The Perspectives of Farmers on the Impact of Climate Change on Smallholder Crop Farming in Kibaale, Kagadi, And Kakumiro Districts, Uganda

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ABSTRACT

This study examined perceptions of smallholder farmers on adverse effects of climate change and how they have impacted farming activities, so as to contribute to efforts of making smallholder farming less risk prone in Uganda. Based on post-positivism, the study applied a mixed study approach through a cross-sectional design to collect quantitative data from 384 smallholder crop farmers qualitative data from 3(n=21) farmers' groups in Kibaale, Kagadi, and Kakumiro Districts, Uganda. Data was collected by means of a structured questionnaire and a focus group interview guide, and was analysed using descriptive statistics, a Chi-squire test and Narrative analysis. It was found that farmers experienced; irregular rain fall, recurrent long dry spells, high temperatures, floods and hailstorms that altered rainfall patterns and reduced soil fertility. This confused planting, weeding and harvesting times, leading to low yields. This made it difficult for farmers to sustain farming activities, making smallholder crop farming, unpredictable, risky and unviable enterprise. Farmers also experienced insufficient food supplies and financial instability, which increased food insecurity and predisposed them to difficult livelihoods. Yet, smallholder crop farmers were helpless, continued being dependent on natural resources and rain-fed farming, increasing their vulnerability. Central government should mainstream farmer -adaptation services to climate change in all community development programs so as to increase community awareness and support. It should also empower Local Governments to coordinate the implementation of farmer adaptation to climate change activities. There is need to explore the role of indigenous knowledge and practices in predisposing and empowering farmers to understand and effectively manage adverse climate change conditions.

Keywords: Climate Change perspectives, Climate Change impact, Smallholder Farmers, Smallholder crop farming

INTRODUCTION

In most parts of the developing world, Uganda inclusive, smallholder agriculture, characterized by farm sizes of between 2-5 ha, is the largest type of farming and major source of food production (Gashure, 2024). Relatedly, Zeray (2025), affirm that small holder farming in Africa, contributes around two-thirds of food supply in most countries, and also a significant contributor to their GDP. In the East African region, especially among countries like Tanzania, Burundi and Rwanda, smallholder farming is the main source of food for both human and animals, and a key contributor to the social-economic wellbeing of majority of farmers (Muzira & Nambooze, 2024). Thus, the productivity of this type of farming is pivotal in sustaining decent livelihoods for most smallholder farmers.

LITERATURE REVIEW

Theoretical framework

The paper was based on Turner et al. (2003) Farmer vulnerability theory. The theory asserts that in order for farmers to effectively adapt to adverse effects of climate change, they need to understand their exposure and sensitivity and the need to be resilient. Understanding exposure, the frequency, magnitude and duration to which the farming activities are subject to hazards. Climate-related hazards comprise of shocks, such as floods and droughts, and stressors, such as increasing rainfall variability. According to Senyonjo et al. (2025), the sensitivity of farmers is determined by environmental and human characteristics that contribute to how they respond to exposures. The resilience of farmers refers to actions that can improve their ability to cope with hazards. This paper thus considered vulnerability to climate change among substance cattle farmers as exposure and sensitivity to negative impacts of climate change (Owusu et al.,2023). Exposure refers to the extent to which farmers were subject to climate change impacts, while sensitivity was the degree to which farmers were positively or negatively affected if exposed to negative climate change (Patt & Schroter, 2022).

when farmers understand well their sensitive and exposure to climate change combine, they are motivated to seek for empowerment, appropriate environmental conservation and local knowledge to enhance to resiliently and sustainably carrying out their farming (Tumwesigye & Beyihayo,2022). Farmers acquire capacity to tackle the effects of climate change by consolidating change adaptation (Zeray,2025). Due fear of repercussions, and the need to secure their lives and future, they are motivated to apply conservation farming practices, use ecosystem services, while minimizing external inputs (Gashure, 2024). Farmers willingly dopt Agroecological practices that utilise relevant indigenous and scientific, conservation agriculture practices.

