MAKERERE UNIVERSITY

FARMERS ADOPTION OF CLIMATE VARIABILITY AND CHANGE MITIGATION PRACTICES IN BWAMIRAMIRA SUB-COUNTY, KIBAALE DISTRICT

BY

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20/U/7021/PS

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF ENVIRONMENTAL MANAGEMENT IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF BACHELOR OF ENVIRONMENTAL SCIENCE OF MAKERERE UNIVERSITY

2023

DECLARATION

I **BYAMUKAMA ANDREW** hereby declare that this research proposal is my original work and as a result of my effort and commitment and never been submitted to any university and other academic institution for any award.

Signature………………………………………… Date: 15/08/2023……………………………

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APPROVAL

This is to certify that this dissertation has been developed under my supervision and is now ready for submission for undergraduate research Makerere University.

PROF. ANTHONY EGERU

Signature

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Date

...........15/08/2023.....................

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ACKNOWLEDGEMENT

I would like to thank the Almighty God for enabling me finish this academic journey. I would also like to express my heart felt appreciation to my beloved research supervisor Prof. Anthony Egeru for the continuous academic guidance, supervision, encouragement and patience from the time this work began up to today, my the almighty God bless you abundantly in whatever you do. I am also grateful to Mr. Ssembatya Ronald for the support and guidance during data analysis. Special thanks goes to my dearest father Mr. Baguma Andrew and the entire family for supporting me both morally and financially throughout my education, my God bless you always. Last but not list I would like to extend my sincere appreciation to Nkono Michael, Joshua Mukonyezi, Wamala Joab and my fellow students for your co-operation, guidance and academic support, my God bless you.

LIST OF ACRONYMS

NDP III- National Development Plan Three

NEMA- National Environmental Management Authority

NFA- National Forestry Authority

NPA- National Planning Authority

UNCCP- Uganda National Climate Change PolicyADP- Agricultural Development Policy

UNFCCC- United Nations Framework Convention on Climate Change

CSA- Climate Smart Agriculture

CA- Conservation Agriculture

ICS- Improved Charcoal Stoves

CMP- Climate Mitigation Practices

ABSTRACT

Following the industrial revolution, the global climate has been changing. The 1972 Stockholm United Nations conference sparked the revelation of mitigation measures to address the different challenges to climate. However, there is limited evidence that documents how farmers have adopted various mitigation practices. Yet, adoption is critical for increasing the rate at which GHG sequestration is implemented. The objectives of the study were; (i) characterize mitigation practices, (ii) determine factors influencing adoption of mitigation practices, and (iii) identify the challenges faced in adoption of mitigation practices. Across sectional household survey using questionnaires was used. Data was analyzed using descriptive statistics, cross tabulation, principle component analysis and linear regression. Results showed that land restoration and intercropping were the most used agroforestry practices (17.77%). Farmers who had high level of education (secondary and tertiary) practiced climate variability and change mitigation practices than those who had low level of education. All challenges were dominant in land restoration, intercropping and conservation agriculture and least dominant in tree planting and biogas respectively. Lack of financial resources and limited land were the major challenge that limited the farmers of Bwamiramira sub county Kibaale district to implement the climate variability and change mitigation practices. Therefore, there is need for the agricultural extension workers and local leaders to regularly train and sensitize the farmers on available and affordable climate variability and change practices and new agricultural technologies at all levels in order to ensure awareness creation.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Following the industrial revolution, the global climate has been changing (Stern & Rydge, 2012). However, the 1972, Stockholm United Nations conference sparked the revelation of mitigation measures to address the different challenges to climate (Paglia & Parker, 2020). In 1979, another United Nations framework consortium on climate change (UNFCCC) was launched to boost the move on the mitigation measures on climate variability and change (Abbass et al., 2022). This was aimed at inviting the technical and scientific experts to review the latest knowledge on climate variability and change (Zheng et al., 2019). The focus was to assess the contribution of natural and human system as well as assessing future impacts and risks to enable the formulation of recommendations moving forward (World Meteorological Organization 1979; (Chen et al., 2022).

Despite the international focus on mitigation, climate variability and change remains one of the most pressing challenge (Mwangu, 2022). Several strategies have been developed by scientists to enhance mitigation action (Fawzy et al., 2020).For example, sustainable agriculture practices such as management of carbon, manure, nitrogen and grazing land management and management of low input systems (Okonya et al., 2013). Management decisions regarding conservation practices such as go-fill, conservation agriculture and returning crop residues to the field to increase nutrient cycling to enhance carbon sequestration as part of mitigation action have equally been implemented (Salau et al., 2013). Additionally, management of grass lands, restoration of degraded land, nitrogen management to reduce greenhouse gas emissions, precisions conservation management at a field or watershed level can also help mitigate climate change (Lal et al., 2011).

