FACTORS AFFECTING YOUTH PARTICIPATION IN CLIMATE-SMART AGRICULTURE IN BUMULA SUB-COUNTY, BUNGOMA COUNTY - KENYA

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Master of Science Degree in Agricultural Extension and Rural Development of Masinde Muliro University of Science and Technology

October, 2025

DECLARATION

This thesis is my original work and has not been submitted or presented for the award of a Diploma or Conferment of a Degree in this University or any institution.

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DEDICATION

This study is dedicated to my Friend and Pastor Costel Vilu and my family members whose prayers, efforts and support were not in vain.

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I sincerely thank my creator, the Almighty God who has always given me the physical, mental, and good health to undertake and accomplish this task. Very special thanks to my supervisors Prof. Vitalis Ogemah and Dr. Teddy Amuge for the enthusiasm with which they provide support, advice, constructive comments, and as the unconditional sacrifices they made towards the success of this work. Their valuable and continuous guidance towards this work are highly appreciated. My special thanks go to the administration of Masinde Muliro University of Science and Technology for granting me the opportunity to advance my studies. God bless you all.

ABSTRACT

Climate-Smart Agriculture (CSA) offers a promising approach to simultaneously enhance agricultural productivity, build resilience to climate change, and reduce greenhouse gas emissions. However, the uptake of CSA, particularly among youth, remains low in many countries, including Kenya. This study investigated the factors influencing youth participation in CSA practices in Bumula sub-county,Bungoma County, Kenya. The region is characterized by high youth unemployment and vulnerability to climate-related challenges. A cross-sectional survey design was employed, collecting data from 120 youth respondents (aged 18-34) across two wards using proportionate and simple random sampling. Data were analyzed using SPSS version 26. The results of the study showed that extension officers were the primary source of both CSA awareness (44.1%) and practical information (45.3%). A very strong, association was found between information dissemination pathways and youth participation in CSA (Cramer's $V = 1.0$, $p < 0.05$). Binary logistic regression revealed that female youth had significantly lower odds of practicing CSA than their male counterparts (OR = 0.284, p = 0.010). Conversely, higher annual farm income substantially increased the likelihood of CSA adoption (OR = 2.520, p = 0.004). Access to credit was also a significant positive predictor (OR = 2.922, p = 0.033). Education level, off-farm income, training, NGO support, and farmer group membership were not significant predictors. The study concludes that targeted interventions are essential to boost youth participation in CSA. Recommendations include facilitating youth-specific credit access, improving farm incomes, modernizing extension services, and implementing programs that address the specific barriers faced by young women, to empower young farmers in adopting climate-resilient agricultural practices in Bumula sub-county.

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LIST OF ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AGRA	Alliance for a Green Revolution in Africa
BLRM	Binary Logistic Regression Model
CSA	Climate-Smart Agriculture
CSAPs	Climate-Smart Agricultural Practices
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistics
GDP	Growth Domestic Product
GoK	Government of Kenya
IPCC	Intergovernmental Panel on Climate Change
MoALF	Ministry of Agriculture, Livestock and Fisheries
NACOSTI	National Commission for Science, Technology and Innovation
NGOs	Non-Governmental Organizations
SACCOs	Savings and Credit Cooperatives
SPSS	Statistical Package for Social Science
UN	United Nation
UNDP	United Nations Development Programme

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OPERATIONAL DEFINITIONS OF TERMS

Barriers: Barriers mean the difficulties or challenges that affect the participation of the youth in CSA like inaccessibility to land, the shortage of money, or insufficient information.

Enablers: These are facilitating factors in participation of the youth, such as favorable policies, training opportunities, and channels of communication.

Climate Variability: Climate variability is defined as the short term variations in climatic conditions, e.g. abnormal rainfall patterns, erratic temperature and aberrant weather patterns. Climate variability is regarded as a primary threat to agricultural productivity and the involvement of young people in the field of CSA in this study (Intergovernmental Panel on Climate Change [IPCC], 2023).

Climate-Smart Agriculture (CSA): Climate-smart agriculture is a generic term describing integrated landscape, croplands, livestock, forests and fisheries managements, that consider the salient issues of food security and climate change interaction. (Lipper et al., 2014). CSA covers conservation agriculture, agroforestry, effective water management, and drought-tolerant crops in order to produce more, build resilience and reduce greenhouse gas emissions in the given study (World Bank, 2023).

Economic Empowerment: Economic empowerment is the means of empowering people especially the youth to be in control of economic resources and opportunities. In this research, it will be evaluated by how the youth can earn incomes, financial services, and better their lives through their engagement in CSA. (United Nations Development Programme [UNDP], 2023).

Food Security: Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996). This research discussed how the involvement of the youth in CSA can help in ensuring food security in Bumula sub-county (Food and Agriculture Organization of the United Nations [FAO], 2023).

Information Communication Pathways: The information communication pathway can be defined as the channel and means that youth use to get access to information related to CSA. These are extension, digital tools (including social media and mobile applications), community connectivity, radio, and farming seminars. These pathways influence youth engagement by determining the accessibility and applicability of CSA-related information(FAO, 2023).

Institutional Factors: Institutional factors encompass formal and informal structures, policies and systems that influence an involvement of youth in CSA. These comprise credit access, presence of training schemes, government regulations, agricultural extension activity and cooperatives or farmer organizations. This is analyzed to conclude on how these factors affect youth involvement (Ngugi *et al*., 2023).

Participation in Climate-Smart Agriculture: Participation in CSA entails youth participation in climate-smart agricultural practices by embracing them and putting them into practice(Mwangi *et al*., 2023). In this study, participation in CSA is operationalized as the self-reported adoption and implementation of one or more specified CSA practices (e.g.,

composting, agroforestry, improved crop varieties) on land managed by the respondent.

Socio-Economic Factors: Socio-economic factors are social and economical situations that contribute to the youth active engagement in CSA. This covers level of income, education, access to land, access to finances, household demographics and the employment size. The following factors are analyzed in this study to identify their effects on the engagement of the youth in CSA (Kipkorir *et al*., 2022).

Sustainable Agricultural Practices: Sustainable agricultural practices are referred to as the farming practices that support or improve the environmental health, economic profitability and social equity. The above practices are interchangeable with CSA and the methods involved support healthy soil, water management, biodiversity and climate resiliency.

Youth: In this study, the term youth will be used to mean 18-35 years of age according to the definition by Kenyan National Youth Policy (KNBS, 2019). The age bracket forms a sizeable percentage of the population at Bumula sub-county and it is the main targeted population to be involved in climate-smart agriculture (CSA). Recent literature indicates that agricultural development should focus more on this group of people to make an agricultural approach sustainable.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Climate change is one of the most pressing global issues that have significant ramifications on food security, economic stability, and environmental sustainability. It is feared that the agricultural sector that particularly relies on climatic conditions will be highly susceptible to the negative impacts of climate change such as erratic rainfall patterns, long term droughts, and certain frequencies of rise in pest infestation (Nega, 2025) . They are further worsened by a population of the world that is set to reach 9.7 billion people in 2050 and are the ones that cause an upward jack in alimentary needs by 60 percent (Doering & Sorensen, 2018). Therefore, a new way of revolutionizing this is by Climate-Smart Agriculture (CSA) challenging to overcome these issues with increased agricultural productivity, climate change resilience, and greenhouse gas reductions (FAO, 2021). Climate-Smart Agriculture includes three primary topics, which are increasing agricultural productivity and incomes in a sustainable manner, climate change adaptation and shaping climate-change resilience, and mitigation of the emission of green house gasses where applicable (FAO, 2021).

In spite of its possibilities, spread of CSA practices remains diverse worldwide with poor involvement of the youth in them. By taking away the possibility of youth engaging in agriculture this is because of the unattractiveness of the sector, low access to resources, and poor policy making environments is being missed because these young people make a significant percentage of the world population, they are therefore, excluded possibly to engage in agriculture as they do in other sectors of the economy in their own countries.

(World Bank, 2015). Youth exclusion is concerning against the backdrop that youth are the future custodians of agricultural systems and are potential drivers of innovation and sustainability in the sector. Nonetheless, the lack of interventions tackling the issues they encounter means that the participation of youths in the CSA will be minimal, and this aspect will undermine the quantitative goal of global food security and climate resiliency.

Most African economies are driven by agriculture and hence make up sizeable percentages of Gross Domestic Product (GDP) and absorb the larger percentages of the populations. The sector contributes 23 percent of entire GDP on the continent and provides almost 60 percent of the workforce in the continent (Ansori, 2021). However, it is also one of the most susceptible continents to climate change as the agricultural systems there continue experiencing more and more challenges due to harsh weather conditions and environment deterioration. As an example, continuous droughts in the Horn of Africa and erratic rainfall patterns in West Africa have led to massive crop losses and livestock losses that have driven food insecurity and poverty to a new level (United Nations Office for Disaster Risk Reduction [UNDRR], 2024). Smllholder farmers have these challenges, especially since they represent the greatest proportion of farming population in Africa and are generally ill-equipped to handle the change in climate.

These challenges are especially harsh in Africa with most of its citizens (more than 60%) classified as youths who are confronted with high unemployment rates and lack of economic opportunities (ILO, 2012). Although CSA has potential in transforming these challenges, youth participation in CSA is minimal considering that among other reasons, there is limited access to land, credit facilities and training and ineffective policy frameworks that encourage the involvement of young people in farming (GoK, 2017). For example, in the majority of

African countries, land ownership lies with older age groups, thereby granting young people limited access to the most vital resource for agricultural production. Additionally, the youth are considered high-risk borrowers by the financial institutions, thus making it difficult for them to access credit to invest in CSA practices and technologies (Bullock et al., 2021).

Kenya, like the majority of other African countries, is very reliant on agriculture, which contributes approximately 33% of the GDP and supports over 70% of the rural labor force (World Bank, 2015). The sector is a prime driver of economic growth, poverty reduction, and food security. It is, nevertheless, under increasing threat from climate change in the form of frequent droughts and floods that lead to crop failure and livestock fatalities. For instance, the 2022 Kenyan drought, the worst in 40 years, left over 4 million people food insecure and led to massive losses in livestock and crop production (Plano, 2023). These problems are compounded by rapid population growth, which is increasing the demand for food and putting further pressure on already strained agricultural systems.

The Kenya government has also realized the importance of CSA in addressing these problems and has also integrated CSA into its national climate change action plan (NCCAP, 2023) . The plan requires the increase in CSA practices like conservation agriculture, agroforestry and integrated soil fertility management to create the resilience and productivity. Even with all this said, CSA has low participation among the youths especially in rural areas where people rely on farming as the main source of income. The Kenyan youths are also confronted with a number of obstacles to their engagement on CSA that include low access to land, finance, and important agricultural skills training (FAO, 2014). For example, a study by Forah, (2023), discovered that CSA involvement amongst Kenyan youth in rural settings is referring to just a fraction (15 percent) of the adults (45 percent). This gap observes that

special interventions are required to tackle the special concerns of young people in agriculture.

Bumula sub-county in Bungoma, Kenya, is a highly productive agricultural area for both crops and livestock.. Soils and climatic conditions are favorable and the subcounty has a large d farming community. The main agricultural activities within the area are maize, beans, sugarcane, cassava and bananas production, whereas the main livestock reared are cattle, goats and poultry (KNBS, 2023; World Bank, 2023). Bumula sub-county, which has much potential in agricultural farming, has also experienced a lot of challenges that can be related to climate changes such as rainy days without precedence, soil erosion, and poor crop productivity. This is worsened by the poor rates of adoption of the CSA practices that can heighten resilience and increase productivity.

The sub-county is equally endowed with young population, where more than 60 percent of its population are below 35 years (KNBS, 2023). Nonetheless, a large percentage of the youths are underemployed or even unemployed and most of them migrate to the city in search of greener economic pastures. This is a critical issue considering the fact that agriculture and CSA in general is a viable option to promote sustainable youth livelihood in the sub-county. Although this has been the potential, there is low youth participation in CSA and the potential of the youths in contributing towards sustainable agricultural development in the sub-county has not been fully exploited. Severe youth shortage in CSA in Bumula sub-county is due to many reasons that include- a) socio-economic reasons such as land disintegration, b) institutional reasons like lack of credit to purse CSA practices, to mention but few and c) poor access to information and communication technologies (ICTs) (Ngigi & Muange, 2022; Ewulo et al., 2025).

For instance, most of the youth do not have access to land, which, most of the time, is owned by the older age groups (Moreda, 2023). Banking institutions are also not ready to advance funds to the youth that they consider to be risky hence restricting them to invest in CSA farming techniques like drip irrigation and seed improvement. In addition, the level of awareness of CSA practices among the youth is low because of low quality of extension services and low utilization of ICTs in information provision (AGRA, 2017). These challenges acknowledge that appropriate interventions are necessary to defeat the obstacles to the youth engagement in CSA in Bumula sub-sounty.

Although, there is a lot of literature on CSA and youth participation in agriculture, not many studies have been geared towards the determinants that influence youth participation in CSA at sub-county level as in the case of Bumula sub-county. Most of the studies have been done at the national or regional stages that are prone to ignoring the unique chances that youths encounter in certain localities in terms of socio-economic, institutional, and informational challenges. For example, while study by Geza et al. (2021) and report by FAO (2014) Although they have already tried the issue of youth participation in CSA at the national level, they have not delved much into issues affecting youth participation in a given local area like Bumula. Such lack of knowledge constrains the capacities of policymakers and development practitioners to formulate interventions that would target the specific problems that are faced by youngsters living under varying conditions.

