

**AN ANALYSIS OF CLIMATE CHANGE ADAPTATION MESSAGING  
TARGETING SMALLHOLDER FARMERS IN MACHAKOS COUNTY, KENYA**

**BY**

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**March, 2025**

**DECLARATION**

This thesis is my original work and has not been presented for an award of a degree or diploma in any other university or institution.

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## **DEDICATION**

I dedicate this thesis to my mother, Mary Wanjiru Kabuu, who is departed. Her unwavering inspiration and encouragement gave me the impetus to complete this project.

This work is a testament to her life and legacy, and I am proud to honor her through it.

## ABSTRACT

Climate change and rising temperatures have put the well-being of millions of people at increased risk and threatens the livelihood of many, especially those in poor countries who depend on rainfed agriculture. The United Nations (UN) Sustainable Goal 13:1 aims to reduce its impact by increasing resilience and adaptability. In this regard, the Kenyan government provides farmers with innovative climate change adaptation solutions through Kenya Agricultural and Livestock Research Organization (KALRO) and the Meteorological department. However, despite an increase in the availability of messages on new agricultural techniques, the rate of adoption remains appallingly low. This study examines how climate adaptation messages are designed, communicated, and perceived by smallholder farmers in KALRO Katumani, Machakos County, Kenya. It employs Social Behavior Change Communication (SBCC) approaches and specifically the Social Learning Theory to analyze the messaging process. The study targeted 35 smallholder farmers who own 1-3 acres of land. The research aimed to address three key questions: What climate change messages are communicated to smallholder farmers in Machakos County? How are the climate adaptation messages designed and disseminated to smallholder farmers in Machakos County? What are the perceptions of smallholder farmers towards climate change messaging in Machakos County? The study employed a relativist-interpretivist research paradigm and utilized a qualitative approach, employing a case study methodology. Data was generated through observations, focus group discussions, one-on-one interviews, and analysis of the seasonal weather-based advisory flyer. Purposive sampling was used to identify the area of study and selection of specific small-holder farmer groups and farming households. The data was presented narratively and descriptively and analyzed through an inductive thematic approach. The findings show that, despite farmers experiencing climate change and its devastating effects, and despite the availability of new technologies, adaptation is low. This is because they are not involved in the messaging. Additionally, entrenched cultural norms surrounding gender roles in agriculture, skepticism towards new technologies, the belief that climate change is a divine punishment and weather forecast messages that are challenged by climate variability collectively contribute to low levels of adaptation. The study concludes that a more farmer-centered approach to messaging will increase trust and ownership of the messages, bridge the gender inequalities ultimately ensuring uptake of innovative practices. This research supports scholars and practitioners advocating for communication procedures that prioritize social learning in addressing the urgency of climate change adaptation. The study recommends co-creating climate change messages from project inception, incorporate cultural and religious considerations for relevance, while integrating SBCC approaches into extension/message designers training programs.

## TABLE OF CONTENTS

<b>DEDICATION.....</b>	<b>iii</b>
<b>ABSTRACT.....</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>xi</b>
<b>CHAPTER ONE.....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>1</b>
1.0 Overview.....	1
1.1 Background and Context of the Study.....	2
1.2 Statement of the Problem.....	11
1.3 Purpose of the Study.....	12
1.4 Research Questions.....	12
1.5 Scope of the study.....	12
1.6 Justification of the Study.....	16
<b>CHAPTER TWO.....</b>	<b>21</b>
<b>LITERATURE REVIEW.....</b>	<b>21</b>
2.0. Overview.....	21
2.1 Communicating Climate Change.....	21
2.1.1. <i>Impact of Climate Change on Agriculture</i> .....	22
2.1.2 <i>Challenges of Climate Change in Machakos County</i> .....	26
2.1.3. <i>Challenges of Communicating Adaptation</i> .....	27
2.1.4. <i>Social Behavior Change Communication for Climate Change Adaptation</i> .....	30
2.1.5 <i>Current State of SBCC for Climate Change Adaptation</i> .....	32
2.2 Situating the study in the field of Communication for Development.....	35
2.3 Review of relevant theories.....	37
2.3.1. <i>Social learning theory</i> .....	38
2.4 Review of Previous Research.....	53

2.5	Rationale of this Study Based on the Reviewed Literature .....	67
2.6	Chapter Summary .....	70
	<b>CHAPTER THREE .....</b>	<b>71</b>
	<b>RESEARCH METHODOLOGY .....</b>	<b>71</b>
3.0	Overview.....	71
3.1	Research Paradigm.....	71
3.2.	Research Methodology .....	76
3.3.	Case Study.....	82
3.4	Study Area and Population.....	84
3.5	Study Pre-planning and Sampling Procedure .....	85
3.6	Instrument Testing .....	88
3.7	Data gathering techniques.....	89
3.7.1.	<i>Semi Structured Interviews</i> .....	89
3.7.2	<i>Key In-depth Interviews (KII)</i> .....	92
3.7.3.	<i>Focus Group Discussions (FGDs)</i> .....	93
3.7.4.	<i>Observations</i> .....	101
3.8	Thematic Data Analysis .....	103
3.9	Field Constraints .....	108
3.10	Trustworthiness .....	109
3.11	Ethical Considerations .....	113
3.12	Chapter Summary .....	117
	<b>Findings.....</b>	<b>118</b>
4.0	Overview.....	118
4.1	Messages communicated on climate adaptation.....	119
4.1.1.	<i>Seasonal Weather Forecast</i> .....	119