In a February 2012 survey of almost 5000 farmers across the region of the United States that produce more than half of the nation's corn and soya bean revealed that 66% of farmers believed that climate change is occurring (Arbuckle, Morton, et al., 2013). Farmers who believed that climate change is occurring and attributable to human activity were significantly more likely to take mitigation actions (Simon et al., 2020) . On other hand, those who believed it was natural were uncertain about its occurrence and less supportive (Carlton et al., 2016). This particularly group were less likely to support government and individual mitigation actions (Arbuckle, Prokopy, et al., 2013). Meanwhile, in Africa especially in sub-Saharan (Mulopo, 2022), (Tschora & Cherubini, 2020) studies have that mitigation is a possibility. These studies have indicated that communities are taking some mitigation actions such as planting of trees, use of renewable energy such as solar energy.

Despite these mitigation actions, research over Uganda have shown that climate change will continue to occur with observed increase in temperature (Obubu et al., 2021). The projected increase in temperature for some regions have been estimated at a mean of warming of 2^{0}c by midcentury 2.5-4.9^{0}c by end century (Egeru et al., 2019). According to Mulinde and others (2022), change in climate will increase and decrease areas' suitability for particular crops such as coffee. This will make farming systems vulnerable to climate-related risks. Accordingly, it will affect household incomes and farmer's livelihoods.

Despite Uganda being highly vulnerable to rainfall variability and climate shocks, micro level studies at the farm level on how farmers perceive these changes show that there is limited knowledge on how farmers perceive climate variability and change (Mulinde et al., 2022). Further, there is a gap on how they are responding to the effects of climate variability and change with intent of reducing their greenhouse gas emissions. It is therefore urgent to establish the practices and how farmers are undertaking climate mitigation at household and farm level.

1.2 Problem statement

Climate variability and change are major concern in the current times because of the disruptions to lives and livelihoods (Sequiera & Reis, 2019). It is shown that climate variability and change over the last three decades over Uganda has changed dramatically (Gabiri et al., 2020). Further, it is projected that change will continue to occur with temperature rising to 32^{0}C while rainfall reducing in some areas (Nsubuga & Rautenbach, 2018). Climate mitigation is one of the solutions that has been promoted to respond to climate variability and change through increasing greenhouse gases sequestration (Oduniyi & Tekana, 2019). In Uganda, these practices have been promoted in several areas of the country among farming communities (Leal Filho, 2020). For example, Kibaale agroforestry project promoted the planting of trees as a mitigation measure (Kakuru et al., 2014). However, there is limited evidence that documents how farmers have adopted various mitigation practices. Yet, adoption is critical for increasing the rate at which

GHG sequestration is implemented. Therefore, this study will generate more information on farmer's adoption of climate variability and change mitigation practices in order to contribute to more resilient farming communities in Bwamiramira sub-county Kibaale district.

1.3 The Main Objective

To assess the adoption and implementation of the various strategies for climate variability and change mitigation by the farmers.

1.4 Specific Objectives

1. To characterize climate mitigation practices adopted by farmers.
2. To determine factors influencing adoption of mitigation strategies.
3. To determine the challenges faced by the farmers in adopting to climate variability and change mitigation practices.

1.5 Research questions

The following research questions guided the research.

1. What mitigation measures have the farmers adopted to address climate variability and change practices?
2. What are the factors influencing adoption of mitigation strategies?
3. What challenges are the farmers facing in adopting to climate variability and change mitigation practices?

1.6 Scope of the study

This study will be conducted in Bwamiramira sub county, Kibaale district in Uganda. We chose this location because of the current tough climatic condition in this locale. This study will cover issues stated in the objectives, give answer to the research questions, analyze and suggest recommendations.

1.7 Justification

The study will generate more information on building capacity for climate variability and change mitigation including hazard / disaster risk reduction to NPA, NEMA, NFA in order to promote continuous integration of climate variability and change and disaster reduction, undertake insurance of carbon footprint certificates to support the sector more towards carbon neutrality. This will help to promote climate resilience and low emissions developments at all levels as it is stated in NDP III, 2021.

The study will significantly contribute to the achievement of UNCCP objective three which aims at identifying and promoting mitigation policy responses for Uganda as mitigation of greenhouse gas emissions also require a series of coordinated responses that are either sector-specific or cross-cutting in nature.

The study will contribute to the implementation of the Agricultural Development Policy (ADP) objective through providing more information to agencies responsible for disaster and risk reduction for building more knowledge capacity on mitigation of climate variability and change in Uganda especially Kibaale district.

CHAPTER TWO: LITERATURE REVIEW

2.1 Mitigation practices of climate variability and change adopted by farmers

In climate context, as the IPCC describes, mitigation is human intervention to reduce the source or enhance the risks of greenhouse gases. In practice, mitigation can take a variety of forms including:

Agroforestry including planting trees and preserving forests so that they can absorb and store more carbon dioxide from the atmosphere. Just like the other strategies, in recent years tree planting has been unprecedented action by government and private groups alike. For example, in 2017, Indian State of Madhya Pradesh planted 66 million trees in just one day (Muelbert et al., 2019).