It is against this setback that this study aims at addressing this gap by giving a detailed insight to an exploration on the factors influencing youth involvement in CSA in Bumula sub-sounty in Kenya. Through this, the study promises to inform the stakeholders to formulate concentrated strategies that can increase youth participation and make agricultural

development sustainable in the region. The socio-economic, institutional and informational factors that influence the engagement of youth in CSA are what the study will mainly look into with practical implications.

1.2 Statement of the Problem

Kenya's youth unemployment remains very high, with a staggering 67% of its youth being either unemployed or underemployed (KNBS, 2022). The crisis is worst in rural agrarian economies like Bumula sub-county, where over 60% of the inhabitants depend on subsistence farming. Though the majority of the youth in such areas do engage in traditional farming to make their living, their engagement is characterized by low-productivity, rain-dependent farming that is highly vulnerable to climatic changes.

Climate-Smart Agriculture (CSA) offers a proven method of transforming trend. CSA practices can improve productivity on farms by 20–30% while enhancing resilience to climate shocks and creating green jobs (Esther & Esther, 2024). However, there is one striking paradox in Bumula sub-county. Despite the potential of CSA having been recognized and young people being well represented in the agriculture sector, the adoption of these exact, innovative practices by the youth is very low. Preliminary data and reports from local levels indicate that while youth are involved in agriculture, they mostly apply traditional practices with little uptake of familiar CSA practices such as agroforestry, water harvesting, and improved crop varieties.

Continuation of inferior agricultural practices perpetuates cycles of economic stagnation, food insecurity, and vulnerability to climate change. Underutilization of CSA innovations by the same group most technologically savvy and receptive to change the youth constitutes missing

opportunities to improve the productivity of agriculture, reverse rural-urban migration, and build climate-resilient local economies.

Therefore, the general problem this study investigate is not a general lack of youth involvement in agriculture, but rather the specific resistance and barriers to the youth in Bumula sub-county transitioning from conventional farming to the uptake of Climate-Smart Agricultural innovations. There is a fundamental knowledge gap regarding the reasons why young people, who are very interested in farming, are not taking up CSA despite its established benefits. This study seek to fill this gap by exploring the socio-economic, institutional, and informational barriers to youth engagement in CSA, with a view to providing concrete proposals for unlocking a youth-led agricultural revolution in Bumula sub-county.

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1.3 Justification of the Study

The pressing need to undertake this study can be justified by the fact that there is an acute convergence of three compelling areas of concern in Bumula sub-county which is aggravated by the problem of youth unemployment, rising climate vulnerability as well as recurrent agricultural stagnation. CSA innovation can be used to offer sustainable solutions to the rural regions like Bumula, where over 35 percent of young Kenyans are unemployed (The Netherlands and Kenya, 2023). However, the lack of correlation between the CSA promise and practice renders the present study essential to ease the problem of unemployment among youth in Bumula.

The study addresses a very large gap in the knowledge base considering why young people, being technology-conscious and physically active, do not adopt CSA practices, even though they are beneficial. The paper aims to know the reason behind the low uptake of CSA, which

has been shown to boost farm productivity by 20-40% in climatic stress (FAO, 2021; Imran et al., 2019), among the youths in Bumula. The research assesses the socio-economic factors (e.g., low land and credit accessibility), institutional factors (e.g., ineffective training programs) and communication barriers, which cumulatively hinder youth participation.

The time of the carried out research is especially relevant due to the increasing climate pressures that are posing a threat to the agricultural activities of Bumula. It is particularly timely to identify implementable youth-based CSA entry points since orthodox agriculture have been made unsustainable. The study facilitate the design of focused interventions for implementing CSA and probably contribute significant ideas for improving the agricultural policies in Bumula and the region.

1.4 General Objective

To enhance climate resilience of agricultural systems and youth employment through promotion of their participation in CSA in Bumula Sub-County.

1.5 Objectives of the Study

The following were the specific objectives of study:

i) To identify the socio-economic factors affecting youth participation in CSA in Bumula sub-county, Kenya.
ii) To determine the institutional factors affecting youth participation in CSA in Bumula sub-county, Kenya.
iii) To evaluate the effects of information communication pathways on youth participation in CSA in Bumula sub-county, Kenya.

1.6 Hypotheses of the Study

The following were the hypotheses of the study:

i) H_{O1}: Socio-economic factors have no significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county

ii) H_{O2}: Institutional factors have no significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county

iii) H_{O3}: Information communication pathways have no statistically significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county.

1.7 Significance of the Study

This study targets the challenging problem of poor youth involvement in CSA in Bumula sub-county given the high rates of youth unemployment and poor economic prospects. The study is able to help present evidence-based knowledge that can be used to inform policies that can also make large numbers of youth to participate and make sustainable use of agriculture since it examines the socio-economic issues, institutional issue and information issue which is determinants of youth participation in CSA..

Further, determining the CSA-inhibiting or enabling factors among the youth in Bumula directly facilitates informed decisions, leading to increased economic opportunities, improved livelihoods, and greater contributions to food security and environmental sustainability.

1.8 Scope of the Study

The study focused on the factors affecting youth participation in CSA practices among the youth in Bumula sub county, Bungoma county, Kenya. Selected factors, including

socioeconomic (youth's gender,education level and income), institutional (access to credit, access to trainings on CSA, NGO support and farmer groups), and informational communication pathways (neighbors and friends, extension officers, radio/television/phone) affecting CSA-adoption were evaluated.

1.9 Assumption of the Study

The assumption was that the respondents would give truthful and honest responses.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This literature review examines the socio-economic, institutional, and informational factors affecting youth participation in CSA. Specifically, it covers the global perspective, narrowing down to Africa, Kenya, and Bumula sub-county.

2.2 The Centrality of Agriculture and the Paradox of Youth Disengagement

The importance of agriculture in the world economy is always reinforced by empirical studies. According to a report by FAOSTAT (2023), the industry is characterized by structural imbalance since in industrialized countries, its role in GDP is quite small (1-4%), but in many low-income countries, the industry is a leading economic activity, with its share of national GDP at 20-50%. Moreover, FDA organization (2025) confirmed that it plays a vital role in the job market, serving more than half of the labor force in Sub-Saharan Africa and providing substantial multiplier effects that keep the rural economy alive and avoid excess urbanization.

This macro economic significance however conceals an important socio-economic paradox especially in Africa. Reports by the African Union (2022, 2023) have discovered that although agriculture is the major means of livelihood to more than 60 percent of people in the continent, it is facing a gradual decline in the number of youths involved in the sector, which poses a threat to future food availability and economic security. This tension is very vivid in the Kenyan context. A survey conducted by the Kenya National Bureau of Statistics (KNBS, 2022) revealed that over 30% of GDP is produced by the agricultural industry and over 40 percent of the population is employed by the agricultural sector, but it is coexisting with an

alarming rate of youth unemployment of more than 35 percent (The Netherlands and Kenya, 2023), which shows that it is not possible to transform the potential of the sector into appealing employment opportunities to young people.

There is evidence that Climate-Smart Agriculture (CSA) may possibly reverse this tendency. A recent study by Ogisi and Begho (2023) on CSA practices in Nigeria and one by Tilahun et al. (2023) on CSA practices in Ethiopia showed that CSA practices can enhance productivity and resilience to make agriculture more sustainable. Nevertheless, there is still a great gap in explaining youth adoption. The literature that is available and mostly concentrates on macro-national analyses does not break down the highly interlaced net of obstacles at the sub-national level. An example is that although education has been simplistically thought to be a positive force of technology adoption, in some situations, such as in rural Kenya, as found by a study by Deressa et al. (2009) of Sub-Saharan Africa, in some cases, higher education can paradoxically pull away youth out of agriculture as they feel better prospects in off-farm activities, which is often lost in aggregate national statistics.

This literature review makes it evident that there is an explicit gap in the research. Although the macro-economic advantages of CSA and the overall issues of youth disengagement have been extensively recorded, there is an urgent deficit of localized, granular studies that explore the specific nature of the interaction between socio-economic, institutional, and informational variables to facilitate or prevent youth enrollment in CSA in a localized, high-potential agricultural setting. This research was aiming at filling this gap through a specific study in the Bumula sub-county, Kenya, to not only identify the key factors, but also radically analyze the relationship among them hence giving evidence based basis to the targeted interventions.

2.3 Youth's Level of Involvement in Climate-Smart Agriculture

The critical background of this study is a worldwide trend of youth not being involved in agriculture. With the view of farming being viewed as an unpaying and physically challenging profession and the attraction of city life, the youth are leaving the agricultural industry across the world (FAO, 2023; Geza et al., 2021). One of the solutions to this crisis that has been extensively suggested to suit the interests of young individuals in technology, economic stability, and environmental stewardship is so called Climate-Smart Agriculture (CSA) (UNDP, 2023). There is however a great mismatch between this theoretical possibility and the fact of low youth participation, and this challenge is manifested differently but remains common in both developed and developing settings.

The barriers in the developed countries are usually structural and economic. Even with decent policy frameworks aimed at enticing youth participation by the means of subsidies, credit, and digital technologies (European Commission, 2025), the participation is just intractable. As an example, young farmers less than 35 years old control a small percentage of farmland of only 6.5 percent in the European Union (EU) and 9 percent in the United States (Adaptation Fund, 2022; European Commission, 2025). This implies that despite the strong institutional support, there exist more systemic barriers such as land scarcity, prohibitively high capital requirements and an aging agricultural infrastructure which make it difficult to enter the market even with the existing policies in place.

The case of developing nations like Kenya has a more difficult and serious contradiction. In this case it is not their youth that is the problem but rather the failure of the agricultural system to attract them. Although agriculture is the greatest source of employment, it is connoted with

subsistence-level susceptibility but not business potential. According to the literature, the same basic disincentives that affect youth in the developed world such as, restricted access to land, credit, and knowledge discourage youth in these areas (Kote et al., 2024). The major limitation of the current studies, however, is that they are quite inclined to consider such barriers as a set of generic, universally applicable ones.

The subtlety of the interaction between these factors and the most salient ones in particular local settings is significantly lacking. As an example, even though the problem of land access is universal, its effects can be moderated differently by local inheritance systems, land tenure systems or even by the existence of rental markets. On the same note, the importance of education is uncertain; it can prepare the young people with the necessary skills to comprehend CSA but can also offer them with more qualifications to get jobs outside the industry and drag them out of the industry (Deressa et al., 2009).

The existing literature base is effective in its diagnosis of the condition of low youth engagement globally but fails to give a more local prognosis of the operating causal mechanisms. There is an urgent need to go beyond the catalogue of generic barriers to exploring the relative significance and interdependence of these factors in particular high potential agricultural localities. Whether such factors as land, credit and information influence youth participation is not the question, but how they interact to either facilitate or kill youth participation in a place such as Bumula sub-county. This gap was overcome by this study which empirically established the most important socio-economic, institutional and informational predictors of CSA involvement among youth in this particular context, thus offering a narrow intervention evidence base.

2.4 Socio-Economic Factors Influencing Youths Participation in CSA

It is a universal acknowledgment of the literature that socio-economic factors play a central role in life when it comes to youth participation in agriculture, but it is complicated and oftentimes context-reliant. Research indicates that a lack of land, capital, and education continue to discourage youths in CSA development in developing economies (FAO, 2022, 2023). An example is a study by Bhatnagar et al. (2024) in India and Tilahun et al. (2023) in Ethiopia which found land fragmentation and limited access to credit to be critical factors, whereas a study by Sennuga et al. (2023) in Nigeria highlighted the reason why young people avoid agriculture, considering it a low-income sector.

Nonetheless, critical scrutiny of the findings has found that there are major controversy areas especially over the role of education. According to a research conducted by Aryal et al. (2018) in Nepal, education increases the ability to learn and implement innovative agricultural technologies as it has traditionally been believed. On the other hand, a study conducted by Deressa et al. (2009) in Sub-Saharan Africa and Sato et al. (2025) in rural Kenya has revealed that education in the presence of off-farm work places can paradoxically draw the young people out of agriculture, making it a dilemma to educate young farmers.

This is indicative of a bigger shortcoming of the current literature, a propensity to look at these socio-economic factors separately. Although the research in different countries is effective in listing the prevalent obstacles, they usually do not simulate the interaction of these barriers. As an illustration, it is still unclear, based on existing literature, whether the income pillar is cushioned by safe access to land, or the gender pillar is stronger than the financial one in certain local conditions. A study by Autio (2021) in Kenya made the right assumptions

regarding the set of typical restrictions but is generalized on a national scale without taking into account local peculiarities.

This research gap is evidenced by the case of Bumula sub-county. In spite of the fact that the region is highly agricultural, research like the one by KNBS (2022) records high unemployment of the young population and low rates of adoption of the new practices. The same study has indicated that in similar rural Kenyan settings, the youth are prone to migrate to urban areas (Eckert et al., 2019), but the previous studies have not been able to empirically test the relative significance of the factors that drive this choice in CSA.