4.1.2. <i>Drought Tolerant Crops and Disease Control</i> .....	121
4.1.3 <i>Farming Innovations and New Techniques</i> .....	123
4.2 Chapter Summary.....	126
<b>CHAPTER FIVE</b> .....	<b>127</b>
<b>CLIMATE CHANGE MESSAGE DESIGN</b> .....	<b>127</b>
<b>5.0 Overview</b> .....	<b>127</b>
5.1 Climate Adaptation Messages Crafted from Regional-to-National-to Local Levels .....	127
5.1 Language used to Communicate Climate Adaptation Messages. ....	131
5.2 Dissemination tools .....	135
5.2.1. <i>Seasonal weather advisory flier</i> .....	135
5.2.2. <i>TV &amp; Radio channels</i> .....	138
5.2.3 <i>Face-to-face dissemination tools</i> .....	141
5.3 Chapter Summary .....	149
<b>CHAPTER 6</b> .....	<b>150</b>
<b>FARMERS' PERCEPTION OF CLIMATE CHANGE AND MESSAGES</b> .....	<b>150</b>
6.0 Overview.....	150
6.1 Farmers Believe Climate Change is Happening and has Devastating Impact .....	150
6.2 Climate Change is a Divine Punishment.....	151
6.3 Drought Resistant Crops Are for the Poor and Not Real Food.....	153
6.4 Farming is not profitable.....	154
6.5 Exclusion in Message Design: Farmers Left Out as 'Experts' Shape Content.....	155
6.6 Distrust of Seasonal Weather Forecast .....	156
6.7 Dissemination Tool/Messengers not Farmer Centered .....	158
6.6 Marginalizing Women from Climate Messaging.....	161
6.7 Chapter Summary .....	164

<b>CHAPTER SEVEN</b> .....	<b>165</b>
<b>DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS</b> .....	<b>165</b>
7.0 Overview.....	165
7.1 Summary of key findings.....	165
7.2 Discussions.....	166
7.2.1. <i>Top-Down Messaging</i> .....	166
7.2.2. <i>Culture and Religion are Determinants of Adaptation</i> .....	184
7.2.3. <i>Role of Source and Message Credibility in Climate Change Adaptation Efforts</i> .....	188
7.2.4. <i>Women’s exclusion from Climate Change Messaging</i> .....	194
7.3 Conclusions .....	203
7.4 Thesis .....	205
7.5 Contributions .....	205
7.6 Implications for Practice and Policy.....	208
7.5.1. <i>Farmer Focused Communication Approaches</i> .....	209
7.5.2 <i>Infusing Local Knowledge into Climate Change Messages</i> .....	210
7.5.3. <i>Capacity Strengthening</i> .....	211
7.5.4. <i>Women-Sensitive Messaging in Climate Adaptation</i> .....	212
7.7 Limitations of this study.....	16
7.8 Suggestions for Further Research .....	213
<b>REFERENCES</b> .....	<b>214</b>
APPENDIX I: INTERVIEW GUIDES.....	236
APPENDIX II - WEATHER ADVISORY FLIER.....	242
APPENDIX III– RESEARCH AUTHORIZATION .....	243

**LIST OF TABLES**

Table 3.1: Symbols used to indicate data source .....	93
Table 3.2: Number of Focus Group Discussion Participants .....	94
Table 3.3: Age of Focus Group Discussion Participants .....	94
Table 3.4: Educational Level .....	94
Table 4.1: Sources of data .....	119
Table 5.1: Content of drought resistant crops included in the weather advisory .....	133
Table 7.1: Summary of Key Findings .....	165

**LIST OF FIGURES**

*Figure 5.1 Message Designing Process* ..... 130

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## OPERATIONALIZATION OF TERMS

**Adaptation:** Adaptation, according to Adger *et al.* (2003), is the adjustment of a system to moderate the impacts of climate change, to take advantage of new opportunities or to cope with the consequences.

**Agro- Advisory** Here refers to the process of giving farmers expert advice on agricultural practices, which is often based on scientific research, weather forecasts, and market trends. These advisories assist farmers in making informed decisions regarding crop management, pest control, irrigation, and climate adaptation.

**Behavior Change:** Behaviour Change Communication (BCC) refers to the strategic use of communications to encourage individuals and communities to adopt healthier and more sustainable practices.

**Climate adaptation messages:** This study looked at climate adaptation messages as those that promote new appropriate approaches to farming. Examples include enhanced water management (smallholder irrigation, rainwater harvesting, sustainable extraction of groundwater and other underutilized water resources) and other improved on-farm water use efficiency messages; messages that support smallholders' intensification of food production through improved access to improved seeds, including messages encouraging a shift toward crop and livestock types, varieties, and breeds with greater heat and drought tolerance as well as improved resistance to pests and diseases; soil fertility management (e.g., fertilizer application).

**Climate Change Communication:** Climate Change Communication is about educating, informing, warning, persuading, mobilizing, and solving the critical challenge of

climate change. At a deeper level, it is shaped by different experiences, mental and cultural models, and underlying values and world views.

**Messages:** In communication studies, a message is defined as information conveyed by words (speech or writing), and other signs and symbols. A message (verbal or non-verbal or both) is the content of communication process. The originator of the message is the sender who conveys a message to a receiver.