According to the study made by(District et al., 2022) Land restoration as an agroforestry practice for mitigation, Nyamuriro wetland in western Uganda has been restored. (Regasa & Akirso, 2019b) argues that wetlands are crucial for delivering diverse ecological services around the world due to their regulating activities in the aquatic sequence, high efficiency, and biodiversity and their projected value is substantially larger than their current modest 5–6% share of worldwide land-use.

Rotational grazing has been practiced by farmers in South west and Central Uganda which has increased productivity and income per unit of product and increased the efficiency of production GHG emissions per unit of product are being reduced which would lead to climate variability and change (Kuyah et al., 2023).

There is crop rotation in many households especially in Kigezi region which has contributed to product diversity and boosts yields as well as maintaining Soil carbon stores which is done when leguminous crops are introduced, the requirement for nitrogen fertilizers is reduced. This reduces on the risk of emissions (Turyasingura & Chavula, 2022).

According to rural Ethiopia, shows a yearly reduction of greenhouse gas emissions by about1.9 t of CO 2 equivalent per digester, an improvement of energy efficiency and energy substitution, and an enrichment of soil fertility in ruler areas of Ethiopia (Owusu & Asumadu-Sarkodie, 2016). Father more, the benefits of domestic bio digesters on the energy, economic and health aspects of rural households in sub-Saharan Africa are increasing. They reported a reduction of conventional fuel consumption in the 84–94% of biogas users, an increase of crop yields in the 84–91% of biogas (Marie et al., 2020).

2.2 FACTORS INFLUENCING ADOPTION OF MITIGATION PRACTICES BY FARMERS

The awareness of climate problems and potential benefits of taking action is important factor influencing adoption of climate variability and mitigation practices (Ajuang et al., 2016). Nicolas et al, 2020 argued that farmers awareness contribute to decision making on which practices to use.

Perception of long term changes in climate variability and change by farmers plays an important role in shaping their behavior (Abid et al., 2019).perception of climate variability and change supported by local knowledge has helped to advance understanding of climate variability and change mitigation by farmers (Daba, 2018). (Saguye, 2017) believes that most farmer's knowledge and exposure to climate variability and change has been influenced by the media from events occurring in different areas e.g. flooding, prolonged droughts, landslides and melting of the Polar Regions. Individual's perceptions in terms of seasonality, with previous experiences of poor season is responsible for how farmers may tend to describe different season types (Moyo et al., 2012).

However, most farmers in Africa perceive the increased temperature and declined precipitation (Negele et al., 2017). When crop yields are low, due to losses as a result of climate variability and change as evidenced in changing times for the start and stop of rainy and dry season, farmers pay dearly for their ignorance and unpreparedness (Ayanlade et al., 2017). Therefore, the perception of climate variability and change is shaped by varying cognitive structures caused by social economical cultural differences that expose peoples differing attitudes, values and interests(Bryan et al., 2013).

Furthermore, farmer's perceptions of climate variability and change and its effects are influenced by psychological and social economical differences which limit their response to climate variability and change (Cherinet & Mekonnen, 2019). Therefore, there is need to consider the local knowledge in conjunction with scientific knowledge systems for climate variability and change mitigation (Regan et al., 2017).

Services and resources/ existing inputs such as capital, land, labor, increase knowledge about mitigation strategies to use (Esfandiari et al., 2020). When resources such as land is big enough, encourage farmers to carry out livestock practices e.g. rotational grazing, agroforestry practices .g. land restoration and agronomy practices e.g. crop rotation which positively influence the use of these mitigation practices (Zizinga et al., 2017).

According to (Ampaire et al., 2017), institutional factors are attributed to membership of farmers to farmers organizations e.g. cooperatives which help farmers to get information that regard to resources and services from both government and non-governmental organizations which help them adopt certain mitigation practices. Father more, most farmers especially in sub-Sahara Africa are not fully engaged in joining these cooperatives missing the potential benefits from these cooperatives (Regasa & Akirso, 2019a).

2.3 Challenges faced by the farmers in adopting to climate variability and change mitigation practices

Although climate change is a global trending challenge, mitigation responses such as agroforestry practices e.g. intercropping, livestock practices such as manure management and agronomy practices e.g. crop rotation are not broadly used as a measure to reduce on greenhouse gas emissions that lead to climate variability and change both at the local, national and international levels (Antwi-Agyei et al., 2015).

Cognitive barriers such as perception basis, information and technology obstacles such as inaccurate weather information provided to farmers especially in sub-Sahara Africa mislead them. (Nsubuga & Rautenbach, 2018). Father more, institutional barriers which involve unsound regulations and laws due to insufficient policy implementation for example inadequate publicity and guidance limit the use of mitigation practices (Barnes et al., 2020).

Farmers' behavioral attitudes towards climate change are complex and poorly understood ,making difficult the development of mitigation policies that would be accepted which limited value placed on environmental protection and conservation by farmers and poor government policies towards the development and implementation of mitigation strategies (Zizinga et al., 2017).

Mitigation challenges are dictated by the lack of endowment of financial, built, human, social, and natural capital (Bishaw et al., 2013). Father more understanding mitigation challenges could inform ways to offset climatic variability and change risks.