. Although the existing literature has been efficient in finding a common set of socio-economic factors, there is urgent need of empirical data to measure the relative importance and interplay of the factors in adoption of youth CSA in a geographical area with high potential, such as Bumula sub-county. This paper responded to this by stepping beyond a descriptive description to a multivariate analysis by establishing what socio-economic levers have the strongest predictive power in youth participation, hence offering a specific evidence base on which to intervene.

2.5.1 Institutional Factors and Youth Participation in Climate-Smart Agriculture

Literature has continuously exerted the critical point on the role played by institutional frameworks in facilitating or limiting participation of youth in Climate-Smart Agriculture (CSA). In a study funded by the High Level Panel of Experts (HLPE, 2021), it was established that in developed countries, strong institutions support the participation of youth by means of policies that drive innovation and access to resources. Indicatively, a review of the policies of the European Union by the FAO (2022) established that the targeted support, such as monetary

grants and access to digital farming innovations, played a significant role in ensuring agriculture is a viable source of livelihood to a new generation.

In such sharp contrast, the research on developing nations pinpoints the absence of such institutional support. A study by Geza et al. (2021) and Zheng et al. (2024) led to the conclusion that young people throughout the developing world are not encouraged to engage in agriculture because of poor access to credit, training, and extension services. This tendency can be observed in particular studies of countries; according to Bhatnagar (2024), a significant problem with the adoption of CSA in India is the bureaucracy and inability to receive subsidies, and a report by UNDP (2023) gave insufficient government support as one of the main obstacles in Latin America. This institutional failure is especially sharp in Africa. In Ethiopia, Tarekegn et al. (2022) and Atsbaha and Tessema (2012) have determined that the young people are willing to engage in agricultural activities when training and credit opportunities exist, although access is the main hindrance. On the same note, a study by Igbolekwu et al. (2020) in Nigeria revealed that lack of government and NGO assistance due to bureaucratic bottlenecks is a significant deterrent to the youths to engage in farming.

The institutional issues in Kenya are similar to those of sub-Saharan Africa. According to a study conducted by Autio (2021) and Mugo (2022), one of the greatest institutional obstacles to youth involvement in CSA is poor access to credit, training programs, and extension services. This is supported by the research conducted by Ofunya Afande et al. (2015), who also concluded that another significant aspect that contributes to the occurrence of rural-urban migrations among the Kenyan youth is the poor institutional environment, leaving agriculture to the older population. It indicates an acute lack of connections: as research such as that of KNBS (2022) verifies the prevalence of agriculture in the Kenyan economy, the institutional

machinery has not succeeded in making it appealing to the young people who are required to sustain the industry.

But there is a weakness that is critical of this literature. Although these studies do a good job in catalogue a general list of institutional barriers credit, training, extension they mainly address these factors separately. There is a significant deficit of empirical research into the interaction between these institutional determinants and which of them has the strongest weight in triggering a youth to adopt CSA. As an example, is it a separate requirement to have access to credit, or is its need contingent on having also had relevant training? The studies including that by Wondim and Kefale (2018) imply the existence of these so-called slew of institutional impediments in certain areas, such as Bumula sub-county but fails to shift to quantification.

It results in a specific and practical research gap. Though the institutional obstacles to youth involvement in Kenyan agriculture are being fully captured in a general manner, there is an urgent dearth of localized, empirical data that classifies the relative importance of such institutional factors and the synergistic impacts of these institutional factors in a context that is both high-potential, such as a sub-county like Bumula, in a specific manner. This gap was filled by not only determining which institutional barriers be it credit, training, or extension are most likely to relate with youth CSA adoption but also by understanding how the lack of one can offset the presence of the other and thus comes up with a fine-tuned blueprint of any effective institutional intervention.

2.5.2 Youth Agribusiness Plans in Kenya and Bungoma

The policy environment, the laws and regulations, and government strategies, establish the basic rules and incentives, according to which all other activities are formed. The Kenya Youth Agribusiness Strategy (YKAS) 2018-2022 was a historic plan that was aimed at providing agribusiness jobs by exploiting the youth bulge (Government of Kenya [GoK], 2018). Its pillars were enhancing involvement, boosting access to factors of production such as land and finance, building markets, and knowledge and skills. Among its strengths in the middle was that it had clearly identified priority barriers and given solutions to the same, which included model land lease agreements and provision of credit to the young. Its major flaw, however, was the fact that it did not combine climate change adaptation and CSA well and rather focused on presenting climate resiliency as an attachment and not an aspect of sustainable youth agribusiness (Mwamakamba et al., 2021).

The Bungoma County Youth Agribusiness Strategy 2022-2027 is a localization effort based on the national plan to solve the unemployment problem among youth by encouraging agriculture (County Government of Bungoma [CGB], 2022). Its more proactive identification of CSA as its core strategy on its capacity development pillar is a better note. As this progress is being observed, it is also accompanied by an opening-eye handicap between the plans of the strategy and the realities of the ground. Its strategy focuses on credit access and group formations but empirical evidence in Western Kenya suggests that the mechanisms do not actually reach the most marginalized youth because of the transaction costs and bureaucratic complexity (Waaswa et al., 2024). Moreover, ineffective extension systems are impediments to implementation and deny youth functional, locally-adaptable CSA solutions (Ngigi &

Muange, 2022). This creates the policy-practice gap where the high-level strategic objectives do not become desirable enabling conditions to the youth.

2.5.3 The Economic and Social Imperative of Youth in Kenya's Food System

The paradigm shift of the young people in the field of agriculture is the change of the problem-oriented approach to the unemployment issue to an opportunity-based approach to youth as the economic change agents, social stabilizers. The article of the Kenya Institute of Public Policy Research and Analysis (KIPRA, 2025) titled The Economic and Social Impact of Youth Engagement in Kenya Food System provides a solid, evidence-based proposal regarding the reorientation. The report quantifies the huge contribution of youth-led agribusiness, and estimates that when fully involved, they would benefit the agricultural sector by up to 1.5 percent per year, the contribution to the GDP. Such growth will be possible due to the adoption of technology-based value chains, radical reductions in post-harvest losses, and the need to join premium niche markets such as organic, health-conscious, and ethically produced (KIPRA, 2025; Mwangi and Birachi, 2023). In addition to the role of economics, the report also has a direct correlation between youth active engagement and a 20% decrease in rural-urban migration pilot counties, which consequently would help release the negative burden on moving populations on congested urban infrastructure and create more stable sustainable regional development (KIPRA, 2025; Njuki et al., 2022). This reinvents youth not just as the beneficiaries of development intervention but as key drivers of individual economic strength and social integration, a view that is more and more reflected in the words of multilateral organization entities such as the African Development Bank (AfDB, 2023).

It is however the critical comparison between this optimistic macro-narrative and other recent empirical studies that point to a tension and an evident fault line in the literature overall.

KIPRA (2025) report, and other similar policy-focused reports, such as that by the Alliance for a Green Revolution in Africa (AGRA, 2024), tend to feature success stories of "agripreneurs" in the areas of aquaculture and digital platforms as well as high-value horticulture. This creates a convincing, albeit possibly partial, account of high pay, technology-based agribusiness. It stands in contrast with the micro level and granular realities documented in the sociological and agricultural research of most rural youth. Empirical studies conducted by Waaswa et al. (2024) in Western Kenya and Mulema et al. (2021) in East Africa suggest that a majority of rural young people are still languishing in the phase of small and fragmented ownership of land, low access to formal credit, and high risk perceptions in agriculture. This causes them to engage in subsistence farming of low-input and low risk that has little adoption of the highly sustainable practices that would make them sustainable in the long-term. There is an inherent contradiction in it, therefore: there is a literature of policy of the visible minority of successful entrepreneurs and there is an empirical literature of the overwhelming, structural barriers that keep the rest of the rural youth, the invisible majority, entangled (Yami et al., 2021).

It is the contradiction that provides one of the key weaknesses of the current state of knowledge. The macro-level and economic-impact analyses do not even tend to break down the term, youth, enough, and they are treated as an aspirational and homogeneous group (Sumberg et al., 2023). They tend to ignore the fact that there are deep heterogeneities in education levels, assets, and gender that give rise to radically different realities. To give an example, the constraints of a young woman with secondary education and no rights to land are qualitatively different as compared to burdens set on a university-educated male with access to family capital (Bezu & Holden, 2021). The conceptual gap also appears to exist in

the inclusion of the problem of climate change in economic narrative. Although KIPRA (2025) report is thorough in its economic potential, its existential threat is minimal to the same youth businesses it is encouraging. The issue of climate resilience is a secondary one instead of a mandatory factor concerning the long-term economic influence (Thorlakson et al., 2023). This is opposed to the Climate-Smart Agriculture (CSA) literature that emphasized so heavily on the creation of resiliency by practices such as water harvesting and agro forestry but ended up doing so without a clear linkage to the profitable and scalable market opportunities available to youth (Kansime et al., 2021).

It is the direction toward successful and sustainable youth engagement that is of concern in the critical argument. A market-oriented, entrepreneurial approach supported by value chain improvement, access to finance, and digital innovation is promoted by one of the factions as expressed by national policy of agribusiness and the KIPRA (2025) report (GoK, 2018; AGRA, 2024). The second camp, a result of the environmental and development research, advocates the resilience-first strategy according to which as long as the underlying adaptation to climate change is not done by CSA, any young business venture is highly susceptible to the impact of climatic shocks (Zerssa et al., 2021; Nyasimi et al., 2024). The failure that is the primary one is that the two discourses operate parallel and cross-fertilize each other to a limited extent. In the entrepreneurship literature, there is an assumption of a manageable or stable climate, whereas the CSA literature ceases at too early a step of farm-level adoption without establishing a believable link to income generation and market access upon which youth motivation can be based (Twyman et al., 2022).

An explicit and fundamental research gap is created as a result of the synthesis. Although such reports as that of KIPRA describe potentially macroeconomic consequence of youth

involvement correctly, and CSA researches are thorough in enumerating the barriers to adoption, a correlation is wanting. There is little empirical literature on the localized conditions in which a youth in a high-potential, climate-sensitive area, such as Bumula, can proceed through a subsistence-to-profitable and stable agribusiness. Still to be answered is the question what set of socio-economic resources, institutional support, and sources of information enables a young farmer to effectively incorporate climate-smart programs into a solid economic venture? This research fills this gap, by going beyond the similar accounts of economic prosperity and climatic stability to test empirically the interactive contributors to youth activity in CSA, which in turn offers the understanding that is needed to come up with interventions that are both economically empowering and ecologically sustainable.

2.5.4 Facilitating the Youth in Agriculture through Capacity Development

The governments, non-governmental organizations (NGOs) and international development agencies have extensively marketed capacity development as a flag ship approach in ensuring that agriculture is made appealing and sustainable to the youth. The strategy usually implies a set of interventions to strengthen human capital, i.e., formal education, training of vocational skills, extension, mentorship, and development of entrepreneurship (FAO, 2022; Salami, 2023). The argument is convincing: they can make young people more inclined to view farming as an opportunity and a decent job by exposing them to the modern knowledge on farming, entrepreneurship, and technical skills, and thus alter the negative attitude that the industry has been associated with (Yami et al., 2021). Its supporters believe that capacity

building is an important part of the development of a new generation of agripreneurs who can stimulate innovation, commercialize production, and rejuvenate economies in the country (AGRA, 2024; World Bank, 2023). The experience with projects such as the South Africa Eshowe Model shows that combined training packages of practical agronomy and financial literacy and market connections can effectively raise the level of youth confidence and business formation to a new level (Mulema et al., 2021). In the same manner, a report by the International Labour Organization (ILO, 2022) also highlights that development of skills is one of the key facilitators through which young people can gain a green job in the agricultural industry, including in Climate-Smart Agriculture (CSA).

Nevertheless, upon critical analysis of the literature, there seems to be a huge controversy on whether standalone capacity-building programs are effective and adequate or not. The general, systemic lack of engagement of the youth to agriculture at the macro scale is a common contradiction between success stories of pilot projects. Although the majority of the case studies report positive outcomes of some of the training activities (e.g., Njeru et al., 2024), more holistic analyses indicate that training is not an appropriate stimulus to engage youth permanently. The supply-side bias of most capacity-building interventions is the major drawback that can be spotted in this literature. There is a tendency toward such interventions to have a high focus on providing knowledge and skills (the capacity) and giving insufficient attention to the corresponding demand-side implications of the opportunity to utilise these skills (Sumberg et al., 2023). An example is a young person who has been trained in managing green houses and has the knowledge but, due to lack of availability of affordable credit, secure land in which to locate the greenhouse and secure markets in which to sell the produce, the

new skill is not applied and ends up frustrating the individual (Mwangi & Birachi, 2023; Waaswa et al., 2024).

This is a simple argument in the industry. Among the possible explanations that are repeated in policy books, one of these is called a skills-first approach, which presupposes that the development of human capital is the first and most practical entry point (GoK, 2018). The other school of thought is backed by an emerging body of empirical research, which claims that opportunity-centered or systems approach is preferable. The scholars of this school of thought argue that the effectiveness of capacity building can only be achieved when it is put in a bigger system that enables access to the necessary productive resources (Cheteni et al., 2023). Issues with content and methodology of training complicate the controversy further. The conventional top-down and extension methods have been argued as being inappropriate to the generation of youth and failing to include digital tools and engaging methodology the younger generations are sensitive to (De Brauw et al., 2022). This is answered by an active need of experiential learning formats such as farmer field schools, online agricultural simulations and mentoring to connect youth with successful agripreneurs (Kansime et al., 2021; Zerssa et al., 2021).

