=176	n=187	n=155	n=323	n=200
Information on Droughts	70	85	43	92	64	78	20	23
Forecast of the start of the rains	91	91	98	97	73	83	65	83
Seasonal weather forecasts	40	80	92	88	80	81	64	67
Short-term forecast	45	75	36	41	37	91	55	61
Long-term weather forecasts	52	20	12	30	18	53	25	29
Information on crop production	65	20	85	62	69	75	61	67
Information on livestock production	37	27	49	36	60	79	24	38
Pest and disease outbreak information	65	76	43	52	83	90	29	38
Post-harvest handling information	63	7	82	72	56	72	52	54
Use of… for making agricultural changes								
Information on droughts	73	66	96	94	77	45	43	63
Forecast of the start of the rains	96	91	100	100	94	94	92	95
Seasonal weather forecasts	83	92	99	94	93	75	68	74
Short-term forecast	47	10	81	4	39	57	81	74
Long-term weather forecasts	81	70	91	89	65	57	54	78
Information on crop production	85	70	98	95	74	72	98	98
Information on livestock production	87	81	100	84	74	55	93	97
Pest and disease outbreak information	76	56	93	91	63	66	84	93
Post-harvest handling information	98	86	98	98	55	66	99	99

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Notes:

No statistically significant difference

More women than men access/use information

More men than women access/use information

Access to different sources of weather and agricultural-related information (i.e. extension agents, radio programs, etc.) is largely structured by gender and, in certain sites, by an individual's religious affiliation. Most men and women across all the sites seem to have access to a few common sources of information, while access to other sources varies across the sites and by gender (Table 7). Nearly all men and women have access to agricultural or climate information from radio programs, family, neighbours, and their own

or traditional knowledge. These sources were also often ranked among the top five most useful sources of information.

Overall, as shown in Table 7, many men and women also get information from NGOs, government extension agents, and community meetings. However, these sources are less common in Kaffrine, especially among women, where only 2% of women report having access to extension agents and 8% to NGOs and community meetings. We also see quite a range in access to community meetings and NGOs across gender and sites; in Kenya, there is no statistically significant difference between men's and women's access to agricultural information from NGOs, while men are more likely to have access to such sources of information in Uganda and Senegal. Men are more likely across all sites, except Wote, to report receiving information from community meetings. Across all the sites, very few men and women have access to agricultural or climate information from TV, newspapers/bulletins, schools/teachers, cell phones, internet, or agricultural shows.

Table 7. Percent of men and women reporting access to different information sources

Access to the following sources of information	Nyando, Kenya		Wote, Kenya		Rakai, Uganda		Kaffrine, Senegal	
	Women	Men	Women	Men	Women	Men	Women	Men
	n=200	n=200	n=175	n=176	n=187	n=155	n=323	n=200
Government Extension Workers	40	42	98	99	30	67	2	12
NGOs	68	64	84	67	31	68	8	24
Community Meetings	38	63	97	99	24	45	8	17
Farmer Organizations/Coops	36	13	30	11	12	36	1	1
Religious groups	42	32	55	44	36	31	13	14
Agri-service providers	16	7	67	18	12	40	6	15
Family members	93	79	97	99	52	73	83	68
Neighbors	82	94	99	99	91	95	80	79
Radio	96	99	99	100	86	98	85	88
TV	15	45	5	15	2	14	10	8
Newspaper/Bulletin	6	27	2	11	1	34	0	1
Schools/Teachers	16	28	2	9	4	14	0	0
Cell phones	6	28	2	2	6	12	1	4
internet	0	11	1	1	0	0	0	0
Traditional forecasters/ indigenous knowledge	81	93	91	90	74	75	88	94
Agricultural shows	3	11	4	11	1	20	0	0
Farmer field schools	8	11	57	41	6	12	0	0

Source: CCAFS/IFPRI/ILRI Gender Survey 2012, author's calculations

Notes:

No statistically significant difference

More women than men access source of information

More men than women access source of information

A closer examination of Kaffrine highlights the way that gender and religion shape access to different sources of information and therefore affect men and women differently in their abilities to adapt to climate change. Similar to the results reported in Table 7, Yacine et al. (2011) report that men in Kaffrine receive most of their information on weather and climate through the radio, television, networks of friends and relatives, NGOs, and development projects. Men also have access to information on soil inputs and fertility management from other farmers, organizations--such as the Regional Directorate for Rural Development (DRDR), and local and national government sources--radio, television, and from local leaders and the mosque. The informal networks of communication are typically exclusionary of

women, particularly those related to livestock and human health. This is important to note because while women may have some access to formal channels of information, they are unable to access informal networks structured by men because of cultural norms. Women primarily access information on livestock feed through women's associations, water and forest services, and social networks, suggesting that most of women's access to sources of information comes from institutions oriented specifically around women and their concerns (Goudou et al. 2012: 31).