Some studies have pointed out the significance of social challenges to mitigation practices (Mwinkom et al., 2021) on how and what people value, how and what people know, how and what people perceive and how and what people live are key aspects of social challenges. Thus social barriers are concerned with the social and cultural processes of society including informal institutions and social capital.

In Uganda, the obstacles limiting farmers to actively participate in climate variability and change mitigation are limited technical know-how, since majority of the participants in agriculture produce food for home consumption about 60% to 80% they face unequal access of resources such as limited land rights, which denies farmers land ownership, low levels of education, and this increases ignorance about the benefits and the need to adopt the mitigation practices practice(Arbuckle, Prokopy, et al., 2013)

CHAPTER THREE: METHODOLOGY

3.1 DESCRIPTION OF STUDY AREA

The study was conducted in Bwamiramira sub- county Kibaale district mid-western Uganda. Kibaale district consist of 2 counties, 11 sub-counties, 45 parishes and 268 villages (Kibaale district statistical Abstract, 2020). According to Kibaale district statistical abstract, 2020, Kibaale district lies at altitude of 700^{1}N, $11500^{'}$N and longitude of 30 $50^{'}$E, $3100^{'}$E. It covers approximately a total land area of 1170 sq. km. The district is made up of two counties that are Buyanja and Buyanja East. The district is bordered by Kagadi district to the west and the north Kakumiro district and Mubende district to the East, kyenjonjo and kyegegwa districts to the south.

Kibaale district has a favorable climate as it enjoys a bio-modal rainfall type which varies between 1000-1500mm per annum and relatively varying temperature between 15^{o}c and 30^{o}c (Kibaale district statistical abstract, 2020). Bwamiramira sub-county being highly vulnerable to climate variability and change in the district and their main economic activity is rain fed agriculture, has been purposively selected as shown in figure 1.