Also, the most striking gap in the existing body of literature on capacity building is the fact that it does not discuss intersectional inequalities, especially gender. Although most of the efforts are aimed at inclusiveness, they fail to reflect on the particular socio-cultural limitations to which young women are exposed, which include limited mobility, augmented household responsibilities, and insufficient authority over productive resources (Bezu & Holden, 2021; Njuki et al., 2022). An uncoordinated CSA practice training programme, which is not tailored to provide in a manner that is safe and approachable to young women, will

simply reinforce the current gender disparities in agricultural involvement and gains (Nyasimi et al., 2024).

Combination of this literature shows the apparent and obvious gap of research. Although capacity building has been recognized to play a crucial role, there are no empirical studies investigating its relative significance and the relationship with other key components, including access to finance and land, in triggering the introduction of particular, sustainable practices, such as CSA. Most studies do not distinguish training interventions individually or in a package, they do not isolate their contribution. Consequently, the most important question that remains open to a context such as Bumula sub-county is not whether training is provided, but rather what the particular modalities of capacity building are the most effective ones, how the effect of these modalities is mediated by resource accessibility such as credit and land and whether resources are sufficient to allow the youth to overcome the particular barriers to the uptake and benefits of Climate-Smart Agriculture. This paper can fill this gap by examining training as an institutional determinant and socio-economic and informational determinants empirically to give rise to a more profound notion of crafting really effective youth capacity-building efforts during a period of climate change..

2.6 Role of Information Communication pathways on Youth Engagement in CSA

The mediums of agricultural information dissemination are critically reviewed in the literature as a decisive factor of the youth participation in Climate-Smart Agriculture (CSA). This is because a study done by the European Commission (2025) has revealed that in developed economies youth engagement is highly made easier with advanced digital platforms which

give an up to date information of weather, markets and best practices and thus makes agriculture an efficient and viable career. This underscores an agricultural information digital divide gap in the world.

Conversely, studies in third world countries always point to a huge lack of effective information channels. A general examination performed by Geza et al. (2021) and Zheng et al. (2024) has shown that in such regions youth tend to be not inclined to agricultural activity because of the basic inaccessibility of the technically sound and timely CSA information. This is supported by research on particular countries; a study by Bhatnagar et al. (2024) in India found that few extensions contact and poor access to digital devices restrained the possibility of youth taking up CSA, and a UNDP (2023) report on Latin America found that the lack of strong information systems was a major deterrent to youth involvement.

Sub-Saharan Africa is one of the situations that are being especially severe. A survey in Ethiopia by Tadesse and Ahmed (2023) showed that adequate CSA information provision based on the extension and online sources will result in high youth trust and participation in agriculture. On the other hand, lack of these services was cited as one of the greatest hindrances. On the same note, a study by Chidozie (2019) in Nigeria was able to determine that the lack of the quality extension services and access to digital platforms directly lowers the participation of the youth in the sector. Institutional failure on a larger scale adds to these problems, and, in this regard, according to the African Union (2022), the absence of proper policy frameworks and insufficient investment in extension services contributes to the low uptake of CSA among young people.

According to the literature, there is a critical contradiction in Kenya. According to a study by Njeru (2017), the Kenyan youth indicated they are more willing to practice agriculture in cases when they have access to the internet and extension services. Nonetheless, this potential is not used to the fullest. Later studies by Mugo and Kinyua (2022) identified the low involvement of youth in CSA is specifically due to a lack of information, ineffective extension, low digital, and poor network within the community. This means that there is a lot of disparity between the noted significance of information and how information is actually being delivered. This is also contextualized by a study by Eckert et al. (2019), which revealed that young people in such regions as Bumula sub-county experience these information barriers in addition to climate exposure and technological stagnation (KNBS, 2022).

This body of work creates a critical weakness. Even though the literature has been categorical on the existence of informational barriers, it has been quite silent on their comparative effectiveness and how they interact in a localized set up. Research is inclined to consider the extension services, digital tools, and social networks as one single information issue, not dividing which of the pathways is the most problematic and how they could supplement one another. To a youth group of tech-savvy and resource-constrained individuals, it is crucial to know whether to focus on mobile-based advisories more than on the enhancement of face-to-face extension, or even how peer networks may enhance the intensity of the formal messages.

This gives a clear-cut research gap. Although the usefulness of information is acknowledged, there lacks empirical research evidence to assess the relative strength and interaction of the various channels of communication between two aspects: extension officers, digital media, and social networks on the youth CSA take-up in a rural setting such as Bumula sub-county. The current study fills this gap by not only determining the most important sources of CSA

information among the young people, but also empirically finding out which of the identified paths has the highest statistical relationship with the real-life practice, thus informing the strategies of designing communication interventions.

2.7 Theoretical Framework

The research was based on the Diffusion of Innovations theory (Rogers, 2003), the hypothesis of Motivation discussed by Krishnan (2014) and the Push and Pull hypothesis discussed by Leeson (1979). Although it can be concluded that Skinner and the Push-Pull theory of migration is an essential resource in identifying the background of motivation and movement, this paper is also informed by the Diffusion of Innovations theory (Rogers, 2003). The adoption of CSA practices is a theory that is most suitable in the analysis because it offers a platform of how new ideas and technologies diffuse within a social system as time goes by. It enables one to study the role of the relative advantage, compatibility, complexity, trialability, and observability of CSA practices in the adoption of CSA practices among the youth in Bumula. Moreover, the specifics of the young population directly (as creators, early adopters, and so on) and the sources of information these groups use can be studied through this lens in a more systematic fashion, which will give an even more thorough account of the results concerning information channels.

The theory of motivation by Skinner is that, the learners will perform the tasks depending on the expected rewards. When the reward is perceived to be positive, positive motivation would develop and hence great success, whereas, when the reward is perceived negatively, negative attitudes and low achievements will be achieved. Bandhu et al. (2024) noted that motivation may be categorized as the intrinsic type (internal), which indicates that motivation is because of an internal process. This is considered to be the best form of motivation and has long term

consequences. Intrinsically motivated individuals usually have high performance, require minimal supervision, and more often than not, they achieve success. Conversely, people who are driven by extrinsic motivation engage them in activities due to the anticipation of external rewards or outcomes (Bandhu et al., 2024). The extrinsic motivation is normally not long-term, since the external rewards are withdrawn and hence, the motivation becomes low and people are unable to finish the activity.

Thus, young people should have an internal motivation to make a successful contribution to CSA internationally. According to Hui and Tsang (2012), the adolescents need to have a feeling of competence and social interrelation but at the same time they should be autonomous in their actions and goals. As a result, people will have the self-determination and intrinsic motivation to take part in CSA. This idea is also relevant to this research because self-motivated children in agriculture are the main initiator of the changes, therefore, requiring the stimulus to pursue CSA to promote national economic development.

Independent, self-motivated teenagers have the ability to overcome major challenges in the agricultural industry because of their openness to the new technology and procedures. As such, various measures have to be taken to make agriculture attractive and lucrative among the young people. The migration of the youths is affected by the push and the pull factors that cause the migration of the youths to rural areas into the urban areas (Leeson, 1979). The push factors include the dwindling sources of production such as land availability, finances, markets that can be viable, and labor in the rural areas. The pull factors involve the possibility of better economic opportunities, a good education system, marriage, and better leisure activities. Rempel (1981) pointed out the importance of migration as movement of labor that exists in the surplus places (rural areas) to areas that experience shortages (urban sectors) until

a balance is achieved. Akpan (2010) assumes that migrants will consider various alternatives in the labor market in both the rural and urban sector and choose the alternative that maximizes the expected benefits.

Other researchers argue that economical push factors, such as financial inadequacy, joblessness, the lack of land, and poverty in rural areas, play a crucial role, whereas others believe that economical pull factors, such as the idea of high wages in the city, are more important (Akpan, 2010; Urbański, 2022).

our concept explains why young people have been less involved in Climate-Smart Agriculture (CSA) in Kenya and is relevant to our investigation, since the young people are the largest workforce in the agricultural sector and should be encouraged to be actively involved in CSA (Mugo & Kinyua, 2022).

Unfortunately, young people are becoming less involved in CSA. Therefore, it is important to promote the idea of CSA being a career choice among students, which requires a multi-level intervention of all stakeholders at Sub-County and national levels. There is the urgent need to address the long-held belief that agriculture and the countryside is where people cannot find jobs in other areas (FAO, 2013b). Agriculture should be transformed as a fresh and untapped field of economic activity to attract the young population and reduce their high rates of migration to urban centers (Afere et al., 2019).

2.8 Conceptual Framework

The theoretical framework of this research describes the interconnection between the important aspects of participation among the young people in Climate-Smart Agriculture

(CSA). The model is developed based on three independent variables, including socio-economic factors, institutional factors, and information communication pathways which have a direct impact on the dependent variable, which is youth participation in CSA. Even though it is an independent variable, Farmer group membership is placed as a critical intervening variable and it mediates and improves the effect of the independent variables on the final outcome.

The underlying determinants of the ability of a youth to do CSA are socio-economic factors such as education, income, land access, and gender. All this has direct impact as it determines the amount of resources and opportunities that a person has to participate. The external enabling environment needed to adopt CSA includes institutional factors, which include availability of credit, training and government and non-governmental organization support. At the same time, the effectiveness of the information flow about CSA practices to the youth is predetermined by the presence of the information communication pathways, including the extension services, digital platforms, and social networks.

Farmer group membership is an intervening variable because the relationship between these independent variables and CSA participation is expected to be stronger. The membership in a farmer group is not a causal factor but a medium through which the influence of the rest of the factors is enhanced. As an example, a young person who as a result of his/her socio-economic status (access to land), institutional status (access to credit) is paired with belonging to a group of farmers, which leads to a structured access to collective resources, knowledge, and training in a group. On the same note, a received information on formal channels is more actionable when it is supported by peer learning and collective action, in a group context.

The framework, therefore, hypothesizes that even though the three independent variables directly affect the youth participation in CSA, they do so through the mediating and strengthening effect of farmer group membership. The ultimate outcome youth participation in CSA is consequently the product of the direct influence of socio-economic, institutional, and informational factors as well as the amplifying, promoting effect of farmer group participation, which serves as an ignition engine in the process of adoption..

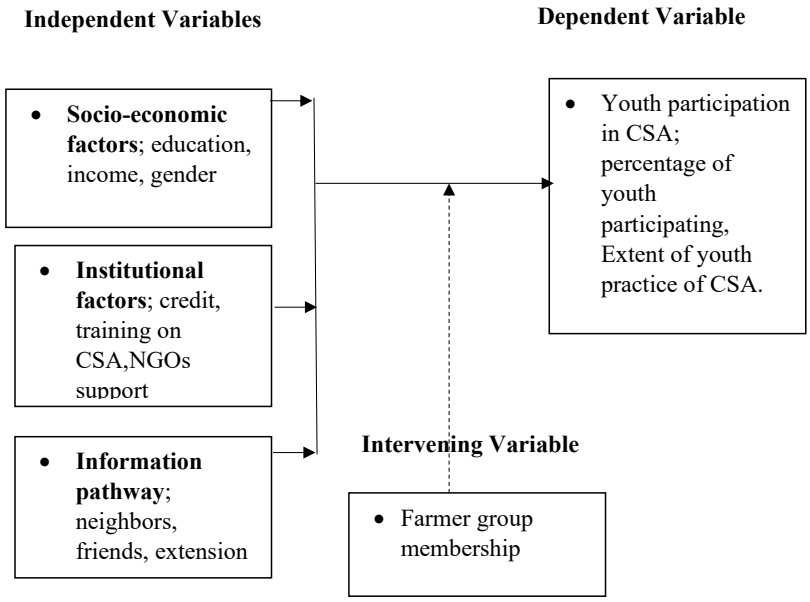

Figure 2:Own Conceptualized framework of the factors affecting youth participation in Climate Smart Agriculture in Bumula Sub-County.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research design, study area, population sampling procedures employed to obtain the required sample size, data collection procedures research instruments, and data analysis procedure.

3.2 Research Design

The research employed a cross-sectional survey approach, facilitating the comparison of literate against illiterate, youth versus aged, and male versus female among other categories, without altering the independent variable of the study population. The responders were permitted to articulate actual phenomena without interference. The practice of Climate Smart Agriculture (CSA) served as the dependent variable, whereas the independent variables encompassed socioeconomic characteristics, institutional factors, and information dissemination channels.

3.3 Location of the Study

The research was done in Bumula sub-county located in Bungoma county. The region occupies 348.2 Km2, and it has seven wards that include Bumula (67.5 km2), Kimaeti (66.5 km2), Siboti (60.1 km2), South Bukusu (48.40 km2), Kabula (41.8 km2), West Bukusu (38.9 km2), and Khasoko (25 km2). Its population is 215,546 (KNBS, 2019) where out of it more than 70 percent are under 18, meaning they do not have formal jobs thus, the high dependency rate (KNBS, 2019).