**Message Dissemination:** Dissemination means conveying or delivering messages to each audience.

**Smallholder farmers:** In this study these consist of farmers who own 1-3 acres of land.

**Social Behavior Change Communication:** SBCC, short for Social Behavior Change Communication, is a strategic approach to communication whose goal is to bring about changes in knowledge, attitudes, norms, beliefs, and behaviors. Previously known as Behavior Change Communication (BCC), the two terms can be used interchangeably. This approach involves coordinating a range of messages and activities across different channels to reach individuals, communities, and larger populations at various levels of society.

## ABBREVIATIONS

AFC	Africa Finance Corporation
OND	October-November-December
AO1	Administrative Officer 1
AO2	Administrative Officer 2
ASALs	Arid and Semi-Arid Lands
ASDSP	Agricultural Sector Development Support Program
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BCC	Behaviour Change Communication
CA	Conservation Agriculture
CCAFS	Climate Change, Agriculture, and Food Security
CCCCF	County Climate Change Fund
C4D	Communication for Development
CGIAR	Consultative Group on International Agricultural Research
CIS	Climate Information Services
COP26	26th United Nations Climate Change Conference of the Parties
COP28	28th United Nations Climate Change Conference of the Parties
FAO	Food and Agriculture Organization
FDG	Focus Group Discussions
FF1	Female Farmer 1
FF2	Female Farmer 2
FF3	Female Farmer 3
FLLoCA	Financing Locally-Led Climate Action
HC3	Health Communication Capacity Collaborative
ICPAC	IGAD Climate Prediction and Applications Centre
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IGAD	Intergovernmental Authority on Development
IMF	International Monetary Fund
KALRO	Kenya Agricultural and Livestock Research Organization
KII	Key In-depth Interviews
KMD	Kenya Meteorological Department
MAM	March and May
MoALF	Ministry of Agriculture, Livestock, and Fisheries
MO1	Metrological Officer 1
MO2	Metrological Officer 2
NCCRS	National Climate Change Response Strategy
NCD	Newcastle Disease
NCST	National Council for Science and Technology
NDC	National Determined Contributions
ND-GAIN	Notre Dame Global Adaptation Initiative

NGOs	Non-Governmental Organizations
PSE1	Private Sector Extension Officer 1
PSP	Participatory Scenario Planning
RO1	Research Officer 1
SBCC	Social Behavior Change Communication
SDG	Sustainable Development Goal
SLT	Social Learning Theory
SMS	Short Media Messages
SSA	Sub-Saharan Africa
SSI	Semi-Structured Interviews
UN	United Nations
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNFCCC	The United Nations Framework Convention on Climate Change
USAID	U.S. Agency for International Development
WASH	Water, Sanitation, And Hygiene
WA1	Weather Advisory 1

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.0 Overview**

This first chapter provides a background on the academic and social contextual issues that led to the study. From the very beginning, the chapter dives into the academic context to illustrate the place of communication, and more specifically, Social Behavior Change Communication in the climate change adaptation messaging process. The social context provides the past and current state of communicating climate change and how messages have been designed and disseminated globally, in Africa and here in Kenya. This background gives the context of the problem and the purpose of the study, which is to examine messaging of climate adaptation messages in Machakos County, Kenya. The chapter gives 3 key research questions guided by theoretical messaging parameters to guide this research. Based on the questions, the chapter defines the content and research scope or boundaries within this research project. The geographical scope justifies the choice of the areas around KARLO Katumani, Machakos county, while the research scope briefly discusses the research approach, methodology, and analysis technique. In addition, the chapter briefly justifies the study, and its significance and ends with a conclusion.

## **1.1 Background and Context of the Study**

### **1.1.1 Academic context**

This study investigated messaging of climate change adaptation among smallholder farmers in Machakos County, Kenya. Specifically, the study sought to understand the messages communicated, how they are communicated, and the perceptions of smallholder farmers toward these messages. According to McLean (2015), a communication message refers to the stimulus or meaning produced by the source for the receiver or audience. He says that messages may be written, spoken, nonverbal, or visual and that transferring a message or piece of information from one location, person, or group to another is referred to as communication. The English word "communication" comes from the Latin word communicate, which means to share or make common, according to Weekley (1967, cited by Coleman et al., 2022). Thus, Pearson & Nelson (2000, cited by Coleman et. al., 2022) define communication as the process of understanding and sharing meaning. There is a sender, a receiver, a message, and an interpretation of the meaning in every communication scenario. Successful communication requires mutual understanding between the sender and the recipient.

The Stichting Nederlandse Vrijwilligers SNV (2016) handbook explains it in a simpler form. The authors have outlined a comprehensive process for effectively communicating a message. The first step is for the sender to have a clear intention to communicate a message to the receiver/s. Next, the message is encoded into a form that can be easily shared with the receiver/s, such as speech, text, or images. The third step involves determining the most appropriate medium for transmitting the message to the receiver/s, whether it be face-to-face

interaction, email, radio, television, or posters. Once the message is transmitted, the receiver/s receive it, and the final step is for the receiver/s to decode the message so that it can be fully understood and given meaning. This process of decoding is crucial, as it ensures that the intended message is effectively communicated, and that the receiver/s fully comprehend its meaning.

Effective communication is crucial for implementing climate change adaptation. It involves ensuring that communities comprehend the message and possess the necessary tools to make informed decisions and act. As Harvey (2012) emphasized, communication plays a pivotal role in promoting successful adaptation and mitigation strategies for climate change. By facilitating the identification of issues, raising awareness, encouraging dialogue, and influencing behavioral changes, effective communication is key to achieving climate change goals (Johnson, 2011; Moser, 2010; Nerlich et al., 2010, as cited by Harvey et al., 2012). According to Moser & Dilling (2012) and Nerlich et al. (2010), successful communication plays a vital role in connecting scientific research with community action to tackle climate change. They argue that effective communication can help people better understand the issue, raise awareness, facilitate dialogue, and influence behavior change.