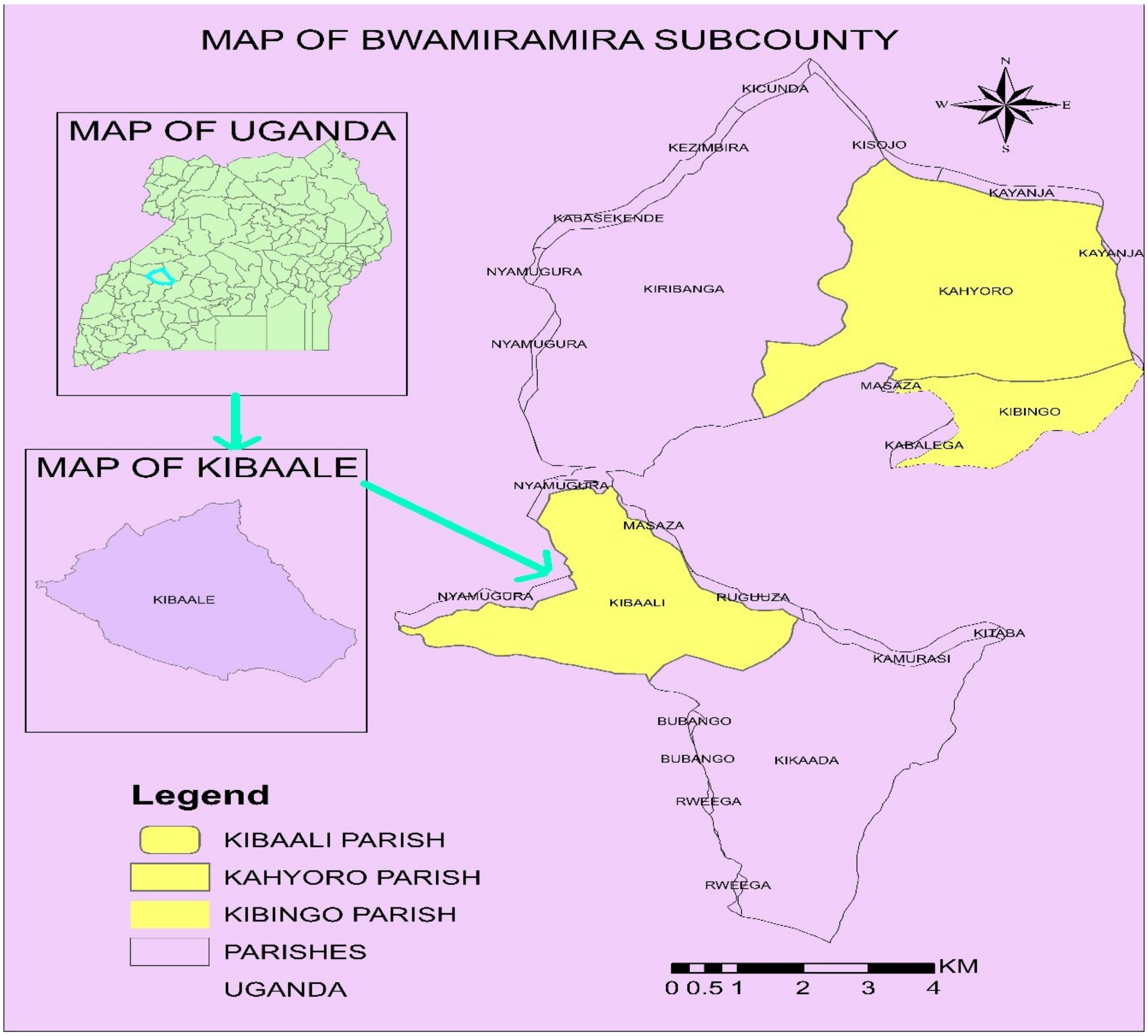

Figure 1 map of Bwamiramira Sub County

3.2 RESEARCH DESIGN

Both qualitative and quantitative research approaches were used. Qualitative research approach helped to interpret information from the respondents and providing descriptions of complex phenomena. Quantitative research approach was used to provide objective data collected from the respondents which will help me communicate it through statistics and numbers.

3.3The study design

The sample size was determined from the available current census data of the total population of Bwamiramira sub-county which is 10,417 people and the number of household is 2,181(ANNET & Naranjo, 2014) . It consists of 5 parishes and are kibingo, Kibaali, Kahyoro, Kikaada and kiribanga.

The study was of a qualitative approach because it involved people's perceptions and views in order to obtain the required information.

3.4 Sampling Technique

The study was conducted in Kibaali, Kahyoro and Kibingo parishes with total household of 1390. These parishes were purposively selected because of their vulnerability to climate variability and change which leads to destruction of crops and livestock causing food insecurity in the sub-county. Simple random sampling was used and the household in these parishes were randomly selected to obtain the information.

3.5 Sample size

The sample size was 91 respondents from the randomly selected households in the parishes and was determined using Tore Yamane formula from the total household's population in Kibaali, kibingo and Kahyoro parishes as bellow,

$n=N/\ (1+N\ (e)^{2}$

Where,

n= sample size

N = Total household population of the study area

1 = constant

e= allowable error

Sampling error was estimated at 89.9% confidence level as bellow, (100-89.9)=10.1%

10/100=0.101 or 10.1% as the sampling error

$n = N/1+N (e)^2$

$n = 1390/1+1390(0.101)^2$

n =1390/15.2

n =91

Therefore, a sample size of 91 households was involved in this study

3.6 Methods and tools of data collection

Across sectional household survey using questionnaires was used. Target respondents were given a list of questions for them to provide information and they recorded the answers by themselves. I wrote for those who couldn't write.

Open and closed ended questions were used to collect qualitative data from the respondents in the randomly selected households in the parishes on various household variables which included people's perceptions on climate variability and change, climate variability and change mitigation practices and challenges faced when adopting climate variability and change mitigation practices.

3.7 Data analysis

3.7.1 characterization of mitigation practices

Descriptive statistics was used to analyze the climate variability and mitigation practices used by the farmers in the study area and principle component analysis was used to visualize the relationships and similarities among different practices and potentially identify groups of similar practices. This was be coded, entered and analyzed using Stata software.

3.7.2 Factors influencing adoption of climate mitigation practices

Climate mitigation practices were cross tabulated with land size, sex, and household size, level of education and age category of the respondents so as to determine the factors influencing adoption of climate mitigation practices in the study area. The data was presented in tables. Linear regression was used to determine the strength of relationships between variables.

3.7.3 CHALLENGES FACED IN ADOPTION OF CLIMATE MITIGATION PRACTICES

Descriptive statistics was used to analyze the challenges faced by farmers who are practicing climate variability and mitigation practices. This enabled me to present the data in a more meaningful way, which allows simpler interpretation of the data.

CHAPTER FOUR: RESULTS

4.1. SOCIO-DEMOGRAPHIC CHARACTERISTICS

Majority of the respondents were males (64.8%), 73.63% of the respondents were married,14.29% single,7% widowed and 4% divorced with secondary being the highest level of education (35%), primary (34.07%), non (17.58%) and tertiary (9.89%) respectively. Majority of the respondents were between (31-45) years (53.85%), (18-30) years (31.87%), (46-60) years (8.79%) whereas 61 and above (5%) registered the least number of respondents.

4.2 MITIGATION PRACTICES

4.2.1 PRACTICES USED IN CLIMATE VARIABILITY AND CHANGE MITIGATION

Climate variability and change mitigation practices were categorized into agroforestry, agronomy, livestock and energy practices.

Among the mitigation practices used by the respondents in the study area, land restoration and intercropping were the most used agroforestry practices (17.77%), boundary planting (12.7%), multi-strata agriculture (11.33%) and tree planting (2.54%) being the least used. Manure management (8.59%) was the most livestock practice used by the respondents while rotational grazing (3.91%) being the least used.

Conservation agriculture (17.77%) was the most agronomy practice used by the respondents whereas climate smart agriculture (0%) not being practiced. Improved charcoal stoves(6.84%) were the most energy saving practice used by the respondents whereas biogas (0.78%) being the least used. land restoration, intercropping and conservation agriculture were the most used climate variability and change mitigation practices by the respondents (17.77%) as shown in the table 1.