Empirical review

Recent evidence indicates that farmers perceive Climate through changes through observable negative effects such as rainfall variability, high temperatures and drought. In a study by North et al. (2024) done in north Africa, it was indicated that smallholder cattle farmers, perceived climate change in terms of adverse changes in temperature, and rainfalls patterns. On the other hand, Bashiru and Oseni(2025), indicated that drought frequency and extreme weather conditions war said to be the major challenges facing smallholder farming in Africa. A study by Zereke et al. (2023) done in Ethiopia also showed that Significant changes in rains fall and Climatic variability were seen were associated with declining agricultural productivity In Ethiopia, Zeray (2025) affirmed that climatic variability and change had contributed to the reduction in yields of major cereal crops in regions of smallholder dominance.

According to Senyonjo et al. (2026), in their study which was carried out among smallholder cattle farmers in Nakasongola district, Uganda, they found that when farmers lack structure and function to address the consequences of climate change, they become more susceptible to and are often incapable of coping with even slight climate variability or extremes. In contrast, Tumwesigye and Beyihayo (2022), in their study done in western Uganda, also affirmed that the consequences of climate change such as erratic rainfall, frequent droughts, high temperatures, floods, and environmental degradation, make Smallholder less viable due to its heavy reliance on nature and the environment.

In a study by Owusu et al. (2023) done in Ghana west Africa, it was found that Smallholder farmers who overlay relied on nature for their farming activities, when they faced erratic rainfall and high temperatures were unable to maintain their families, for they had sufficient food and funds. In a study by North et al. (2024), that compared the effects of drought and intermittent floods in north Africa on small holder crop and subsistence cattle farmers it was found that, unlike subsistence cattle farmers smallholder crop farmers were badly hit for they had less adaptive capacity to protect their farming and livelihoods. Muzira and Nambooze (2024) study also recently affirmed that compared to other farmers, smallholder crop farmers in northern Uganda faced higher food insecurity and lower productivity due negative effects of climate change. According to Alvar-Beltrán et al (2024), small holder crop farmers in Burkina Faso were found to be more

vulnerable to climate change due to the fact that existing farmer support programs did not reach them not protect them against climate change risks.

Studies (Atube et al., 2022; Gashure, 2024; Zeray ,2025) continue to show that the impact of unreliable environmental conditions on agricultural activities of smallholder farmers in the developing nations of Africa, is on the increase due to their reliance on rain-fed agriculture . For example , Zeray (2025) recently found that in Ethiopia , the rising temperatures, unpredictable rainfall and drought lead to poor soils and which reduced agricultural output for smallholder farmers in coffee farming. Zereke et al. (2023) also found that the extremely different weather scenarios lead to proliferation of and spread of crop diseases, which further compromised productivity of smallholder farmers specialising in wheat production.

According to Senyonjo et al. (2025), while other categories of farmers seem to be steadily coping , there was limited information on how the perception of smallholder crop farmers on climate change affected their ability to sustain their subsistence crop farming , amidst limited resources . Hence, the above studies, have insufficient geographically comparative evidence on how farmers' perceptions of climate change impacts differ across Uganda's Agro-ecological zones.

They also have limited evidence comparing farmers' perceptions across different food crops such as maize, beans, cassava, bananas, groundnuts, rice and sweet potatoes. So, there was limited research on whether farmers perceive climate change impacts differently across major smallholder food crops and whether particular crops are considered more vulnerable than others. So, to have less district-specific and cross-sectional information, there was need to examine how climate risks, combined with non-climate-related challenges, threatened smallholder farming in a context with large proportion of small holder farmers such as Kibaale, Kagadi, and Kakumiro Districts in Uganda.

METHODS

Research paradigm, approach and design

Post- positivism serves as the paradigm for this study. The researcher assumed that while reality exists and can be studied objectively, but it may not be known with complete certainty, requiring use of mixed methods to gain more complete understanding (Majid, 2022). Thus, the researcher placed emphasis on getting evidence through systematic collection and analysis of data (Leavy, 2022). Epistemologically, the study aimed at objectivity by doing systematic measurement, reasoning and critical analysis of data. conclusions were drawn basing on the best available evidence. A mixed study approach was applied where the researcher relied on the quantitative, post -positivist view of the research process, while concurrently recognizing that the addition of qualitative data would enable the researcher to capture a more complete, holistic view of the research outcome (Creswell & Creswell, 2018). A cross-sectional research design was adopted and so data was collected at a point in time. The cross-sectional design allowed the researcher to concurrently collect both quantitative and qualitative data. Quantitative data was collected using a close-ended self-administered questionnaire while Qualitative data was collected from specific individuals with enough knowledge about the study using an open-ended focus group interview guide.