Originally, climate change was presented as a complex and abstract scientific problem – but there is a growing consensus that for any adaptation to take place, climate change messages need to be framed and communicated in a way that will bring about behaviour change amongst all stakeholders, including farmers. This is where behavior changes communication or social behavior change communication approaches come in. Both terms refer to the coordination of messages and activities across a variety of channels to reach multiple levels of

society, including the individual, the community, services, and policy. As per the Health Communication Capacity Collaborative (HC3) in 2016, SBCC involves the strategic deployment of communication approaches to encourage change in knowledge, attitudes, norms, beliefs, and behaviors. It leans on evidence-based research to grasp individuals' thoughts, emotions, and motivations, aiming to facilitate the desired behavioral changes.

Hence, message design becomes behavior-centered when insights gained from studying behavior are used to create messages. Understanding individuals thoroughly allows us to identify the most effective arguments and communication timing. Tailoring interventions to encourage desired behaviors can be achieved by analysing obstacles, challenges, and change drivers. This approach assumes that a Social and Behavior Change Communication (SBCC) strategy serves as a road map for intervention development, outlining the target audience, communication goals, specific messages, materials, activities, and channels (Lee & Davis, 2019). Despite its critical role, SBCC is underutilized as a tool for helping individuals and communities cope with and adapt to climate change (Lee & Davis, 2019).

Lee and Davis (2019) have stated that many measures for adapting to and reducing the risks associated with climate change require individuals to adopt or modify their behaviors. In light of this, my study focused on exploring climate change messaging through the lens of Social Behavior Change Communication theories. These theories focus on how values, beliefs, attitudes, habits, social norms, and policies interact to shape behavior. As a result, I sought to understand how the same factors interact to influence Machakos County farmers' response to messaging about climate change adaptation.

Achieving behavior change, particularly when dealing with complex issues like climate change adaptation for smallholder farmers, necessitates a comprehensive approach that includes commitment from agencies and governments, as well as the involvement of entire social systems. This includes not only changing attitudes, habits, and values, but also implementing inclusive and participatory approaches that allow affected communities to contribute to decision-making processes. Policy changes are critical for creating an environment that encourages and incentivizes desired behaviors while addressing systemic barriers. Finally, successful behavior change requires a concerted effort to inform, engage, and involve stakeholders at all levels, ensuring that adaptation strategies are not only effective, but also sustainable and equitable.

Sadly, the traditional approach to promoting behavior change around climate change and new technologies is to simply provide people with information, operating under the assumption that the right information will bring about the desired change. Indeed, farmers are aware of climate change and its devastating effects on their farms; they are aware of the need to change. However, this knowledge is not translating to transformational behavior change, even when alternative technologies are introduced to them.

Research on climate change obstacles shows that a variety of barriers impede behavior change. Individual barriers include uncertainty, skepticism, a lack of knowledge about the benefits, and a reluctance to change one's lifestyle, habits, or beliefs, including self-efficacy. Social barriers are caused by phenomena such as the free rider effect, which occurs when individuals benefit from the actions of others, as well as entrenched social norms. Furthermore, cultural barriers manifest as deficiencies in infrastructure and supportive

frameworks, adherence to traditions, and the influence of political systems (Lorenzoni et al., 2007, as cited by Moore, 2012). These factors point to the question of messaging. Are the messages designed to address individual barriers, social barriers, and cultural barriers? Is the whole system involved to enable individuals to change?

### **1.1.2 Social Context**

There's a global consensus on the paramount importance of Adaptation as the primary challenge facing nations, for a multitude of reasons. "This significance was underscored during the 2023 COP28 summit by Saber Hossain Chowdhury, who emphasized the critical nature of adaptation, stating, 'Adaptation is really a life-and-death issue. We cannot compromise on adaptation; we cannot compromise on lives and livelihoods' (Jessop, Stanway, & Abnett, 2023)." His statement indeed highlights the urgent need to address the impacts of climate change, a topic that was evidently at the forefront of discussions during the U.N. climate summit in Dubai in 2023.

As per the United Nations Development Programme (UNDP, 2024), adapting to climate change means taking measures to decrease one's vulnerability to present or predicted climate change consequences, such as severe weather conditions, rising sea levels, the loss of biodiversity, as well as the insecurity of food and water. A large portion of adaptation efforts must take place at the grassroots level, requiring significant participation from rural communities and urban centers. These initiatives include the cultivation of drought-resistant crop varieties and the adoption of regenerative agricultural practices, improvements in water storage and utilization techniques, the implementation of land management strategies to

reduce wildfire risks, and the construction of strong defenses against extreme weather events such as floods and heatwaves.

Why the urgency to adapt? As per the UNDP (2024), the worsening effects of climate change necessitate urgent adaptation efforts. As temperatures continue to rise, the frequency and severity of climate-related events will escalate. This will not only make adaptation more difficult but also significantly increase the financial burden on human societies and ecological systems.