Table 1 mitigation practices

Mitigation practices	Frequency	% of respondents
Land restoration	91	17.77
intercropping	91	17.77
Boundary planting	65	12.70
Tree planting	13	2.54
Multi-strata agroforestry	58	11.33
Manure management	44	8.59
Rotational grazing	20	3.91
Conservation agriculture	91	17.77
Climate smart agriculture	0	0.00
Improved charcoal stoves	35	6.84
biogas	4	0.78

4.2.2 MITIGATION STRATEGIES COMBINATIONS

Multi-strata agroforestry, tree planting and rotational grazing where the most used mitigation practices in comp1,improved charcoal stove and boundary planting where the most mitigation practices used in comp2 while biogas was the most mitigation practice used in comp3 because they have variance above 0.4 as shown in the Table 2

Table 2 mitigation strategy combinations

Mitigation practice	Comp1	Comp2	Comp3	unexplained
Boundary planting	0.3613	**0.4013**	-0.4210	.2787
Tree planting	**0.4018**	0.0093	-0.2235	.5859

Multi-strata agroforestry	**0.4800**	0.0974	-0.3885	.302
Manure management	0.3215	-0.4953	0.2436	.3603
Rotational grazing	**0.4729**	-0.1529	0.3213	.3538
Improved charcoal stoves	-0.0757	**0.7107**	0.3378	.1475
biogas	0.3808	0.2359	**0.5875**	.1958

4.2 Factors influencing adoption of climate variability and change mitigation practices

The results of cross tabulation showed that male farmers practiced more of climate mitigation practices than female. Farmers who had high level of education (secondary and tertiary) practiced climate variability mitigation practices than those who had low level of education. Household size between 4 and 6 were engaged more in climate mitigation practices than the other categories. Although most of the farmers who had small sized land, they actively practiced CMP as shown in the Table 3

Table 3 factors influencing adoption of climate variability and change practices

Factors influencing CMP		**Mitigation practices(percentages)**										
		Land restoratio n g	intercroppi ng	Boundar y planting	Tree plantin g	Multi-strata agricultu re	Manure manageme nt	Rotation al grazing	CA	CA	ICS	biogas
sex	male	65	65	69	82	67	76	70	65	0	54	67
	female	35	35	31	18	33	34	30	35	0	46	33
age category	18-30	32	32	22	18	21	30	9	32	0	26	0
	31-45	54	54	63	53	60	46	39	54	0	60	67
	46-60	9	9	11	18	12	14	30	9	0	11	33
	Above 60	6	6	5	12	7	10	22	6	0	3	0
Level of educatio n	None	18	18	14	24	14	28	26	18	0	11	0
	primary	34	34	31	29	33	32	39	34	0	39	33
	secondar y	39	39	49	35	44	32	26	39	0	49	67
	Tertiary	10	10	6	12	9	8	9	10	0	11	0
Land size	1-3hact	74	74	80	53	75	62	50	74	0	77	67
	4-6hact	25	25	20	47	25	36	50	25	0	24	33

	Above 7	1	1	0	0	0	2	0	1	0	0	0
Household size	1-3	26	26	23	12	19	24	17	26	0	17	0
	4-6	66	66	71	82	75	66	70	66	0	77	100
	Above 7	8	8	6	6	5	10	13	8	0	6	0

4.2.1 LINEAR REGRESSION FOR FACTORS INFLUENCING ADOPTION OF CLIMATE VARIABILITY AND CHANGE PRACTICES

There was a relationship between age category and boundary planting whereby p<t=0.759, a relationship between sex and multi-strata agriculture whereby p<t=0.605, biogas with p<t=0.985. Level of education had a relationship with tree planting with p<t=0.641, multi-strata agriculture with p<t=0.747 and improved charcoal stove with p<t=0.937.Household size had a relationship with tree planting with p<t=0.594 as shown in table 4

TABLE 4 LINEAR REGRESSION FOR FACTORS INFLUENCING ADOPTION OF CLIMATE VARIABILITY AND CHANGE PRACTICES

Factors influencing CMP	**Climate mitigation practices**										
	land restoration	intercropping	Boundary planting	tree planting	Multi-strata agriculture	Manure management	Rotational grazing	CA	CSA	ICS	biogas
Age category	-	-	**.049(0.795)***	.169(.45)	.128(.486)	.169(.299)	.978	-	-	.323(.067)	-.575(.174)
sex	-	-	-.012(.926)	.184(.237)	**.066(.605)***	.273(.017)	-.115(.421)	-	-	-.067(.579)	**.005(.985)***
Level of education	-	-	-.901(.022)	**.214(.641)***	**.122(.747)***	.506(.133)	**.062(.883)***	-	-	**.028(.937)***	-1.237(.553)
Land size	-	-	-.223(.084)	.39(.008)	-.126(.308)	.303(.007)	.142(.284)	-	-	.109(.348)	-.142(.6)
Household size	-	-	.163(.287)	**.097(.594)***	-.115(.443)	.213(.11)	.244(.149)	-	-	.213(.136)	-.298(.386)