Study population and sample

The study population comprised all small holder farmers in Kibaale, Kagadi, and Kakumiro districts with 796,445 registered farmers being accessible (2026 district farmers registers). A total of 389 farmers were selected basing on Morgan and Krejcie (1970) sampling strategy and 384 returned fully completed questionnaires giving a response rate of 98.7%, which according to Levy (2022) was good enough. Majority 157 (40.9%) were from Kagadi, followed by 148(38.1%) from Kakumiro and those from Kibale district were 81(21.0%). Random sampling was used to select individual farmers, and so all farmers who were available on the day of data collection and willing to particate in the study were selected. In connection to farmers groups, one group was purposely selected form each of the 3 districts that participated in the study. Each group comprised of 7 members, making a total of 21 farmers.

Data Collection

A semi-structured questionnaire was used to collect Primary data from the 384 individual farmers. The instrument contained both open and closed-ended questions for the researcher wanted to collect both structured information and personal experiences of individual farmers on the issues that were being investigated (Creswell & Creswell, 2018). The method was used because responses from it could be quantified and standardized to allow for the systematic collection of data from a large sample. Structured questions could also be easily answered by respondents leading to more objective information. In addition, the instrument ensured greater anonymity, encouraged on the spot collection of data and produced large amount of information. The questionnaire method also assured confidentiality of respondents, which increased the response rate.

Data from key informants, farmers' groups was collected using semi semi-structured interviews. Interviews with predetermined questions, were used with some measure of flexibility, to encourage respondents to answer at length were used. Using semi-structured interviews ensured that questions were responded to in appropriate sequence and as elaborately as possible. The researcher was also able to observe the body language so as to get more reliable data. The interviews were carried out at a place of convenience agreed upon by the participants. They were done by the principal researcher, supported by a trained research assistant. This method enabled the researcher to get clarity from the respondents and clearly examine their sincerelity.

An observation guide was also used to gather firsthand information on the negative effects of climate change faced by farmers and how they have responded to them. Observations complemented the questionnaire by providing firsthand insights and real-time information on the issues that were being investigated. Observations helped to the researcher to contextualize the findings and also capture the true-to-life information.

Data management and analysis

The collected questionnaires were cleaned and sorted to ensure that only fully completed questionnaires were included in data analysis. Incomplete ones were eliminated and the complete were entered in SPSS version 27. The presumptions underlying the use of univariate, bivariate, and multivariate approaches were tested for all the variables. In connection to qualitative data, quality control focused on enhancing credibility and confirmability through detailed documentation of the research process. This process enhanced the credibility of qualitative findings by ensuring that it reflected participants' true experiences and insights. Additionally, documentation of data collection procedures, promoted confirmability, enabling other researchers to follow similar methods and verify findings (Majid, 2022).

Data analysis

Both quantitative and qualitative approaches were applied to analyse data. In connection to quantitative data, descriptive statistics were used to indicate the frequency and percentage of occurrence of responses. Overall means and standard deviations of responses on each variable were calculated. A chi-square test was used to establish the magnitude and direction of the relationship between variables. The results were presented using tables.

In connection to qualitative data, Narrative analysis was used to process and interpret the data from focus group discussions. Descriptive accounts were obtained to provide answers to the research questions. The accounts were written as a story to bring out the meaning participants ascribed to issues under investigation. Through repeated reading, the researcher became familiar with the information. Then coherent stories and descriptive statements to capture detailed, meaningful patterns were written. The researcher then looked for similarities, differences, and connections across the data set through intensive familiarization and revision. Then emerging issues were presented using narrative descriptions and verbatim quotations from participants.

RESULTS AND DISCUSSION

The findings show the characteristics of participants, adverse climate change conditions affecting smallholder crop farming, how they perceive this situation and the impact it has had on their farming activities.