This urgency is particularly pronounced in developing nations, where the negative consequences of climate change are already being felt, and where factors such as geographical and climatic conditions, reliance on natural resources, and limited adaptive capacity render populations disproportionately vulnerable. Furthermore, adaptation efforts are critical for marginalized groups such as women, children, the elderly, ethnic minorities, Indigenous Peoples, refugees, and displaced people, who have been shown to bear a disproportionate burden of the climate change.

One major challenge to Adaptation is communication. The UNDP (2024) report puts it this way: *"another major challenge is information and knowledge gaps. Accurate climate data is not easily available in many developing countries..."* According to literature, conventional approaches have presumed that providing better information to people about science, and probably new technology, will lead to better will enable improved decision-making to lessen the effects of climate change. While good scientific data and technical information are important, they are insufficient for people to take adaptative action.

According to Monroe et al. (2017), the challenge of addressing the topic at hand is due to its inherent complexity and uncertainty, making it difficult to simplify. The issue is regarded as one of the most significant globally in terms of the political and economic agenda. However, a report compiled by Otieno, Pauker, and Maina of BBC World Service Trust notes that it took at least 20 years for it to become an international priority. Why? Because in many ways, they say, climate change was originally communicated as a scientific problem. Complex, complicated, and at times scientific information resulted in a delayed public and political response to the climate crisis. Even in the Global South, climate change remains an abstract concept, further complicating efforts to drive local action (BBC world Service Trust 2010).

Research conducted by the Climate Change, Agriculture, and Food Security (CCAFS) program highlights the significant knowledge gaps among smallholder farmers regarding climate variability and its impact on agriculture. These gaps include a lack of confidence in seasonal climate forecasts and limited understanding of how climate data can be applied to agricultural planning and management (CCAFS, cited in IRIN, 2012). Even when climate adaptation strategies are introduced, uptake among smallholder farmers remains slow. In other words, the messages on seasonal climate forecasts did little to bring about Adaptation due to farmers' perception of the climate itself.

In fact, the same survey carried out by CCAF scientists shortly before the catastrophic drought of 2011 revealed that small farmers in the Horn and East Africa generally performed poorly when it came to adopting a more sustainable type of agriculture that was better equipped to withstand unpredictable weather patterns. According to a report by CCAFS cited by IRIN (2012), households have made only marginal changes in the past decade when it

comes to managing soil, water, and land. This lack of uptake of well-tested and widely disseminated management practices is a worrying trend noted by researchers. The CCAFS comprehensive survey in the four East African countries: Ethiopia, Kenya, Uganda, and Tanzania aimed to create household-level indicators to evaluate the ability of small farmers to cope with climate change. Through interviews with 700 households, the researchers gained valuable insights into the challenges faced by small farmers and assessed their capacity to adopt new farming practices, diversify, and adapt in the face of climate change. This suggests that despite access to scientific information, there are other underlying factors influencing decision-making at the community level.

Furthermore, the research carried out by the CCAFS researcher unveiled other obstacles that impede effective adaptation in the East Africa region. These included insufficient information in some counties, undocumented information, unreliable existing information, limited access to information due to high levels of illiteracy within communities, a lack of comprehensive scientific data, and the absence of a centralized location or platform for climate change information (Alin & Republic of Kenya, 2012). Furthermore, the findings from the CCAFS study prove that documented scientific information on the relationship between communication and Adaptation is scarce or totally lacking. This research will contribute to providing such information specifically examining messaging of adoption option among small holder farmers in Kenya.

In Kenya, Kwena et.al. (2011) contend that it is common knowledge that great efforts have been expended in developing and validating agricultural technologies and approaches that help farmers adapt to climate change, not only in Kenya but the whole of SSA. This has been

going on for more than 50 years now and is still on-going. Yet, he says, hardly two years pass by without seeing pictures on the Kenyan T.V. of malnourished people in many parts of Kenya.

Indeed, the government has mainstreamed adaptation by integrating climate risk actions into national and local development planning and has also commissioned the development of a communication strategy to facilitate adaptation (Chaudhury et al., 2020). However, despite the Kenyan government's efforts to address climate change—most notably through the launch of the National Climate Change Response Strategy (NCCRS) in 2010, which recognized communication as a key tool for adaptation—awareness and behavioral change among farmers remain limited. It is obvious that farmers are not adapting as envisaged by the architects of the communication strategy, who confirmed from their own studies that the level of awareness of climate change issues and impact is low countrywide.

In summary, while climate adaptation remains a global priority, there is a growing consensus among environmental and science communication scholars and practitioners, that people are not adapting to climate change at the rate they are expected to and that they do not fail to adapt due to lack of information. There seems to be a major disconnect between climate adaptation messaging and its reception among smallholder farmers. Even when farmers are aware of climate change and its effects, this knowledge does not always translate into transformational behavioral change. This research sought to understand how messages are designed, what influences their design and the perceptions towards the messages. By doing so, it hopes to inform more effective communication strategies that not only raise awareness but also facilitate tangible, long-term adaptation among vulnerable farming communities.

## 1.2 Statement of the Problem

Despite ongoing efforts by the Kenyan government and its development partners to promote climate adaptation through communication strategies, the awareness and adoption of climate-resilient practices remain low among smallholder farmers according to Atule et al., (2024). Other researchers such as Waaswa et. al., (2024) say there is progress on awareness but acknowledge that despite the sustained promotion of climate smart agricultural practices by the government and development partners, adoption rates remain low. Yet the most effective way to mitigate challenges of climate change is through the uptake of Climate-Smart agricultural practices. Research institutions such as universities, the Kenya Agricultural and Livestock Research Organization (KALRO), non-governmental organizations (NGOs), and the Ministry of Agriculture, Livestock, and Fisheries (MoALF) have developed various climate smart agricultural practices aimed at enhancing farmers' climate adaptation capacity (GoK, 2017; Nyongesa et al., 2019; Satognon et al., 2021a; Satognon et al., 2021b). However, the adoption of these practices remains significantly low, discouraging further research and innovation in climate smart agricultural practices, they say.