The elevation of Bumula sub-county is 1600 meters and two types of rainfall are observed; there are heavy rains between March and July and brief rains between September and

November. The annual rainfall varies according to the height with its average being about 1,067.5 mm (640 mm to 1,495 mm) (Eckert, Turner & Yeager, 2019). The lowest temperature is 12c in July and the highest temperature is 30c in March with average temperature of 21c. Subsistence agriculture, which is small scale agricultural and livestock farming, is practiced by approximately 80% of the population. Over half of the population of the sub-county aged below 50 years received formal post-primary education; however, about 70% of them are jobless (County Government of Bungoma, 2021). Moreover, 80 percent of the population is engaged in various subsistence agriculture value chain activities. This sub-county was the target of the research because of its agricultural potential and large number of educated people living in the area.

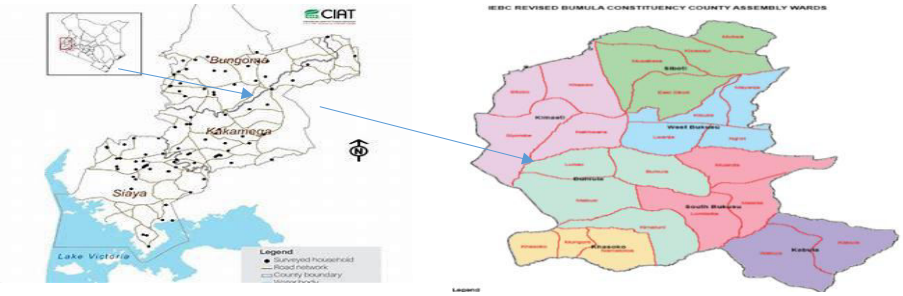

Figure 3: Map of Study Area

3.4 Target Population

The study targeted youths in Bumula sub-county, with 51,641 youths {Siboti (6,602), Kimaeti ward (4,287), West Bukusu (7,420), South Bukusu (8,582), Bumula (11,843), Khasoko (5, 207), and Kabula (7,700)}. Bumula sub-county was considered for this study because of its susceptibility to the effects of climate change and has attracted several interventions to already been foster CSA practices, thus, cushion the climate change shocks (Debates, 2023). The

accessible population consisted of the 10,888 youths found in Siboti (6,602) and Khasoko (4,286) wards, respectively (Debates, 2023).

3.5 Sampling Procedure and Sample Size

Siboti and Khasoko wards were chosen due to their significant population of youth farmers within the Sub-County. Moreover, these wards constitute the principal agricultural settlements in the Sub-county, in contrast to other wards such as Kabula ward, which is characterized by stony soils and minimal agricultural operations (Eckert et al., 2019).
The sample size was determined using the coefficient of variation formula proposed by Nassiuma (2000). Consequently, a 21% coefficient of variation and a standard error of 0.02 were employed to calculate the sample size utilizing the equation proposed by Nassiuma (200).

$$n = \frac{NC^2}{C^2 + (N-1)^2}$$

Where n= sample
N=population
C= Coefficient of variation
e= standard error

$$n = \frac{10889 \times (21\%)^2}{(21\%)^2 + (10889-1)0.02^2}$$

$$n = 109$$

The choice of these parameters was facilitated by the fact that they have a smaller coefficient of variation and standard error in order to reduce variability and error in the sample. Moreover, the coefficient of variation is set to a maximum of over 30 percent, which is

unnecessary and low coefficient leads to a poor sample size that cannot be used in a survey research. The researcher used the formula of 10 in 109 to get the sample size of 120 as he included 10 in the sample to cover non-responses and attrition as well as to allow a representative sample. The wards and sub-county extension offices helped in making up list of all youth farmers in the research area. The numb of respondents of the purposely sampled wards was determined using proportionate random sampling (Table 1) and the actual respondents were selected using simple random sampling.

Table 1:Proportion of Sample Size Per Ward

Ward	**Number of Farmers**	**Proportion**	**Sample size**
Siboti	6,602	60.63	73
Khasoko	4,286	39.37	47
Total	**10,888**	**100**	**120**

3.6 Data collection Instruments

A semi-structured, researcher-administered questionnaire was used to collect the primary data which was sent to the sampled youth in Siboti and Khasoko wards. The questionnaire was easy to administer and it was easy to score and analyze the data in a realistic manner. In addition, there is also a consistency in the responses to the items in the questionnaire among the respondents (Barnum, 2011). The study goals were used to form questions in the questionnaires. Part A of the questionnaire received the information about socioeconomic problems, but Part B concerned the institution. In section C and D, the channels of information dissemination were described and the implementation of CSA was described, respectively.

3.6.1 Validity

Questionnaire validity means its ability to measure the desired construct correctly (Bolarinwa, 2015). Before data collection, the instrument was submitted to the professionals in School of Agricultural Veterinary Science and Technology to determine whether it was valid or not. The feedback of the experts was used to improve the tool.

3.6.2 Reliability

Reliability determines the consistency of the instrument (Edmonds and Kennedy, 2017). The reliability of the questionnaire was determined by conducting a pilot study of 30 youths in the Bumula Ward, Bumula sub county, Bungoma County. As such, the pilot study selected youths in Bumula who had the same socioeconomic characteristics as the target demographic. Bumula was chosen because it is susceptible to climate change and its young people have been engaged in agriculture. The Cronbach Alpha Scale was used to calculate the reliability coefficient, which is 0.805 (Adamson and Prion, 2013). The reliability coefficient of the questionnaire was considered to be greater than 0.70 and, therefore, it was considered as reliable. The instrument questions were also changed according to the results of the pilot study..

3.7 Data Collection Procedure

A clearance letter was acquired from the Director of Postgraduate Studies at Masinde Muliro University of Science and Technology, which was utilized to apply for a research permission from the National Commission for Science, Technology, and Innovation (NACOSTI). The research permit was subsequently submitted to the authorities, permitting data collection from Bumula sub-county. A sample was extracted from the cohort of youths according to the previously outlined procedure. Subsequently, visits to the selected adolescents were

coordinated with the aid of the agricultural extension officers from Bumula sub-county. The researcher personally administered the questions. The respondents responded to the questionnaires and the researcher collected them and left for anaylsis.

3.8 Data Analyses

The data were systematically organized and coded with regard to the independent and dependent variables, and subsequently entered into IBM's Statistical Package for Social Sciences (SPSS) version 26. Cramer's V was employed to evaluate and analyze the impact of information transmission channels on the practice of CSA, as well as the disparities in their utilization between male and female teens. Binary logistic regression was employed to determine the influence of socioeconomic and institutional factors on CSA practice. The significance of all hypotheses was assessed at the 5% level. Refer to Table 2

The logistic regression model for socioeconomic factors indicated was:

$y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$

Where;

y = individual factors as shown below:

In model 1: farmer characteristics (y_1)

Dependent Variable:

y_1 = Adoption of Climate-Smart Agriculture (CSA) practices

Independent Variables:

X_1 = Gender of the farmer (binary: e.g., 1 = Male, 0 = Female)

X_2 Education level of the farmer (ordinal: e.g., primary, secondary)

X_3 = Off-farm income (continuous: e.g., annual income in Ksh);

ε= error term

In model 2: institutional factors (y_2)

Dependent Variable:

y_2 = Adoption of Climate-Smart Agriculture (CSA) practices

Independent Variables:

X_1 = Access to credit (binary: e.g., 1 = Yes, 0 = No)

X_2 = Access to training on CSA (binary or ordinal: e.g., number of trainings attended)

X_3 = NGO support (binary or continuous: e.g., extent of support received)

X_4 = Membership in farmer groups (binary: e.g., 1 = Member, 0 = Non-member)

Table 2:Summary of Data Analysis

Hypotheses	**Independent variable**	**Dependent variable**	**Analysis method**
H1 Socio-economic factors have no statistically significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county	Socioeconomic factors	Practice of CSA	Percentages, frequencies, Binary logistic regression
H02: Institutional factors have no statistically significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county	Institutional factors	Practice of CSA	Percentages, frequencies, Binary logistic regression

H03:Information communication pathways have not statistically significant effect on youth participation in Climate Smart Agriculture in Bumula sub-county.	Information dissemination pathways	Practice of CSA	Percentages, frequencies, and Cramer's V

3.9 Limitation of the Study

One limitation was that some farmers may have already been receiving CSA interventions from local development organizations, thereby contaminating their responses. To offset this, farmers were randomly chosen and informed clearly that the study was independent of any current interventions.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion of data examined to answer the research aims and hypotheses outlined in Chapter One. The results in the analysis are that there were a number of significant findings: first, a wide gender divide was found, with young females having significantly lower odds of being involved in CSA than their male peers. Second, economic ability, as measured by annual farm income and access to credit, was found to be a significant driver for adoption. Third, while institutional support through training and farmer groups was omnipresent, its influence was less potent than short-term financial factors. Finally, channels of information flow, particularly extension agents, were strongly associated with CSA practice. The chapter discusses these results in detail, examining the role of socioeconomic determinants, institutional determinants, and the pivotal role of channels of information communication towards Climate-Smart Agriculture adoption by the youth of Bumula sub-county, Kenya.

4.2 Socioeconomic Factors of the Youths in Bumula Sub-County

In Bumula sub-county, 60% of the respondents were males, and 40% were females (Table 3). Education level was diverse, with 50.8% having primary, 33.3% secondary, 8.3% post-secondary, 2.5% university education, and who 5% never attended school. The annual farm income shows that 30.8% of the youth earn <10,000 KES, 37.5% earn 10,001–25,000 KES, 15% earn 25,001–35,000 KES, and 16.7% earn over KES 35,000. Further, 23.3% earn <

10,000 KES off-farm income, 34.2% earn 10,001–25,000 KES, 17.5% earn 25,001–35,000 KES, and 25% earning >35,000 KES.

Table 3:Selected youth's Socioeconomic factors

Socioeconomic factor	**F**	**%**
Gender of the respondent		
Male	**72**	**60**
Female	48	40
Education level		
Did not go to school	6	5
Primary	**61**	**50.8**
Secondary	40	33.3
Post-secondary	10	8.3
University	3	2.5
Annual farm income		
< KES 10,000	37	30.8
KES 10,001- KES 25,000	**45**	**37.5**
KES 25,001- KES 35,000	18	15
> KES 35,000	20	16.7
Annual off-farm income		
< KES 10,000	28	23.3
KES 10,001- KES 25,000	**41**	**34.2**
KES 25,001- KES 35,000	21	17.5
> KES 35,000	30	25

KES – Kenyan Shillings

Table 3 reveals that male youths have greater access to and control over the productive resources such as land, which may be a prerequisite for adopting some of the CSA practices

such as agroforestry. Kiptot & Franzel, (2012), noted that CSA adoption is heavily reliant on land tenure and access. However, the high percentage of males does not necessarily translate to more CSA adoption, as cultural and social norms can also come into play in participation. For instance, Lunduka et al., (2019) showed that women, despite having limited access to resources, are central in adopting CSA practices since they are directly engaged in farm activities. Recently, Nelson & Forsythe, (2023), emphasized the importance of gender-sensitive approaches in CSA interventions, citing that empowering woman through access to resources and decision-making is significant role in CSA adoption. Besides, the educational levels of the respondents also provide informative results.

Despite the fact that the aspect of education has been identified as enhancing levels of awareness and embracing of new technologies, low educational standards among the surveyed individuals can inhibit their comprehension of and adopting of CSA practices.. Amadu et al., (2020), clamoured that educated farmers had higher chances of engaging in off-farm ventures, which, most likely restrict their role in agriculture. Mnukwa et al., (2025), however, suggested that farmer literacy levels can assist them find and utilize the available information, thereby simplifying the process of adopting CSA. This disparity requires targeted extension services, which unravel technical knowledge and make it easy to understand among farmers of different educational backgrounds. An example is that Berhane et al., (2018), demonstrated how online extension services reduce the knowledge gap between farmers with different education levels, which implies that such a strategy would be effective in Bumula sub-county. Off-farm income and on-farm income are important factors in the CSA adoption. The survey report revealed that 30.8 percent of the interviewees had a

farming income of less than 10,000 KES, and 37.5 percent earned between 10,0001 and 25,000 KES.

In the same way, 23.3 percent received less than KES 10,000 as off-farm income with 34.2 percent having KES 10,001-25,000 income. This low income level might discourage practices of CSA in form of terracing, irrigation and control of drainage that are very capital intensive. Debie, (2021), Added that farmers had frequently given a long list of costs as holding back soil conservation activities like terracing. On the same note, farmers with more capital find it easier to embrace CSA practice because they can afford to employ labour and purchase the required irrigation equipments in this practice. Access to credit in facilitating smallholder farmers to invest in CSA practices would therefore imply that financial interventions would increase CSA adoption among poor farmers. However, there is little clarity with regard to income and adoption of CSA. Ndung'u et al., (2023), demonstrated that less capital-constrained CSA practice agroforestry would present greater prospects of adoption by poor farmers. Thus, the characteristics of CSA practice and the costs of this practice are the key factors that are critical determinants of the level of adoption.

Conversely, low cost measures such as agroforestry and mulching can be affordable to the poor farmers than high cost measures such as irrigation or terracing. In this way, recent literature has argued that there is a need to invest in low-cost CSA practices that are within the reach of impoverished farmers, especially those in sub-Saharan Africa (Ndungu et al., 2023). Generally, the nature of the socioeconomic determinants of youth engaging in CSA is multilateral.