Participants' Characteristics

In connection to individual Smallholder farmers, out of the 384 farmers who responded to the questionnaire, 237(61.4%) were female and 38.2% were male, and most (n=206; 54%) of them were sufficiently educated, for they had secondary education and above. The information in table1 further reveals that most 287(74.9%) of the farmers had 5 acres of farm land, and mostly (n=280 ;72.9%) grew Maize and Beans (see table 1). Hence due to their education, and life responsibilities, majority of farmers who participated in the study had candid reasons for have a good understanding of the impact of climate change on their key sources of livelihood, smallholder farming.

Table 1: Background information of farmers

Variable	**Category**	**Percentages**	
Gender		f	%
	Male	147	38.2
	Female	237	61.8
	>1acre	3	.8
	1-3 Acres	25	6.5
Farm size(acres)			
	4.5 acres	64	16.7
	5acres	287	74.9
	Maize and beans	280	72.9
	Beans	4	1.0
Primary crops	Maize, Cassava	19	4.9
	Maize, Beans, Cassava	78	20.4
	Cassava	3	.8

Propulsion =796445
sample =384

Source: Primary Data (2026)

Regarding Farmers' Groups, a total of 3 farmers groups one from each of the districts that participated in the study provided key informant information. The characteristics of the groups are indicated in table 2.

Table 2: Profile of farmers' groups (n=21)

Group	**Gender**	**Farming experience (in Years)**	**Average Farming experience (in Years)**
KIB	(M=4, F=3)	(16, 12, 9, 10, 14,12,17)	(Av=12.9)
KAG	(M=5, F=2)	(15, 13, 19, 14, 16, 8, 13)	(AV=14.0)
KAK	(M=4, F=3)	(15,21, 15, 18, 19, 17,9)	(AV=16.3)

Source: Primary data from the field (2026)

In connection to farmers who participated in focus group discussions, table 2 shows that they had good farming experience ranging from 12.9 to 16.5 years. This was substantial farming experience that enable

these farmers to have an adequate understanding of the negative effects of climate change in their area and it has affected their farming, thus were able to provide credible information.

Adverse Climate Change conditions affecting Small Holder farming in Kibaale, Kagadi and Kakumiro Districts

The research first examined some evidence of Adverse Climate Change conditions in Kibaale, Kagadi and Kakumiro Districts by examining rainfall and temperature variability. The yearly rainfall totals for a 30-year period from; 1995 to 2024 of the area as recorded by the regional Ministry of agriculture, animal industry and fisheries were analysed (see figure 1).

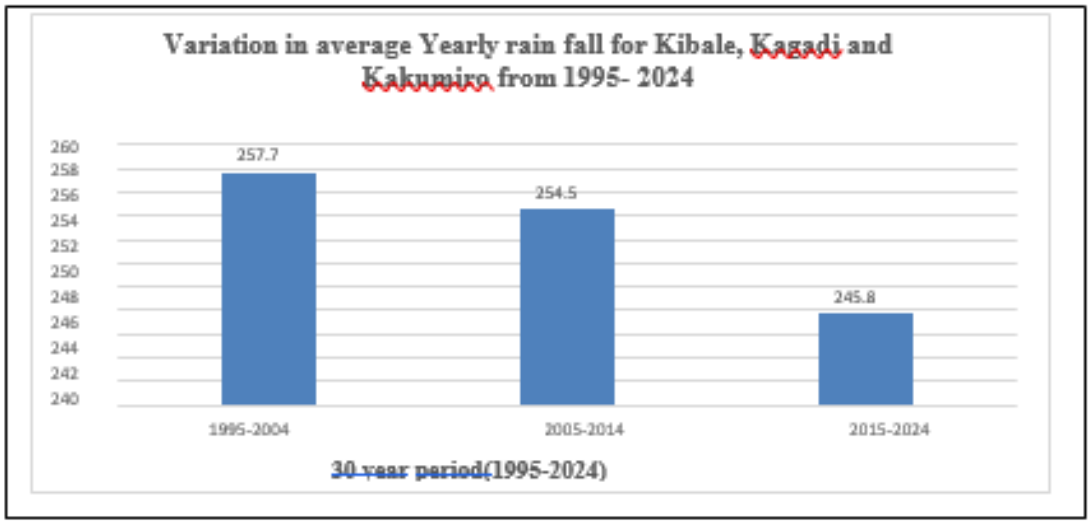

Figure 1: Variation in average Yearly rain fall for Kibale, Kagadi and Kakumiro districts from 1995-2024