While some progress has been made in improving access to agricultural information (Kalungu et al., 2013), existing climate change communication efforts have primarily focused on disseminating information rather than promoting deeper understanding, dialogue, and behavior change necessary for effective adaptation (Moser, 2017). Although awareness of climate change is growing, research suggests that communication gaps persist in influencing smallholder farmers to adopt sustainable adaptation practices. The findings of this study will

contribute to improving the design and dissemination of adaptation messages, facilitating the adoption of new technologies that increase smallholder farmers' resilience to climate change.

### **1.3 Purpose of the Study**

This study examined how climate change adaptation messages are designed, communicated, and perceived by farmers.

### **1.4 Research Questions**

The central question of this study was: what is the nature and complexity of communicating climate adaptation messages in Machakos County? The general questions for the study were:

1. What climate change messages are communicated to smallholder farmers in Machakos County, Kenya?
2. How are the climate adaptation messages designed and disseminated to smallholder farmers in Machakos County, Kenya?
3. How do smallholder farmers perceive climate change messaging in Machakos County, Kenya?

### **1.5 Scope of the study**

Regarding content scope, the first question investigated the climate change messages communicated to smallholder farmers. This study examined climate adaptation messages as those promoting new, appropriate farming approaches. Ngigi (2009) outlines a series of messages encouraging smallholder farmers to increase their food production. The messages promote the importance of accessing high-quality seeds, implementing effective soil fertility

management practices, such as fertilizer application, and securing dependable water supplies. Additionally, they emphasize the significance of implementing efficient water management practices, such as smallholder irrigation, rainwater harvesting, and sustainable groundwater extraction.

According to Mburu et al (2015), the messages highlight the significance of implementing conservation agriculture practices and increasing efficiency in utilizing on-farm water. They suggest shifting to crops and livestock varieties that are more resistant to drought, heat, pests, and diseases. Additionally, the messages recommend diversifying agricultural enterprises into higher-value crops and incorporating value-added processes such as processing. To ensure food security, it is recommended to improve grain storage facilities at the household and national levels. Finally, the messages underscore the importance of climate forecasting and timely advice for governments, private sector stakeholders such as agro-dealers, extension services, and farmers. It is also recommended to promote weather-related crops and livestock insurance to mitigate risks and ensure sustainable income for farmers.

The messages are communicated through various platforms, for example, through weather advisories, demonstrations, radio, from peers, and generally by the agricultural and extension officers. Communication has a significant role in popularizing, disseminating, and adopting these innovations for small-scale farmers. This research informs climate change adaptation communication strategies in Kenya.

The second question focused on message design and dissemination. This question covered the message-designing process, the people involved in the design, and how the messages are disseminated. Some of the questions asked under this question included: Who the main

message developers are, the criteria used to select them, what informs the inclusion of content on this informational material (radio and weather advisory flier) for the farmers, the process undertaken from inception to making the materials/messages ready for farmers use and how farmers participate in the process of developing the materials/messages. The third question examined the farmers' perceptions of messages, messengers, and channels. The probe questions also explored the factors that influence perceptions and choices.

In terms of geographical scope, I conducted the study with communities living around KALRO Katumani, which is in Machakos County, Kenya, within the Kalama Ward of Machakos Town Sub-County. The location represents semi-arid regions where the government and other NGOs work hard to promote agricultural production through alternative farming methods. I selected this geographical area because it provides easy access to a wide range of climate change messages. Farmers in this area have access to such messages because the area is adjacent to KALRO Katumani; obviously, farmers are immediate beneficiaries of any new technologies or approaches to climate change.

The data generation techniques employed included a document analysis to assess the messages on climate change and how they are framed, packaged, and transferred within farmers' natural settings. This included a document analysis of climate messages to gain deeper understanding of content, break it down, identify and analyze concepts and underlying themes.

I conducted five focus group discussions to explore farmers' perspectives on the factors influencing their adoption of climate-resilient technologies. My focus was on understanding the meanings farmers and other stakeholders assign to these messages. The participants were

drawn from farmer groups recommended by agricultural officers and fellow farmers in Machakos County. The discussions and in-depth interviews took place in Ichanda sub-location, Muua Hills location, Kinutwa location, Mwanja Watershed, and Machakos town. I drew the focus groups from farmer groups recommended by others, like the agricultural officers and other farmers in Machakos County. I held focus group discussions and key in-depth interviews at Ichanda sub-location, Muua Hills location, Kinutwa location, Mwanja Water Shed, and Machakos town.

Machakos County has a plethora of stakeholders who help farmers adapt to climate change. These include non-governmental organizations (NGOs), KALRO, the Meteorological Department, other government ministries, and local community leaders whose perspectives on messages were sought through in-depth interviews. I interviewed two message designers from each representative institution to understand the messaging context. What factors influence message design?

Furthermore, I attended an innovation/technology transfer meeting, where an extension officer from a private input company demonstrated new farming approaches. I observed and documented the communication process between farmers and two innovation actors, a private seed company extension officer and a government agricultural officer who interacted with farmers to introduce new agricultural innovations. I recorded the conversations in this meeting and observed the communication exchange without interfering.