Education, gender and income level are some of the factors that affect the intake of the CSA depending on what form of the practice the CSA is participating in. These challenges should be addressed through targeted interventions, including making land and credit more widely available to youth, streamlining technical information facing farmers who do not have higher education levels, and encouraging low-cost CSA practices that can be accessed by the families who are poor. By overcoming these obstacles, development professionals and policymakers can boost the participation of youth in CSA, therefore improving climate resilience and agriculture output in Bumula sub-county

4.2.1 Effect of Socioeconomic Factors on CSA Practice

Test of Hypothesis HO1

Socioeconomic factors significantly influenced CSA practice among youths ($\chi^2 = 17.966$, df = 5, p = 0.003), as confirmed by the omnibus tests for the step, block, and model (Table 4).

Table 4:Omnibus tests of model coefficients for socioeconomic factors

		Chi-square	df	P-value
Step 1	Step	17.966	5	0.003
	Block	17.966	5	0.003
	Model	17.966	5	0.003

This result demonstrates that the socioeconomic determinants impact the implementation of CSA practice, thereby the null hypothesis is rejected. Recent studies have indicated that socioeconomic determinants are key drivers of the adoption of agricultural technologies, such as improved crop varieties. These determinants, including income levels, resource access, education, and social networks, influence farmers' ability and willingness to adopt innovative

practices that improve productivity and resilience. In addition, socioeconomic determinants explain a significant percentage of the variance in CSA adoption.

Further, the Hosmer and Lemeshow test for the binary logistic regression model (BLRM) of socioeconomic variables generated a 4.471 chi-square using 8 degrees of freedom with a 0.812p-value, a good fit for the model explaining the differences in youths' decisions to participate in CSA (Table 5). Therefore, there is insufficient evidence to claim that the model does not fit the data adequately and the BLRM of socioeconomic factors explain the unseen traits across youths' resolutions to practice CSA.

Table 5:Hosmer and Lemeshow test for the BLRM of socioeconomic factors

Step	*Chi*-square	df	P-value
1	4.471	8	.812

The binary logistic regression of socioeconomic factors (Table 6) indicates that gender (B = -1.257, p = 0.010, Exp(B) = 0.284) and annual farm income (B = 0.924, p = 0.004, Exp(B) = 2.520) are significant determinants of youths' preference, while level of education (B = -0.226, p = 0.476) and annual off-farm income (B = -0.021, p = 0.936) have no significant impact, with the model constant term at B = 1.076 (p = 0.334).

Table 6:Socioeconomic variables in the binary logistic regression equation

Socioeconomic variables		B	S.E.	Wald	df	P-value	Exp(B)
Step 1[a]	Gender of the respondent	-1.257	0.486	6.701	1	0.010	0.284
	Education level	-0.226	0.318	0.507	1	0.476	0.797
	Annual farm income	0.924	0.319	8.402	1	0.004	2.520

Annual off-farm income	-0.021	0.256	0.007	1	0.936	0.980
Constant	1.076	1.114	0.933	1	0.334	2.932

a. Variable(s) entered on step 1:Gender of the respondent, Education level, annual farm income, Annual off-farm income.

The findings in Table 11 show that within the hypothesized explanatory socioeconomic variables contained in the model, only two (gender and annual farm income) have a significantly negative relationship with the practice of CSA.

Gender

The negative coefficient of gender (B = -1.257, p = 0.010) was large, and odds ratio of 0.284 (Table 6). This shows that the odds of female youth taking up CSA practices were reduced 71.6 percent relative to male youth holding other factors constant. The result disputes the dominant discourse of women being more probable to move in the direction of a sustainable practice and indicates that women youth in Bumula experience considerable gender obstacles to CSA involvement. Such obstacles may encompass limited land access, access to capital, and decision-making authority, or a higher limitation on work and movement (Doss, 2018).

This result aligns with recent research which highlights the active involvement of women farmers in adopting climate adaptation strategies. For instance, Shahbaz et al., (2022), argue that women's widespread involvement in agriculture gives them more knowledge and experience in managing farm practices, thereby making it more likely for them to adopt CSA. Besides, the gendered division of labor in the majority of African societies places women at the forefront of agricultural activities, hence subjecting them to be more sensitive to climate-

related challenges. This increased exposure can explain their greater willingness of women to adopt adaptive measures such as CSA.

Secondly, men are more doubtful when it comes to the inventory and impacts of a climate change. As indicated by (Hailemariam et al., 2024; Vazquez et al., 2021), revealed that men would have lower rates of believing in the effects of climate change, thus, they are less inclined to take up CSA practices. The gender disparity in CSA adoption hence may be attributed to such cynicism in addition to the cultural beliefs which tend to encourage male participation in off-farm economic activity.

Other studies however revealed the fact that male farmers had a higher chance of adopting adaptation measures and agricultural technologies. In another illustration, (Awoke et al., 2025; Kassie et al., 2015), indicated that male farmers were likely to adopt adaptation activities as a result of having numerous assets such as land, labor, and financial capital. Institutional constraints impose a general limitation on women to practice farm activities that are labor intensive or embrace the new technology. Such constraints comprise their cultural norms to stick to the house and household activities, the inability to access credit and other forms of finance, and lack of leeway over farm resources (Doss, 2018).

These two-sided reports points to the influence of context in determining gender dynamics for CSA adoption. While the current study highlights the proactive inclination of female youths to adopt CSA, it is equally crucial to recognize that gender-differentiated differences in access to resources, social norms, and climate change information could influence the adoption patterns. Hence, policymakers and stakeholders need an integrated approach that account for

the unique challenges facing men and women in different contexts of agriculture to promote CSA uptake.

Education of the Youths

The level of education was not a statistically significant predictor of CSA practice ($p = 0.476$). This non-significant finding suggests that in the context of Bumula, formal education may not be a primary driver of CSA adoption for youth. The potential for education to facilitate adoption may be offset by other factors, such as the pursuit of off-farm employment opportunities by more educated youth, rendering them less reliant on agricultural innovation for their livelihoods.

This finding aligns to the Deressa et al., (2009), work, which confirmed a negative relationship between education and utilization of climate adaptation strategies by farmers in sub-Saharan Africa. More educated individuals have alternative sources of income and are less reliant on agriculture, hence their motivation to adopt adaptive farming practices is reduced. Similarly, educated individuals in rural Kenya were more likely to pursue non-agricultural livelihoods, explaining the explanation their lower adoption of CSA (Sato et al., 2025) .

In other studies, farmers with no or less educated were unaware of how to adapt to climate change measures and were not keen on adjusting farming practices (Tambo & Wünscher, 2017; Mwungu et al., 2020). Therefore, education possibly raises farmers' ability to access, comprehend, and apply information about new technologies and practices, including CSA.

In contrast, Aryal et al., (2018), showed a positive and significant relationship between educational level and adoption of CSA and other climate adaptation strategies because educated individuals can more effectively understand, access, analyze and utilize advanced

agricultural technologies about climate change and its implications. For example Aryal et al. (2020), stated that Nepalese educated farmers are more likely to adopt CSA activities because of better awareness on climate risks and easier access to extension services.

These differences in outcomes across studies underscores the contextuality of the relationship between education and CSA adoption. Education may increase information and knowledge access, but its impact on CSA adoption can vary under different conditions like livelihood opportunities, culture, and access to agricultural extension services. Educated young people who have access to non-farm income sources may not be motivated by CSA. However, education may be more powerful in the uptake of CSA where agriculture is the primary livelihood activity.

These results are significant for policymakers and those with an interested in encouraging CSA among young people. Specifically, interventions targeted at attracting educationally motivated young people into agriculture need to highlight the economic and environmental attractiveness of CSA.

Annual farm income of the Youths

Annual farm income and CSA adoption have a significantly positive relationship (Wald χ^2 = 8.402, df = 1, $p < 0.05$) (Table 6). Specifically, every unit increase in annual farm income increases the odds of adopting CSA by 2.52 compared to adoption under lower annual farm income. Therefore, higher farm earnings provide farmers with the financial resources to invest in CSA practices like the purchase of improved seeds, fertilizers, herbicides, and labor. All these are the inputs that farmers require in applying CSA practices like planting improved varieties of crops, conservation of the soil, and crop diversification.

Previous research also highlights the cost of financial capital that farmers need to have in order to implement and maintain CSA practices. As an example, Aryal et al., (2020), established that adopting the practice of CSA demands a fortune. Growing high yielding varieties of crop or practicing soil conservation requires additional finance to acquire the inputs required and pay labourers. On the same note, well-off farmers will tend to dedicate more of their finances in the agrochemicals, plant more and use of better seeds; the lifelines of CSA (Mwungu et al., 2020; Makate et al., 2016). Tambo & Wunscher, (2017), demonstrated that when farm income is high, there is high likelihood of implementing adaptation measures to climate change like changing the date of planting, crop diversification and conservation farming methods. Therefore, economic stability provides an opportunity to farmers to experiment and implement new steps, which ameliorate the effects of climate change.

Mthethwa et al., (2022), on the contrary, demonstrated that farmers with higher farm incomes were less likely to uptake some of the CSA practices like planting enhanced maize varieties because higher-income farmers may diversify their revenue stream to non-farm enterprises or other farm enterprises that are not compatible with CSA. This contrast indicates the context-specificity of the relationship between CSA adoption and farm income. While increased income on average permits increased CSA adoption, the specific practices that are adopted may vary depending on local circumstances, market demand, and risk preferences of farmers.

The positive relationship between farm revenue and CSA adoption carries profound implications for policymakers and stakeholders, suggesting that institutions of offering economic support, such as subsidies, credit facilities, and grants, could be a driving force for CSA adoption, particularly among low-income farmers. Removing the economic constraint

of CSA could unlock the potential for more farmers to adopt resilience-inducing climate change and productivity-boosting agricultural practices.

4.3 Status of Institutional Factors on Youth Involvement in CSA

The data on institutional factors (Table 7) revealed that 58.3% of youths lacked access to credit, while 41.7% had access, primarily through SACCOs (70%). Among those who accessed credit, 42% received KES 10,001–25,000 annually. Regarding CSA training, 67.5% had no training, while 33.3% attended their first training in the last season. Most training was provided by the Ministry of Agriculture (60%), and 77.5% lacked NGO support, though 60% of those who received support benefited from extension services. Additionally, 59.1% were not part of farmers' groups, but 84.1% of members received support, mainly for accessing extension services (74%).

Table 7:Youths' status on institutional factors

Institutional factors	**F**	**%**
Access to credit		
No	**70**	58.3
Yes	50	41.7
Sources of credit		
SACCOs	**35**	70
Private money lenders	4	8
Relatives and friends	6	12
Banks	5	10
Amount of credit accessed annually		
<KES 10,000	14	28
KES 10,001- KES 25,000	**21**	42
KES 25,001- KES 35,000	6	12

>KES 35,000	9	18
Trained on CSA		
No	**80**	67
Yes	40	33
Time when first training on CSA was attended		
Last season	**23**	57.5
One year ago	12	30
Two years ago	5	12.5
Three years ago and above	00	00
Number of trainings on CSA attended		
One	14	35
Two	12	30
Three	8	20
Four and above	6	15
Source of training on CSA		
Ministry of Agriculture	**24**	60
Private companies	5	12.5
NGOs	11	27.5
Universities	0	0
Access to NGO support on CSA		
No	**105**	87.5
Yes	15	12.5
Kind of support received from NGOs on CSA		
Extension services	9	60
Credit	4	26.7
Inputs	2	13.3
Farmers' group membership		
No	**71**	59
Yes	49	41
Receive support from farmers' group on CSA		

No	8	16
Yes	**41**	84
Kind of support received from farmers' group on CSA		
Eases access to extension services	**36**	74
Eases access to credit	5	10
Eases access to inputs	8	16

The relatively small percentage of youths who had access to credit, mostly in small quantities from local sources, suggests that youths in Bumula sub-county face gigantic challenges in accessing the financial inputs required to adopt CSA effectively. Most of the CSA practices require high financial investment, and limited access to credit may impede youths from adopting these practices. (Aryal et al., 2020; Mwungu et al., 2020) reported the importance of access to credit in facilitating the adoption of CSA and other climate adaptation strategies. Besides, (Ogunleke & Idowu, 2025; Waaswa et al., 2024) articulated that access to CSA information is typically contingent on access to finance, which additionally limits the potential of youths lacking credit access in implementing appropriate adaptive strategies.

The low rate of CSA-trained youths could provide a possible explanation as to why CSA practices are low in Bumula Sub-County. Training is of essence in sensitizing the young generation to institutions capable of facilitating agricultural growth in terms of provision of inputs and credit to enable effective implementation of CSA. (Geza et al., 2021). For example, in training workshops, input dealers are typically invited to provide farmers with access to quality inputs. Training also provides youths with information on weather forecasting, which can motivate them to employ adaptation strategies like CSA (Danso-Abbeam et al., 2018; Geza et al., 2021).

Some youths who have been trained over three times report that most of them lack the knowledge required to apply CSA effectively as required several trainings to comprehend and embrace new practices entirely. Danso-Abbeam et al., (2018), determined that the frequency of training significantly influences the adoption of improved maize varieties by farmers. Most such trainings are done by the Ministry of Agriculture and NGOs, indicating that these institutions are key sources of CSA knowledge dissemination. The Ministry of Agriculture alone may have direct linkage with research organizations that come up with agricultural innovations, making it simple to pass on the new practices to farmers (Makate et al., 2016).