Source: Primary data from the field (2026)

According to figure 1, the area experienced a significant drop in yearly average rainfall every 10 years. The fall from 2005 to 2014 period was 3.18mm and jumped to 8.69mm in the 2015 to 2024 period. The yearly average temperature for the period 2018 to 2024 were also examined. According to figure 2, the area has experienced a rise of 1.3 degrees in temperatures which according to Lamichhane et al.(2020) is so high and can significantly affect crop farming. Thus, the rainfall and Temperature changes that have happened Kibaale, Kagadi and Kakumiro districts due to climate change have been quite high and unpredictable, which often result into Precipitation and droughts that significantly destabilize farming activities of smallholder farmers.

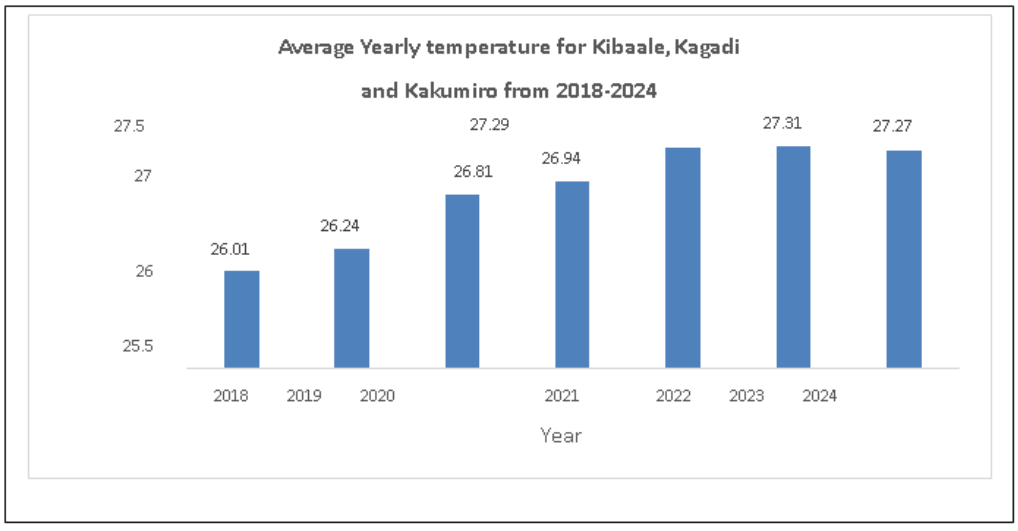

Figure 2: Variation in average Yearly temperatures for Kibale, Kagadi and Kakumiro from 2018-2024

Source: Primary Data from the field 2026

The views of farmers on climate changes that have occurred in their area in the past few years were collected and are summarised in table 3.

Table 3: Farmers' views on climate Changes that have occurred in their areas in the past few years

Climate Change	**f**	**%**
Very high temperatures	143	37.2
Prolonged dry seasons	14	3.6
Frequent floods	12	3.2
Unpredictable rains	121	31.5
Recurrent hail storms	94	24.5
Total	**384**	**100**

Source: Primary Data from the field 2026

According to table 3, farmers mentioned 5 changes in climate that have occurred in their in the past few years. They intimated that they face very high temperatures 143(37.2%), Unpredictable rains121(31.5%) and Recurrent hail storms 94(24.5%) They also mentioned Prolonged dry seasons14(3.6%) and Frequent floods12(3.2%). It was sobering to see large field of crops that had dried up due to a prolonged dry season. For example, the maize field in figure 3 was about 1½ acres and it had dried up with no hope of having nay yields. This was quite a significant loss to the farmer.

Figure 3: A dried maize field in Isunga subcounty.

Perceptions of famers on Impact of Climate Change on Smallholder farming activities in Kibaale, Kagadi and Kakumiro Districts in Uganda

The farmers revealed how these changes have affected their farming activities. Their views are summarised in table 4.