These qualitative methods enabled me to ask exploratory questions based on the purpose of this study, such as "how" and "why" questions, to understand the nature and complexity of the

messaging processes in Machakos County. Qualitative methods are also allowed for various data collection methods, such as focus group discussions, in-depth interviews, observations, and document analysis. In chapter three, I have thoroughly discussed the research methodology used in this study.

I conducted the study in Machakos County, Eastern Kenya's semi-arid and arid lands (ASALs). As previously stated, the reason for choosing this location is that climate change has adversely affected small-scale farmers in the area, resulting in low productivity. Second, many organizations and stakeholders have established projects in this area to assist farmers to adapt to climate change. This means that communications about climate change adaptation take place daily in the communities surrounding Machakos, and as a result, I had access to various communication formats.

### **1.6 Limitations of this study**

I have indicated the benefits of this research to practice and scholarship, I do wish to acknowledge that the research had certain limitations. One, this research concentrated on in-depth interviews with farmers in Machakos county since I needed to hear the perspectives of farmers, who are recipients and consumers of the information on climate change. However, I did not engage deeply with the message designers. It would be interesting to hear in depth the perceptions of message designers and scientists and further research is recommended to understand where they come from as they design these messages. Future research can build on this study to understand the considerations from scientists.

In addition, the methodology used is a qualitative case study and so interviewing a variety of people across many parts of the county is not included. Instead, this study is a face-to-face interview with a few farmer groups in Machakos county, Kenya. However, the research is consistent with the principles of qualitative research: to describe, understand and explain. It seeks to tease out common themes which may emerge, it is not expected that the attitudes and perceptions of these individuals would be widely generalized to other individuals or situations.

On the same note, the sample size for the research was also not big. I held in-depth interviews with 3 farmers, 2 agricultural officers, who also participate in message design, 2 extensionist and engaged farmers in 7 focus group discussions consisting of between 7-15 participants. I used the defense provided by Crouch & Mackenzie (2006), which states that research using a qualitative framework aims to reveal meanings by penetrating social life beneath the surface. The goal of this kind of research is to deeply explore the research question through theoretical reflections, build meaningful relationships with the participants, and become fully immersed in their lives. Therefore, according to Crouch & McKenzie (2006), a small number of cases (less than 20, say) will facilitate the researcher's close association with the participants, and enhance the validity of fine-grained, in-depth inquiry in naturalistic settings.

In addition, the sample size was large enough to sufficiently describe the phenomena of interest and address the research questions, as recommended by Tenny et.al., (2021). I realized that adding more participants would have led to saturation, I would not have obtained additional insights and perspectives. The FGDs were especially useful since I obtained as diverse opinion as the number of group members. Although the current study is based on a

small sample of participants, the thick description that used to present data is evidence to the rigor of collected data from the sampled participants – thus maintaining the trustworthiness expected from a qualitative study.

### **1.7 Justification of the Study**

Climate change is a pressing global challenge with far-reaching implications for human life, including food security. Smallholder farmers in Africa are particularly vulnerable to the impacts of climate change, given their heavy reliance on resources that are sensitive to climate change. Despite the availability of abundant information on climate change and the need to adapt, African farmers still struggle to adapt to changing climate conditions effectively. As a result, farmers are disproportionately exposed to the adverse impacts of climate change. The United Nations has recognized the need to enhance member states' resilience and adaptation capabilities to combat climate change, as evidenced in SDG 13:1. The United Nations (U.N.) states that farmers can combat climate change by utilizing adaptation knowledge, such as forecasting and adaptation alternatives. However, failure to adopt new technologies increases when adaptation choices are inadequate or poorly communicated.

The existing literature shows that access to greater knowledge on agriculture and climate change can help farmers compare different farming methods and make choices that will help them adapt to changing climate conditions. For example, Kandlikar and Risbey (2000) and Jones (2003, cited in Baethgen et al., 2003) suggest that increased access to information about climate change and its impact on agriculture enables farmers to effectively assess various farming methods and make informed decisions to adapt to changing climate conditions. However, there is a lack of documented scientific research on how smallholder farmers in

Kenya and Africa, use messages on adaptation techniques to make farming decisions in response to climate change.

Furthermore, although new communication strategies have been implemented recently, not much research has been done on the benefits and limitations of these campaigns in Africa, including the communication theories and approaches that guide messaging. Also, little research addresses the social, cultural, and individual obstacles that limit African smallholder farmers from adopting messaging and other climate change adaptations.

This study emerges from the pressing need to understand the intricacies of climate change messaging among small-scale farmers in Africa, especially in Kenya. Despite the abundance of climate adaptation information, the adaptation strategies related to communication remain understudied, particularly in the context of the unique challenges faced by smallholder agricultural communities. This study aims to fill the gap in the existing literature by investigating how small-scale farmers in Kenya perceive messaging as a climate change adaptation technique and why it has not been effective in the past. The study also provides ways to improve communication strategies and increase the effectiveness of messages on climate change adaptation among smallholder farmers in Kenya. The research is valuable in informing and developing future communication strategies and approaches to enhance the effectiveness of climate change messaging in Africa.

## **1.7 Chapter summary**

This chapter lays a background of the study by generally illustrating the importance of using the social behavior change communication approaches in designing climate change adaptation messages. Indeed, the main aim of this research was to study how climate change messaging affects Adaptation and why. The next chapter is a review of literature around climate change adaptation and communication around the globe and in Africa. In this next chapter, I also examine in depth the methodologies and approaches I used for effective analysis of the problem.