4.3 CHALLENGES FACED IN ADOPTION OF MITIGATION PRACTICES

Among the challenges faced by the respondents in the study area, limited land (22.09%) and lack of financial resources (22.09%) are the most challenges faced in adoption of mitigation practices. limited access to technologies or equipment (21.6%), uncertainty about the effectiveness of these practices (19.42%) as well as lack of information or knowledge about suitable practices (14.81%) respectively as shown in the Table 5

Table 5 challenges faced in adoption of mitigation practices

Challenges	Frequency	% of respondents
Limited land	91	22.09
Limited access to technology or equipment	89	21.60
Uncertainty about the effeteness of practices	80	19.42
Lack of information or knowledge about suitable practices	61	14.81
Lack of financial resources	91	22.09

4.3.1 Association of challenges with mitigation practices

All challenges were dominant in land restoration, intercropping and conservation agriculture and least dominant in tree planting and biogas respectively as shown in Table 6.

Table 6 association of challenges with mitigation practices

Challenges faced in adoption of CMP	Mitigation Practices (Percentages)									
	Land restoration	Intercropping	Boundary planting	Tree planting	Multi-strata agroforestry	manure management	rotational grazing	Conservation agriculture	Improved charcoal stove	biogas
Lack of financial resources (n=91)	100	100	71	19	63	55	25	100	39	3
Lack of information(n=64)	100	100	63	19	56	52	20	100	31	2
Uncertainty about the effectiveness of practices (n=81)	100	100	70	20	65	58	26	100	35	4
Limited access to technologies or equipment (n=89)	100	100	71	19	62	54	25	100	38	2
limited land(n=91)	100	100	71	19	63	55	25	100	39	3

CHAPTER FIVE

5.0 DISCUSSIONS

5.1 Practices used in Climate variability and change mitigation

The most cited to be used practices included; land restoration, intercropping and conservation agriculture. However, in terms of effective combination of useful mitigation strategies, this study has shown that multi-strata agroforestry and tree planting were the major agroforestry mitigation practices used by the farmers. This could be attributed to their affordability in terms of management and associated benefits such as reducing wind speed as they act as windbreaks. It was particularly observed that farmers used cassia, prosodies, Calandra, acacia and mooring. Combination with crops such as coffee and bananas. According to (Rahman et al., 2022), agroforestry has been found to be a good climate mitigation strategy that has been adopted among smallholder farming communities because of its multiple benefits. Further, according to (Mulinde et al., 2019), study carried out in Mable, it was found that it provided more farmers better incomes. Equally, (Sebuliba et al., 2022) has documented that agroforestry is effective in sequestering more soil carbon.

5.2 Factors influencing adoption of mitigation practices

The results of this study showed that male household headed farmers practiced more of climate mitigation practices than female. This could be attributed male-headed households typically having larger land holdings and more income, which allows them to invest in more expensive climate mitigation practices such as biogas, manure management and tree planting. Female-headed households, on the other hand, are often more constrained in their ability to adopt climate mitigation practices due to smaller land holdings and lower incomes, less access to labor and less control over decision-making about climate mitigation practices. These constraints can make it difficult for female-headed households to adopt climate mitigation practices that require significant resources or labor. As a result, they are more likely to adopt less expensive or labor-intensive climate mitigation practices, such as land restoration and intercropping. According to

(Goli et al., 2020),findings revealed that male headed households performed better than the female ones in practicing CMP.

Level of education influenced the farmer's abilities to undertake most of the climate variability mitigation practices. This study showed that farmers who had high level of education engaged more in climate mitigation practices. This could be attributed to uncertainty about the effectiveness of these practices. However, according to (Nanfuka et al., 2020), the use of indigenous knowledge by farmers as a major sources of knowledge positively influence the use of climate mitigation practice. Equally,(Jahan et al., 2022) has documented that better-educated farmers can easily decipher best practices and adopt them when compared to less-educated counterparts.

In a study by Susan et al (2020), it was reported that socio-economic factors such as land size has a strong relationship with the farmers capacity to undertake the CMP because majority of the farmers who owned large chunks of land practiced a number of practices. However, according to this study, the results showed that farmers who had small sized land, actively practiced CMP. This could be attributed to allowing them to exploit the heterogeneity of their soils and micro-environments to cultivate different crop types which cushions against climate shocks.

5.3 Challenges faced in adoption of climate mitigation practices

Results of the study revealed that lack of financial resources and limited land were the most cited challenges that limited the farmers of Bwamiramira sub county Kibaale district to implement climate variability and change mitigation practices. This could be attributed to high poverty levels as human poverty index for kibaale was 25.3% in 2006.According to (Jahan et al., 2022), has documented that farmers mentioned that lack of government support in terms of financial resources is the prime hindrance for them. Farther, (Feliciano et al., 2022) lack of financing appear to be the main barriers to large-scale deployment of CMP.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. major climate variability and change mitigation practices practiced by farmers in Bwamiramira sub county Kibaale district were multi-strata agroforestry, tree planting, and improved charcoal stoves and manure management being the least practiced.
2. Level of education was the most influencing factor that limited farmer's abilities to undertake most of the climate variability mitigation practices
3. Lack of financial resources and limited land were the major challenges that limited the Farmers of Bwamiramira sub county Kibaale district to implement the climate variability and change mitigation practices.