Table 4: Farmers' views on

Reponses	**Frequency**	**Percent**
Unpredictable precipitation	145	37.8
Unsupportive ecosystem	150	39.2

Frequent storms	17	4.5
Poor soils	72	18.5
Total	**384**	**100**

Source: Primary Data from the field 2026

According to table 4, farmers felt that climate Changes had resulted into unpredictable precipitation145(37.8%), and an unsupportive ecosystem 150(39.2%) which made farming difficult due to depleted water and soil nutrients. The farmers further indicated that they faced frequent stroms17(4.5%) and poor soils72(18.5%) that destroyed greenery that enriches soils, leading to reduced quality of soils. The situation in some of the farms that were visited by the researcher was so bad, that close to half of their farm land was parched and crops had dried. For example, the field in figure 4 in Namenda, Kibale district was so dry and the soils so leached that it could not support crop farming.

Figure 4: A parched filed for beans in Nyamarunda subcounty.

The farmers also indicated how climate variability has affected their livelihoods. The findings are summarized in table 5.

Table 5: Effects of climate variability on the livelihoods of farmers

Response	**Frequency**	**Percent**
Food insecurity	142	37.1
Low animal farming	29	7.5
Low incomes	152	39.7
Poor health	61	15.7
Total	**384**	**100**

Source: Primary Data from the field 2026

The information in table 5 shows that climate variability had mainly resulted into Food insecurity142(37.1%) and Low incomes152 (39.7%). The farmers also revealed that their animal farming activities 29 (7.5%) had reduced and also faced poor health 61(15.7%). This means that unpredictable climate variability had resulted not only into environmental, but also in socioeconomic challenges. The yield cycles were so disturbed that some crop fields had green crops without any yields. A crop farm in figure 5 in Kyanaisoke, Kagadi district was so overgrown, without any yield.

Figure 5: A green crop field without yields in Kyanaisoke subcounty

The extent to which farmers were concerned about the impact of climate change was also explored. The results are summarised in table 6.

Table 6: Farmers' concern about the impact of climate change on their

Response	**Frequency**	**Percent**
Not concerned at all	5	1.3
Not concerned	6	1.6
somewhat concerned	21	5.5
Quite concerned	140	36.6
very concerned	212	55.1
Total	**384**	**100.0**

Source: Primary Data from the field 2026

According to table 6 an overwhelming majority 352(91.7%) of farmers were quite concerned about climate change and it's impact on their lives, so needing drastic adaptation.

The Relationship between Climate Change Patterns and the livelihoods of Small Holder Farmers in Kibaale, Kagadi and Kakumiro Districts in Uganda

The association between Climate Change Patterns and livelihoods of Small Holder Farmers in Kibaale, Kagadi and Kakumiro Districts in Uganda was examined using the chi square test of independence. Climate Change Patterns were assessed as Very high temperatures Prolonged dry seasons Frequent floods Unpredictable rains Recurrent hail storms, while livelihood was assessed as farmers facing Food insecurity, Low incomes and Poor health. A p-value lower than 0.05 implied that a particular Climate Change Pattern was positively associated with livelihood changes of Small Holder Farmers. The findings are indicated in Table 7.

Table 7: Relationship between Climate Change Patterns and livelihood of Small Holder Farmers in Kibaale, Kagadi and Kakumiro Districts

Climate change pattern	**Chi-square**	**df**	**P-value**
Very high temperatures	65.12	24	.001*

Prolonged dry seasons	45.13	18	.000*
Frequent floods	75.58	24	.230*
Unpredictable rains	33.45	12	.001*
Recurrent hail storms	209.66	60	.000*

Key; p<.01**, p<.05*

The findings in table 7 show that 4 (Very high temperatures, Prolonged dry seasons, Recurrent hail storms and Unpredictable rains) Climate Change Patterns had a positive interaction with livelihoods of Small Holder farmers, apart from frequent floods, X2 =75.58, p>0.05. This implies that adverse Climate Change Patterns enhanced livelihood challenges of Small Holder farmers in Kibaale, Kagadi and Kakumiro Districts in Uganda.