This relatively low NGO support percentage can constrain the youth to a certain extent to be exposed to exogenous knowledge and resources required to adopt CSA. Generally, NGOs can play an elementary part in the implementation of recent perseverance processes, organization of information, and farmer-farmer learning (Yakubu et al., 2019). Most of the young people exposed to extension services like the NGO services have enhanced adoption rates on CSA. Conversely, the absence of NGO support may also encourage the youths to look forward to alternative solutions on their own which may turn out to spur innovation as well as self-reliance. As Dube, (2025), observed, overdependence on the NGO assistance might breed dependency and diminish the drive of the farmers to act at their own pace in regard to climate change.

There is also a possibility of low proportion of youths in organizations of farmers as a hindrance to adoption of CSA interventions that necessitate community efforts, including agroforestry. The pooling of resources, joint input procurement and collective learning can be collectively implemented with the aid of farmer groups to ease the adoption of CSA

practices by the members. Khatri-Chhetri et al., (2017), established that farmer group membership (FGM) enhances access to information and collective action in CSA adoption. For example, the success of the Lower Nyando soil and water conservation project resulted from the active participation of farmers' groups (Swallow et al., 2002). However, (Meijer et al., 2015; Ndiritu et al., 2014) cautioned that strong ties between farmers group members sometimes causes resistance in adopting new practices as members prefer to maintain traditional methods.

4.3.1 Effect of Institutional Factors on Youth's Participation in CS

The binary logistic regression results for institutional variables (Table 8) showed that access to credit significantly predicts CSA practice (B = 1.072, p = 0.033, Exp(B) = 2.922). However, training on CSA (B = 0.777, p = 0.203), NGO support (B = -0.768, p = 0.353), and farmers' group membership (B = 0.406, p = 0.413) were not statistically significant predictors, with the model's constant term at B = 0.423 (p = 0.160). Only access to credit had a significant relationship with the practice of CSA.

Table 8:Institutional variables in the binary logistic regression equation

Institutional variables		B	S.E.	Wald	df	P-value	Exp (B)
Step 1[a]	Access to credit	1.072	0.504	4.524	1	0.033	2.922
	Trained on CSA	0.777	0.611	1.619	1	0.203	2.176
	Received NGO support on CSA	-0.768	0.827	0.863	1	0.353	0.464
	Farmers' group membership	0.406	0.496	0.670	1	0.413	1.501
	Constant	0.423	0.301	1.970	1	0.160	1.526

a. Variable(s) entered on step 1: Access to credit, trained on CSA, Received NGO support on CSA, Farmers' group membership.

Access to Training

The non-significant result for training (B = 0.777, p = 0.203) is particularly noteworthy. While training had a positive coefficient, indicating a trend towards increasing the odds of CSA adoption by a factor of 2.176, this relationship was not statistically significant. This suggests that in the context of Bumula sub-county, merely providing training is an insufficient intervention if it does not concurrently address the primary barrier of financial capital. Farmers may acquire the knowledge but lack the requisite funds to purchase inputs, hire labor, or invest in the infrastructure necessary to implement learned CSA practices (Mwungu et al., 2020). This finding aligns with research from Ethiopia, where knowledge of climate adaptation strategies did not translate into adoption without access to complementary resources like credit and land (Tadesse & Ahmed, 2023). Conversely, the result contrasts with studies such as that by Geza et al. (2021), which found training to be a critical driver of CSA adoption, highlighting that the effectiveness of training is likely contingent on its integration with broader financial and resource support mechanisms.

NGO Support

NGO support was not a significant predictor of CSA practice (B = -0.768, p = 0.353), with an odds ratio of 0.464 indicating that recipients of NGO support were less likely to adopt CSA, though not significantly so. This counterintuitive result could be attributed to several factors. The support provided by NGOs may be fragmented, short-term, or misaligned with the specific, immediate needs of youth farmers, such as direct financial aid or access to markets (Dube, 2025). Furthermore, the small proportion (12.5%) of youths who received NGO support suggests that its reach was too limited to manifest a statistically detectable effect in the model. This finding challenges the common assumption that NGO interventions are

inherently enabling and is consistent with critiques that such support can sometimes create dependency or fail to address root causes of non-adoption (Yakubu et al., 2019). However, it diverges from positive outcomes reported elsewhere, for instance, in Ghana, where NGO-led programs were pivotal in facilitating technology adoption (Tambo & Wünscher, 2017), underscoring the variability in NGO effectiveness based on implementation strategy and local context.

Group Membership

Membership in a farmer group was not a statistically significant predictor of CSA adoption ($B = 0.406$, $p = 0.413$). Although the positive coefficient suggests that group members had 1.501 times higher odds of practicing CSA, this effect was not strong enough to be significant. This non-significance may indicate that the existing farmer groups in Bumula are not fully functional in fulfilling their potential roles, such as effectively pooling resources, facilitating bulk input purchases, or serving as robust platforms for experiential learning and collective action (Meijer et al., 2015). It is possible that membership is nominal rather than active, or that groups lack the specific focus and capacity to support the unique demands of CSA practices. This result contrasts with studies like that of Khatri-Chhetri et al. (2017), which found group membership to be a key factor in CSA adoption by enhancing access to information and resources. The finding suggests that for farmer groups to become significant enablers for youth, their capacities may need to be strengthened to provide more tangible and targeted support.

4.4 Information Communication Pathways for Climate-Smart Agriculture

The analysis of information sources in Table 9 reveals distinct and purposeful patterns in how youth in Bumula sub-county access knowledge on different Climate-Smart Agriculture (CSA) practices, moving beyond a monolithic view of information dissemination.

Table 9:Frequencies of CSA use arising from different information communication pathways

Information of CSA practices	**Extension officer**		**Media**		**Neighbors and friends**	
	F	**%**	**F**	**%**	**F**	**%**
Composting	37	36.3	28	27.5	37	36.3
Rainwater harvesting and storage	30	25.6	42	35.9	45	38.5
Crop rotation	**53**	46.9	27	23.9	33	29.2
Mulching	43	41.3	25	24.0	36	34.6
Drainage	**50**	47.6	22	21.0	33	31.4
Irrigation	30	31.6	26	27.4	39	41.1
Furrow/ ridge planting	41	42.7	29	30.2	26	27.1
Minimum tillage	41	41.4	27	27.3	31	31.3
Improved crop varieties	37	38.1	40	41.2	20	20.6
Agroforestry	**51**	47.7	25	23.4	31	29.0
Terracing	46	43.8	30	28.6	29	27.6
Intercropping	41	36.0	24	21.0	49	43.0
Inorganic fertilizers	**50**	43.9	38	33.3	26	22.8

F – Frequency; % - Percent; N/F – Neighbours and friends; Ext Off – Extension officers

A clear delineation emerges based on the technical complexity and observability of the practices. Extension officers were the dominant information source for knowledge-intensive and permanent land management techniques. Practices such as agroforestry (47.7%), drainage (47.6%), and crop rotation (46.9%) relied most heavily on formal extension. This aligns with

the findings of Anderson and Feder (2007), who noted that farmers depend on extension agents for technically complex practices that require expert guidance for correct implementation. The high reliance on extension for these practices in Bumula suggests they are perceived as demanding specialized knowledge that is less easily transmitted through informal channels.

Conversely, informal social networks, including neighbors and friends, were the primary pathway for practices that are highly visible, easily replicable, or managed communally. This was most evident for intercropping (43.0%), irrigation (41.1%), and rainwater harvesting (38.5%). This pattern strongly supports social learning theory (Bandura, 1977), where individuals adopt behaviors observed and validated within their immediate social circles. The prominence of peer-to-peer learning for these practices, also observed in rural Kenya by Conley and Udry (2010), underscores their low perceived risk and the critical role of community-based demonstration in their adoption, particularly for techniques like rainwater harvesting which may involve shared resource management.

Mass media (radio, television) played a significant but specific role, acting as a key conduit for information on market-linked inputs. Media was the leading source of information for improved crop varieties (41.2%) and a major source for inorganic fertilizers (33.3%). This finding corroborates research by Ogada et al. (2014), which found that mass media is highly effective for disseminating information about commercial inputs like seeds and fertilizers, which are often promoted through advertisements and sponsored programs. However, media's lower influence on complex land management practices like terracing (28.6%) and minimum tillage (27.3%) highlights its limitation in delivering the hands-on, experiential learning these methods require, a constraint noted by Van Campenhout et al. (2021).

These findings present a nuanced picture that both confirms and challenges broader narratives. The robust role of extension in Bumula contrasts with studies from regions like Northern Ghana, where extension services were found to be ineffective due to logistical constraints and high farmer-to-agent ratios (Danso-Abbeam et al., 2018). This discrepancy suggests that Bumula may benefit from a relatively more functional extension infrastructure or targeted youth programs. Furthermore, the practice-specific effectiveness of media underscores the "digital divide" in agricultural extension (Aker, 2011); while digital and broadcast media are powerful for simple messages, they cannot replace demonstration for complex techniques. Ultimately, the data argue against a one-size-fits-all communication strategy and instead advocate for a segmented approach that matches the communication channel to the inherent characteristics of the CSA practice being promoted.

4.4.1 Climate Smart Agriculture Practice Rates

Bumula sub-county registered different adoption rates of several CSA practices; from 31.7% for irrigation to a 95% for of inorganic fertilizer application (Figure 4). This knowledge is critical in noting which CSA practices are easiest to adopt among youth farmers and which are limited by adoption barriers. The high adoption rates of certain practices suggest successful knowledge transfer and perceived usefulness, whereas low ones could be due to technical, economic, or social constraints requiring targeted interventions.

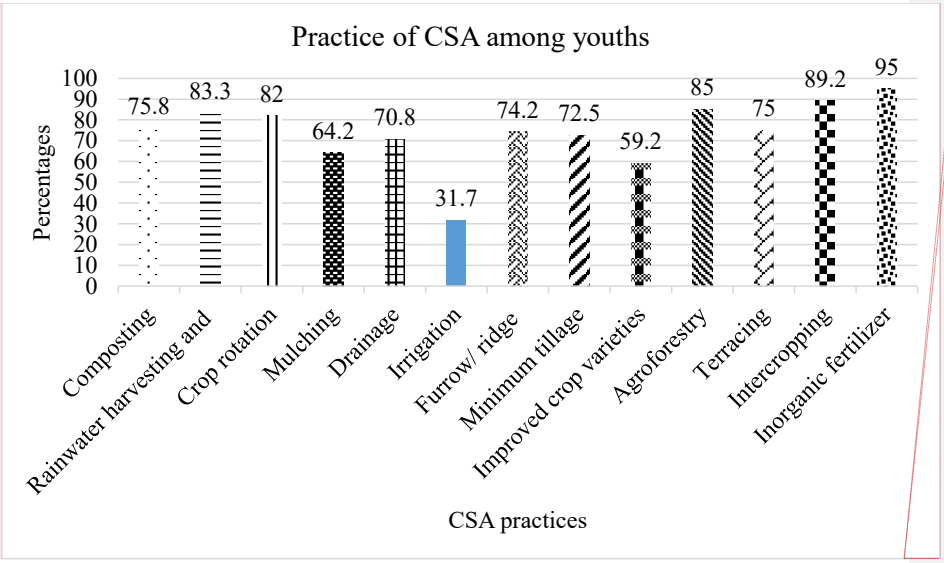

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Figure 4: CSA practice rates among youths

The very high adoption rate of inorganic fertilizers (95%) is consistent with research by Duflo et al., (2008), which established that smallholder farmers in Kenya prefer chemical fertilizers because they have an immediate visible effect on crop production. However, excessive use of inorganic inputs, is contrary to the tenets of sustainable agriculture and a major hazard for long-term soil health. This result may be due to extensive promotion by fertilizer companies or government subsidies (Vanlauwe et al., 2014). The extensive coverage means that economic incentives or resource availability limit farmers' choices more than the environment.

Intercropping (89.2%) and agroforestry (85%) also recorded very high adoption rates, attributable to their simplicity of integration into the conventional farming systems of the region. FAO, (2013), revealed that CSA practices that tap into existing indigenous knowledge are likely to have faster uptake. The high rate of adoption of intercropping in specific is also

congruent with the Kerr et al., (2007), study in Malawi, where farmers valued the practice for its risk-spreading benefit in the face of unpredictable climatic conditions. The successful adoption of such practices shows that the youth in Bumula realize the significance of diversification as a climate adaptation strategy.

Practices like rainwater harvesting (83.3%), crop rotation (82%), and terracing (75%) showed strong but limited spatial adoption, a postitve trend considering that both are more knowledge- and infrastructure-demanding strategies. The rate of adoption for rainwater harvesting is greater than that reported for other similar semi-arid regions (Kelemewerk Mekuria et al., 2020; Lutta et al., 2020), possibly indicating the effectiveness of the demonstration projects or extremely severe water scarcity in Bumula. The extensive uptake of crop rotation contradicts earlier concerns that crop rotation fail in the face of market requirements for monoculture (Kassie et al., 2015), suggesting perhaps changed attitudes or effective extension messages in the sample region.

The relatively low uptake of irrigation (31.7%) is unexpected despite rainwater harvesting having extensive adoption. This disparity can be accounted for by the higher capital expenses of irrigation systems compared to simple water storage mechanisms You et al., (2011), or perhaps farmers believe there is sufficient rainfall for most crops and reserve irrigation for high-value horticulture. The low uptake of improved crop varieties (59.2%) highlights the poor-quality seed access or skepticism regarding their performance in seed system research conducted in East Africa (Haug et al., 2023).