6.2 Recommendations

1. There is need for the agricultural extension workers and local leaders to regularly train and sensitize the farmers on available and affordable climate variability and change practices and new agricultural technologies at all levels in order to ensure awareness creation.
2. Favorable government policies aimed at supporting farmers to adopt climate mitigation practices such as giving incentives like loans, provision of technological equipment to the farmers and agricultural insurance so as to develop the agriculture sector at all levels.

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APPENDICES

APPENDIX1: RESEARCH QUESTIONNAIRE GUIDE.

My name is BYAMUKAMA ANDREW a student from the Department of Environmental Management, Maker ere University, and pursuing Bachelors Degree of Environmental Science. I am carrying out a research on Farmers Adoption to Climate Variability and Change Mitigation Practices.

The information provided to me is very important and will contribute much towards this study. All the information given will be treated with high confidentiality and I highly appreciate your cooperation.

District…………… parish……………. Village……………

A. SOCIO-ECONOMIC & DEMOGRAPHIC DATA

1. Age:
2. Sex: 1) Male 2) Female
3. Marital status: 1) Married 2) Single 3) Divorced 4) Widowed
4. Head of household: 1) Male 2) Female 3) Child (below 18)
5. Household head formal Education: 1)None 2)primary 3) secondary 4)tertiary
6. Land ownership: 1) own land 2) Rent 3) Communal
7. If you individually own the land, how big is your farmland...
8. If communally owned, do you freely/always access it? 1) Yes………. 2) No………….
9. How old is the house head? ....
10. Household size……………………….
11. Do you own the homestead? 1) Yes……. 2) No……...
12. Main Activity…1) livestock………2) Crop…………3) Mining…………4) Trade……. .5) Other………………
13. Do you belong to any farmers group? 1) Yes…….. 2) No……….

14. Do you receive technical support and training? 1) Yes……. 2) No……

15. If yes, from where? 1) Farmers 2) Agricultural Extension Officers 3) Relatives

B. MITIGATION PRACTICES ADOPTED BY FARMERS

1. How long have you been practicing agriculture?

2. Are you aware of climate change and its potential impacts on agriculture? 1) Yes 2) No

3. Have you experienced changes in climate patterns in your region over the past few years? 1) Yes 2) No

4. If yes, please describe the changes you have observed.

5. How have these changes in climate patterns affected your farming practice?

   a. Changes in crop yields or quality
   b. Increased pest or disease pressure
   c. Water scarcity or changes in water availability
   d. Changes in planting or harvesting dates
   e. Other (please specify)

3. How often do you experience them? 1) Every season, 2) once a year 3) every yea

5. Have you adopted any climate mitigation practices on your farm? 1) Yes 2) No

6. If yes, please specify the practices you have adopted from the table below

AGROFORESTRY PRACTICES	**NO/YES**	**LIVESTOCK PRACTICES**	**NO/YES**	**AGRONOMY PRACTICES**	**NO/YES**	**ENERGY PRACTICES**	**NO/YES**
Land restoration		Manure management		Conservation agriculture		Improved charcoal stove	
Intercropping		Rotational grazing		Climate smart agriculture		Biogas	
Boundary planting							
Tree planting							
Multi-strata agroforestry							

7. What factors influenced your decision to adopt climate mitigation practices? (Use the table below

PRACTICES	**NO/ YES**	**REASON FOR CHOICE OF PARTICULAR PRACTICE**	**REASON FOR NOT USING A PARTICULAR PRACTICE**	**WHERE DID YOU LEARN IT FROM?**
		affordable[1]/ acceptable[2]/ available[3]/ other specify[4])	did not know about[2]it, laborers[3], Does not work for me[4]**)**	(Relative [1]/ Friends[2]/ School[3]/ Gvt Extension Officer[4], LC1[5], Parish Chief[6], Religious leader[7], farmer groups[8]**,** cultural practice[9]
AGROFORESTRY				
Land restoration				
Intercropping				
Boundary planting				
Tree planting				
Multi-strata agroforestry				
LIVESTOCK				
Manure management				
Rotational grazing				
AGRONOMY				
Conservation agriculture				
Climate smart agriculture				

ENERGY				
Improved charcoal stove				
Biogas				

8. Have you observed any positive outcomes or benefits from adopting climate mitigation practices? 1) Yes 2) No

9. If yes, please describe the outcomes or benefits you have observed.

a) improved crop yield
b) reduced extreme events
c) financial resources
d) Others specify………..

10. What are the main challenges you have faced in adopting climate mitigation practices?

a) Lack of financial resources
b) Lack of information or knowledge about suitable practices
c) Uncertainty about the effectiveness of practices
d) Limited access to technologies or equipment
e) Other (please specify)