The key informants also affirmed to poor precipitation, long dry seasons and high temperatures to negatively affect farming activities of small holder farmers in Kagadi, Kibale and Kakumiro. They intimated that these are very adverse climate changes for farming and reduce the predictability, cost advantage and productivity of farming which if often the comparative advantage of small holder.

The participants also revealed that the bad climatic conditions had also resulted into other farming challenges such increased pests, crop diseases and poor soils. It was observed (see figure 7) in some fields that farmers who had moved to coffee farming were being disappointed by diseases that cause drying and early ripening of berries.

Figure 7: A diseased and wilting coffee plant in Kyanaisoke subcounty

The farmers elaborated the challenges they face due to unpredictable climatic conditions. The farmers from Mugarama who were in FGD KIB explained;

The foods that often grow for even home consumption and were formerly dry season resistant such as cassava, has dried before harvest time due to drought. In most of our areas we have given up growing beans, maize and greens, for they require good soils and rains. So, we now have no stable family food and supplementary feeds for our animals (FGD KIB interviewed on 22/02/2026 at 3:30 pm).

The farmers further indicated the livelihood challenges they faced due to climate change. Farmers from Isunga subcounty who were in KAG elaborated that;

The foods we often grow for our home consumption such as cassava, cow peas and ground nuts, have dried before harvest time due to drought. The maize which we use as stable family food and supplementary feeds does not put on seeds. We now but food from the shops, yet it is very expensive. Bad weather has

completely whipped out our means of livelihood (FGD KAG interviewed on 24/02/2026 at 3:30 pm).

The farmers from Kyabasaija in focus group discussion KAK revealed the unstable climatic conditions have badly affected their earnings to the extent they cannot even pay fees for their children. They intimated that;

We take many terms without paying fees, due to the fact we have no crops to sell. Our crops dried in the field before they could yield. So, we hide away from head teachers so they do not ask for school fees which we do not have. Our children are now a mockery, for they are often left outside class because they have not cleared school dues. Many have dropped out of school. It is painful that even some P7 candidates drop out due to lack of fees. We are no longer certain whether we will be able to educate our children in the future, since our economic situation is just worsening (FGD KAK interviewed on 23/05/2025 at 4 pm).

Farmers from a Focus Group Discussion in Kakimiro explained why they felt very vulnerable to climate variability in their area. They intimated;

We are quite shocked that we can longer rely on mother nature to do profitable farming. Unfortunately, we did not acquire smart farming skills when they were being by extension workers. So, we are unable to anticipate bad weather changes or even plan to revive our farming. We are doomed! (FGD KAK interviewed on 23/02/2025 at 4pm).

Thus, adverse Climate Change in the area, has stripped Small Holder Farmers in Kibaale, Kagadi and Kakumiro Districts of their livelihoods, due inability to have sufficient produce, which was their social economic security.

Discussion

In connection to climate change patterns that impact small holder farmers in Kibaale, Kagadi and Kakumiro districts, it was revealed that farmers perceived the impact of climate change as noticeable, unpredictable and threatening variations in weather conditions that reduce crop yield and make farming unviable. Concurring with Gashure (2024), the main concern of farmers with climate change was changes in the amount and timing of rainfall as well as persistent droughts and high temperatures. The farmers further complained that these adverse conditions affected precipitation, humidity and soil quality, which according to Atube et al. (2022), are the key conditions necessary for crop farming to thrive. Farmers reported fears that climate changes in their area confused planting, weeding and harvesting times which negatively affected productivity. The fears reported by farmers were in agreement with Adoch et al. (2025), who said that farmers often get scared that the adverse Climate Change Patterns increase their livelihood challenges. It was also found that farmers faced increased crop pests and diseases that were even resistant to pesticides. This finding affirmed Zizinga et al. (2024), who had earlier found that climate change risks disrupt agricultural practices, leading to increased pests and diseases, which lower crop yields. In such a situation, as affirmed by Tumwesigye and Beyihayo (2022), farmers are unable to have sustainable agriculture which severely undermines their social economic condition. To a large degree, crop farming was dying due to water stress, poor soil fertility, climate variability and yet farmers did not know how to anticipate and plan for climate change variability. Farmers showed no intention to move away from being dependent on natural resources and rain-fed farming their main cause of vulnerability. According to Zakari et al.(2022) such a perspective impairs the capacity of farmers to cope as they are unable to act positively to manage the adverse impacts climate extremes , which increases their vulnerability. In such a situation, according to Ouédraogo et al.(2023), it is usually difficult for farmers to make the most out of their difficult conditions, without feeling personally affected. Thus, the adverse climatic conditions faced by farmers predisposed them to low food security and reduced incomes which in the case of Small Holder Farmers in Kibaale, Kagadi and Kakumiro district, exacerbated their proneness to poverty and difficult livelihoods.