As the case of Kaffrine, described in detail in Box 1, exemplifies it is important to consider not only the type and source of information for different target audiences but also the timing. Access to and use of different types and sources of information is highly related to the gender, ethnicity, and religion of individuals in the CCAFS sites. If development projects and policies ignore how different individuals interact with sources and types of information and other resources, they may unintentionally address the needs of one group while further marginalizing the other. In this section we have identified that types of information, sources of information, dissemination methods, and timing are all important aspects for climate information services to consider when delivering information that both men and women farmers can use to make informed decisions.

Box 1: Climate information dissemination in Kaffrine, Senegal

It is important that climate information providers consider not only the type and source of information for different target audiences but also the timing of such dissemination. In Kaffrine, we found that while men need information regarding when rains start, many women need to know when rains will cease. This is related to the fact that culturally, men prepare their lands and plant first and then their wives can do so (in order of marriage in the polygamous society). Therefore, women cannot choose when to plant their crops. On the other hand, rain cessation information is important because they can better plan when to harvest the crops. Along with the type of information (when rains start or end), men and women in the region have different preferences for sources of information.

Access to sources of climate and agricultural related information is largely informed by religious affiliation and gender. At the beginning of a project to reduce the vulnerability of women rural producers to rising hydro-meteorological disasters in Senegal, many experts and community leaders suggested that information be provided by radio, at the mosque, and to community leaders to make it widely accessible. However, later in the project it was found that women often fail to receive the information from the mosque or community leaders (authors' observations and Goudou et al. 2012). And, although they listen to the radio, women often do not hear the forecasts on the radio because they are given at the times of the day when women are the busiest: in the morning and evening when women are cooking or doing other chores.

Religious affiliation and whether people are more conservative or liberal in their religious practices and beliefs also seems to affect access to information related to weather variation. The women identified with a more conservative form of Islam were noted as less mobile and more restricted from participation in formal spheres in which sharing of information and access to knowledge and resources took place. In general, the women that identified with a less strict form of Islam were more able to share issues in public and, as a result, to work toward strategies of resolving these issues.

In order to cope with problems of limited access to sources of information, researchers began to ensure that information was distributed in spaces occupied by women, such as at local sources of water, through radio programs during the evening when women were able to listen, and by texting children. All of these strategies permitted women to access information that would normally be distributed directly to men through the more formal networks targeting the village leaders and the mosques. These strategies also reveal the importance of attention to gender and religion in research as understanding how these parts of social life are interrelated is integral to inclusion of all individuals of a particular community.

Conclusion/recommendations

This paper has presented new evidence regarding gender differences in perceptions of climate change, awareness and adoption of various adaptation strategies, and access to and use of climate information sources in a range of agricultural systems typically found in African countries. In general, the findings related to climate change perceptions, adaptation strategies, and climate information services presented in this paper differ across site and by gender. Key findings include the following. 1) The majority of respondents, both men and women, perceive that long-run weather patterns have changed in their lifetimes. In some cases, they differ on the types of changes that are occurring. 2) For those that experienced such changes, their reported adaptation measures in terms of changes in their agricultural practices are quite similar across sites and by gender. The most frequent adaptations made are fairly simple crop adjustments such as switching varieties or the types of crops planted, as well as changing the planting dates. 3) Women are less likely than men to be aware of CSA practices, but just as likely as men, if not more so, to adopt such practices if they are aware. 4) It is encouraging to see that when individuals, both men and women, have access to weather and agriculture-related information, most report using the information to make agricultural changes. 5) Sources and modes of dissemination of weather and agriculture-related information strongly influence how well it reaches both men and women farmers, as exemplified by the work in Kaffrine. And, 6) there are three common sources of information across sites that are also typically ranked as the most useful: radio programs, personal networks (family, friends, and neighbours), and their own/traditional knowledge.

The results highlight the complexity of local context in terms of various factors such as climate, agro-ecological zones, agricultural production systems, socio-economic status and cultural differences, all of which influence how climate change will impact individual men and women in local contexts. This idea of complexity of the local situation and how the same agricultural practice or technology can have different gendered impacts is supported in recent literature related to conservation agriculture (see Beuchelt and Badstue 2013). Similarly, Kaijser and Kronsell (2014) discuss the importance of understanding power structures within local communities.

Based on these CCAFS findings and previous research, some implications for policy and programs emerge. Policymakers who are beginning to prioritize CSA practices need the type of information generated in this report that demonstrates the opportunities and constraints that men and women face when adapting to climate change. For example, results indicate that investing in programs that effectively

reach women with climate and agricultural information are likely to result in uptake of new agricultural practices for adaptation.

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