The adoption trends in Bumula both confirm the extensive adoption of inorganic fertilizers in developing countries but contradicts the growing global emphasis on organic alternatives

(Pingali, 2012). The extremely high uptake of agroforestry and intercropping exceeds the levels reported in similar studies (e.g., 60-70% in Western Kenya, (Ndung'u et al., 2023), suggesting that certain environmental or social conditions favor these practices in Bumula.

Structural practices like terracing (75%) had similar uptake to those in Ethiopia (40-50%) (Amsalu & de Graaff, 2007), possibly because of more effective extension services or more effective community organization in Bumula. The irrigation adoption rate (50-60%) is similarly to other agro-ecological zones Mume et al., (2023), indicating persisting constraints to small-scale irrigation adoption.

These results have large implications for many theoretical frameworks in agricultural adoption studies. The dramatic divergence in the adoption rates of activities with near-term economic payoffs (fertilizers) compared to long-term payoffs (agroforestry) supports the diffusion of innovations theory of relative advantage (Rogers, 2003). Strong adoption rates of technology-intensive practices like crop rotation challenge the common image of farmers' opposition to complicated methods (Knowler & Bradshaw, 2007), and suggest that quality training can overcome such barriers.

The social dynamics articulated in these adoption trends also speak to the social practice theory Wang & Xu, (2024), and how certain practices get routinized among the farming community. Meanwhile, widespread uptake of some of these techniques implies their transition from being innovations to routine practice, while others remain niche applications.

4.2.2 Effect of Information Communication Pathways on Youth's CSA Practice

This study rejects the null hypothesis (HO1) by evidence of information channels having a statistically significant influence on youth participation CSA in Bumula sub-county. The chi-

square result test was significant ($\chi^2 = 100.12$, $p < 0.05$), Cramer's V had an ideal association relationship (V = 1.0) between information source and youth involvement in CSA (Table 10). Thus, the mechanism of information communication determines youth participation in sustainable agriculture.

Table 10:Effect of information communication pathways on youth's CSA practice

Statistical Measure	Value	Interpretation
Chi-square (χ^2)	100.12139	A significant association between variables.
Degrees of freedom (df)	2	Number of categories minus one for the chi-square test.
p-value	< 0.05	Statistically significant at the 5% level (rejects the null hypothesis).
Cramer's V	1.0	Very strong association between information sources and CSA participation.
Conclusion		Information communication channels significantly influence youths' CSA adoption.

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The strength of such a relationship agrees with emerging research demonstrating the enabling potential of information and communication technologies (ICTs) for agricultural transformation. For instance, Jumanne, (2024) confirmed that digital platforms i.e., mobile applications and social media play an important role in boosting youth involvement in sustainable agriculture. Technology-savvy young farmers are more likely to adopt CSA practices if the information is made available through interactive digital media compared to traditional extension services. Similarly, Aker, (2011), demonstrated that farm advisories via mobile phones in Niger led increased the farmers' adoption of new methods, validating the assumption that easily accessible, real-time information promotes behavior change in agriculture. The results of this study therefore add to the growing consensus that ICT-based communication is a powerful force for agricultural innovation, particularly among the youth.

The near-perfect Cramer's V in this study provides an interesting contrast with earlier empirical research. While the association strength (V = 1.0) indicates a very significant relationship between information channels and CSA adoption in Bumula, earlier studies showed less effects. For example, Tambo & Wünscher, (2017), contrasted the extension contribution in Ghana and found Cramer's V scores ranging from 0.3 to 0.5, a weaker but positive relationship. The disparity might be accounted for by local conditions, such as Bumula's relatively high mobile phone penetration or targeted use of youth-specific platforms (e.g., WhatsApp groups, YouTube tutorials) for farm advice. Alternatively, the strong correlation may indicate a sampling constraint, for example, a high proportion of digitally literate young people in the study group. Future studies should investigate whether this result is consistent across more diverse populations within the sub-county.

The findings of this study also contradict studies that have challenged the effectiveness of some methods of information dissemination. For instance, Danso-Abbeam et al., (2018), showed that conventional agricultural extension services (e.g., farmer field schools and radio shows) are ineffective in reaching Ghanaian youth because low digital literacy combined with such passive platforms are communication hindrances. Hence, information accessibility is no guarantee of activity unless the modalities of transfer are aligned with the atitudes and inclination of the audience. For Bumula, the raw significance of the information channels entails that young people will become more media savvy or that dominant modes of communication are especially well suited to their requirements. That trend raises a tough scalability questions: would the same techniques yield the same outcomes in the surrounding areas, which would have varying socioeconomic conditions?

The close link between participation in CSA and channels of information strengthens the need for policymakers to ensure ICT-integrated agricultural extension systems are put on the agenda. ICT-based platforms, particularly those already popular with youths such as social media and SMS advisories, must be used for disseminating knowledge on CSA. However, Wyche & Steinfield, (2016), caution that technology-oriented policies must be inclusive to avoid lagging behind in marginalized communities with limited digital connectivity. In Bumula, interventions would also welcome a mixed-methods approach that combines digital technologies with community-level peer learning, since the information source-CSA adoption link is very strong.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, discussion, conclusion drawn from the analysis of data and recommendations made. The main objective of this study was to investigate factors affecting youth participation in climate smart agriculture in Bumula sub county, Bungoma county, Kenya.

5.2. Summary of Research Findings

Contrary to initial expectations, female youth had 71.6% lower odds of practicing CSA than males (OR = 0.284), highlighting significant gender-based constraints. The analysis of socioeconomic factors (Objective i) reveals that gender and farm income are pivotal. The significantly lower participation rates among female youth underscore the presence of gender-specific barriers, while the strong positive relationship with farm income emphasizes the role of economic capacity in enabling CSA adoption.

When it comes to institutional factors, access to credit stood out as the only significant predictor of CSA participation, boosting adoption odds by a factor of 2.922 (OR = 2.922, p = 0.033). Other factors like training programs, NGO support, and being part of farmer groups didn't show any significant impact on youth involvement.

Extension services were the main source of knowledge, helping to raise CSA awareness for 44.1% of young people and guiding practical implementation for 45.3% of those who adopted. Peer networks (28.7%) and media (27.2%) also played important roles as secondary channels for spreading information. The analysis revealed a very strong link between the sources of information and CSA participation (Cramer's V = 1.0, $p < 0.05$). However, despite all this, the

intensity of adoption was still quite low, with only 14.3% of youth being classified as high adopters.

5.3 Conclusions

For Objective i, which was addressing socioeconomic factors, the study determines that gender and farm income are significant determinants of youth engagement in Climate-Smart Agriculture (CSA). Young women had significantly lower chances of adopting CSA than young men, wherein an odds ratio of 0.284 implies 71.6% less chance of adoption. This finding underscores the presence of ingrained gender-specific constraints, such as disparities in access to land, credit, and decision-making powers, that discourage the participation of young women. Conversely, annual farm income emerged as a powerful enabler; with every unit increase in income, the probability of adopting CSA practices increased 2.52 times. This highlights that economic potential is a background necessity for overcoming the investment constraints associated with CSA inputs and technology.

For Objective ii, which sought to determine the institutional factors affecting youth participation, the study concludes that access to credit is the pivotal institutional driver for CSA adoption. The analysis revealed that access to credit significantly increased the odds of youth practicing CSA by a factor of 2.922. In contrast, other institutional supports including training programs, NGO support, and farmer group membership were found to be statistically insignificant predictors. This indicates that while knowledge and social structures are present, they are insufficient to enable adoption without the fundamental financial means to act. The institutional environment in Bumula sub-county is therefore characterized by a critical finance gap that effectively locks out a significant portion of youth from participating in CSA.

For Objective iii, which evaluated the effects of information communication pathways, the study concludes that these pathways are a dominant and significant factor influencing youth engagement in CSA. A very strong statistical association (Cramer's V = 1.0) was found between the source of information and CSA practice. Extension officers were the most critical channel, serving as the primary source of awareness for 44.1% of youth and the source of practical information for 45.3% of adopters. This underscores the irreplaceable role of formal, expert-led dissemination for complex agricultural innovations. However, the overall intensity of adoption remained low, suggesting that while information is a powerful catalyst, its effectiveness can be constrained by the socio-economic and institutional barriers identified in the first two objectives.

5.4 Recommendations

Development agencies and county agricultural departments should design and implement interventions that specifically address the barriers faced by young women. This includes improving their access to land, providing credit facilities with flexible terms tailored to their circumstances, and ensuring extension services are gender-sensitive. Empowering female youth is essential for equitable and widespread CSA adoption.

Financial institutions, in partnership with county governments, need to create credit products tailored for youth. These should come with flexible collateral requirements and repayment schedules that align with agricultural cycles to overcome the main institutional barrier. Access to credit has been shown to increase the odds of adoption by 2.922 times, while other institutional supports have had minimal impact.

The Ministry of Agriculture ought to modernize extension services by utilizing integrated digital platforms, such as SMS alerts and mobile apps, while also bolstering peer-to-peer

knowledge exchange networks. This is crucial, especially since research indicates that extension officers are responsible for 45.3% of practice adoption, despite the current challenges in reaching tech-savvy youth through traditional methods alone.

5.5 Suggestions for Further Research

Future research should employ longitudinal methods to track CSA adoption patterns and socioeconomic impacts over time, building on this study's cross-sectional design. Additional valuable inquiries would include perception studies examining youth attitudes toward CSA risks and rewards, as well as evaluations of digital extension tools like agricultural apps and USHAURI platforms. These investigations would provide critical insights for developing more effective, youth-oriented CSA promotion strategies in Kenya and similar contexts.

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Appendix A: Questionnaire for Youths

Introduction

My name is David Saenyi, a Student of Masinde Muliro University of Science and Technology undertaking a Master of Science Degree in Agricultural Extension and Rural Development. I am conducting research on determining factors influencing the involvement of youth in Climate-Smart Agriculture in Bumula Sub County. You are chosen as one of the respondents of this research. Please spare me a moment and answer me some of these questions since I request it humbly of you. You will be asked to make choices given to you and in some cases, provide your opinion. The details you give will solely be to the academic good and it shall be dealt with the highest confidentiality.

Guidelines:

Please complete all the sections provided by ticking (□) *the most appropriate answer from the alternatives given.*

Section A: Information on Socio-Economic Factors

1	Sub-County: Bumula Ward_____ Location_____
3	Gender : Male Female Others, specify
4	Highest Education level attained: Did not go to school Primary Secondary Post-secondary University
5	How much do you earn per year from your farm? Less than (<) KES 10,000 KES 10,001- KES 25,000

	KES 25,001- KES 35,000 > KES 35,000
6	How much do you earn from potato per year? Less than (<) KES 10,000 KES 10,001- KES 25,000 KES 25,001- KES 35,000 > KES 35,000
7	How much do you get per year on average from other sources of income? Less than (<) KES 10,000 KES 10,001- KES 25,000 KES 25,001- KES 35,000 > KES 35,000

Section B: Information on Institutional Factors

8	Do you have access to credit? Yes No
9	What is/are the sources of your credit? SACCOs Private money lenders Relatives and friends Banks
10	If yes in questions 10 and 11 above, how much do you get on average per year? Less than (<) KES 10,000 KES 10,001- KES 25,000 KES 25,001- KES 35,000 > KES 35,000
11	Have you been trained on CSA? Yes No
12	How often do you attend trainings on CSA Rarely =1 Sometimes =2 Regularly =3
13	Since when have you attended the trainings on CSA? Last season One year ago Two years ago

	Three years ago and above
14	How many times did/ have you attended the training on CSA? Once 2 times 3 times 4 times and above
15	Who offer (s) the training? Ministry of Agriculture Private Companies NGOs Universities
16	Do you have any NGO here working on CSA? Yes No
17	If yes, in question 20 above, do you receive any support on CSA from them? Yes No
18	If yes, in question 19 above, which kind of support do you receive? Extension services Credit Inputs Others, specify
19	Are you a member of any farmers' group? Yes No
20	If yes, in question 22 above, do you receive any support from it on CSA? Yes No
21	If yes, in question 23 above, which kind of support do you receive? Access to extension services Access to credit Access to inputs Others, specify

Section C: Information on Information Dissemination Pathways

Climate Smart Agricultural practices	Are you aware of the Climate Smart Agricultural practices below? Yes = 1 No = 2	What was or is your major source of information on CSA? Radio/Television/Phone =1 Neighbors/friends =2 Extension officers =3
Rainwater harvesting and storage		
Irrigation		
Mulching		
Minimal tillage		
Improved crop varieties		
Terracing		
Drainage management		
Intercropping		
Agroforestry		
Synthetic fertilizers		
Composting		
Furrow/ ridge planting		
Crop rotation		

Section D: Information on Practice of CSA

Climate Smart Agricultural practices	Do you practice the CSA below? Yes = 1 No = 0	If yes, to what extent? = low = moderate = high
Rainwater harvesting and storage		
Irrigation		
Mulching		
Minimal tillage		
Improved crop varieties		
Terracing		
Drainage management		
Intercropping		
Agroforestry		
Synthetic fertilizers		
Composting		
Furrow/ ridge planting		
Crop rotation		

Thank you for your time.

Appendix B: Research License

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