Despite smallholder farmers, recognising that their farming activities and consequently their livelihoods were in jeopardy due to climate change, they still depended on rain-fed farming. Participants agreed that due to confusion about their vulnerability, the Farmers continued with relying on nature and traditional farming practices, for they did not perceive any other means as useful to their farming. This continued reliance on

nature made their farming even more prone to climate change. They were unable to apply water irrigation so as to keep their farming activities moving forward and so found it difficult to sustain the quality of their soils. This finding was in line with what Zeray (2025) had found in Ethiopia among coffee farmers that, amidst climate change variability, farming becomes a very risky and unpredictable enterprise, forcing those with less adaptive capacity to dropout. As earlier discovered by Gashure (2024) in Ethiopia, the unstable and unfriendly climatic conditions meant that smallholder farmers were not able to benefit from their farming activities as it was in the past, predisposing them to difficult living conditions.

It was revealed that the adverse effects of Climate Change had reduced productivity of farmers. In most cases they had to water crops manually, delayed to plant due to uncertainty, their crops dried before they could yield, and in most cases had low yields, which reduced the market value of their products. They had poor market prices due to low quality products which significantly reduced their earnings. Thus, in agreement with Adoch et al. (2025), the unpredictable and poor climatic conditions increased the farmers' cost of production. The rampant crop diseases, due to poor climate weakened the crops and reduced quality and quantity of harvests. So, farmers were unable to use the low cost of production as their attraction and advantage in being a smallholder farmer. Their average incomes from crop farming significantly reduced, making it difficult for the farmers to meet their socio-economic responsibilities. In line with Owusu et al.(2021), in this situation, famers certainly make very low sales and so their incomes drop affecting their capacity to meet their basic needs. Thus, the negative effects of climate change that Small Holder Farmers in Kibaale, Kagadi and Kakumiro district cannot allow them to have profitable farming.

CONCLUSIONS AND IMPLICATIONS

Adverse climatic conditions have severely disrupted agriculture practices among Small Holder Farmers and predisposed them to food insecurity, reduced incomes and difficult livelihoods. Farmers were finding it difficult to sustain the quality of their soils and were even unable to have water for irrigation so as to keep their farming activities moving forward. Farmers perceived smallholder farming as a very risky and unpredictable enterprise, forcing most with less adaptive capacity to dropout. Amidst this scenario, Small Holder farmers in Kibaale, Kagadi and Kakumiro district, did not actively seek for empowerment to cope or even to adapt to this state of affairs which exacerbated their proneness to adverse climatic conditions, poverty and difficult livelihoods.

Despite Small Holder Farmers in Kibaale, Kagadi and Kakumiro district, being cognizant of the fact that depending on rain-fed farming is no longer viable, farmers were less empowered to make changes that would enable them sustain their farming productivity. They were still bent on depending on the natural climate for their farming resources which were quite but unreliable. These findings point to an urgent need for policies and strategies to empower farmers to effective cope with climate change through appropriate mitigation measures. Thus, central government should mainstream farmer -adaptation services to climate change in all community development programs so as to increase community awareness and support essential. The government can start from allocating national budget funds to farmer adaptation services activities. The central government should also create an enabling environment and regularly monitor local government's support for farmer adaptation services. In addition, the Central government should also empower Local Governments to coordinate the implementation of farmer adaptation to climate change activities as they are nearer to farmers. There is need to explore the role of indigenous knowledge and practices in predisposing and also empower farmers effectively manage adverse climate change conditions.

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