The subsequent chapter delves deeper into the reviewed literature concerning the aspects of social behavior change communication, particularly the social learning theory and its application in the messaging of climate change adaptation messages.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0. Overview**

The purpose of this literature review is to provide the reader with a general overview of communication of climate change messages. The chapter begins by laying the groundwork for the study of climate change communication, first describing climate change and the critical need to address it through communication. It discusses the efforts made by governments and other stakeholders to address climate variability through improved technologies and advanced farming methods. Recognizing, however, that this alone will not solve the problem: effective communication and messaging are required to assist farmers in understanding such a difficult subject. The chapter examines the study's various disciplines and theories, including communication, development communication, and social behavior change communication theories. It goes into detail about the role of social behavior change communication approaches in designing climate change adaptation messages, as well as how this is happening on a global, regional, and Kenyan scale. To study messaging, literature on social learning and lay expert theories are used. The chapter also looks at the importance of, and challenges associated with communicating climate change adaptation technologies to farmers.

#### **2.1 Communicating Climate Change**

Climate change, which includes global warming, is the most severe and widespread threat to local and global communities. It is a complex and challenging threat to communicate, as it is elusive and difficult to understand (Moser & Dilling, 2004; cited by Van Der Linden, 2014). facilitate targeted and effective responses to this multifaceted threat. Therefore, it is

imperative that nations act with confidence and a sense of urgency to address climate change in a manner that befits its magnitude and complexity. When employed efficiently, communication can raise awareness of the phenomenon and motivate people to act. Indeed, communicating climate change effectively is an essential step toward creating an enabling environment for widespread community adaptation.

Little attention has been paid to exploring what is known about effectively communicating climate change for adaptation in semi-arid regions like Machakos, where this research was carried out despite the uniqueness of these dry regions, according to McGahey & Lumosi (2018). This research responds to this need and seeks to understand the challenge of communicating the concept and how it affects adaptation to climate change. However, before delving deeper into climate change communication, the section below will discuss the magnitude of the climate change challenge to agriculture.

### **2.1.1. Impact of Climate Change on Agriculture**

Extreme weather events are predicted to become more frequent in the upcoming years because of the global effects of climate change. According to Chemonics (2019), there is a chance that issues with food and water security will worsen globally, making communities more vulnerable to climate-related risks like rising sea levels and extreme weather. Heat waves will likely shift the distribution of water- and vector-borne diseases, increasing mortality. The substantial social, economic, and environmental effects of climate change will make it harder for people to maintain traditional lifestyles, worsen conflicts, and worsen humanitarian crises.

In fact, because of climate variability, farmers—including those in east and southern Africa—are dealing with three main threats that are becoming more and more problematic: pests and diseases; changes in temperature and moisture conditions allow pests and crop diseases to spread to new areas, weakening the resistance of crops and livestock; extreme weather, which is volatile weather that manifests in increased heat waves, cold snaps, droughts, and frosts. The most severe drought in decades in this region was experienced in 2016. It dramatically reduced harvests and left many families hungry (One Acre Fund, 2020).

Agriculture in Africa is particularly vulnerable to the effects of climate change due to its heavy reliance on rainfall, and climate change has had a significant impact on rainfall across the continent (Ray, 2021). Unfortunately, projections indicate that Africa's remaining glaciers will likely melt in the next decade due to rising temperatures or global warming, leading to increased food poverty and population displacement. A study published last year revealed that if global temperatures rise by four degrees Celsius by 2100, maize yields in some African countries could decline by more than 20% (World Meteorological Organization, 2021).

It has been widely recognized that Africa is one of the most vulnerable regions in the world when it comes to the effects of climate change. In fact, eight out of ten of the most vulnerable countries are located on the continent, according to the ND-GAIN Index. The rising temperatures have caused a significant decline in the agricultural productivity of Africa, estimated to be around 34% since 1961. This reduction is the most significant in any other region worldwide, as stated by the UNDRR in 2023.

It has finally been accepted globally that the long-term global response to climate change must include adaptation as a critical strategy for protecting ecosystems, human livelihoods, and populations. Specifically, communities must be resilient in the face of climate variability and anticipated changes; this is especially true for those whose means of subsistence—such as the farmers in Machakos—are highly vulnerable to climate change. Simply put, to address the present and future impacts of climate change, countries and communities must develop adaptation plans and implement them (2024 UN).

As climate change accelerates, responding to its consequences becomes more complex and costly. To assist farmers in adapting to climate change, numerous stakeholders, including governments, have invested in improving environmental quality and raising agricultural productivity. According to Percy (2013), to adapt to climate change, farmers must improve and adjust their farming practices globally. Using risk-reduction techniques like cereal banks, drought-tolerant seeds, income diversification, weather-based insurance policies, and early warning systems are some examples of this. Similarly, Nhemachena (2007) emphasizes that adaptation requires changing farming practices in response to the conditions brought on by climate change.

Mwaniki et al. (2017) also concludes that farmers' ability to adapt to changing climates is critical given the threat of climate change. According to this group of researchers, agricultural extension services are essential in promoting the growth of the farming industry by equipping farmers with relevant, practical, and timely messages on technologies, to tackle climate change related challenges. This is particularly crucial for African farmers, who are largely aware of climate change but lack the required technological, financial, and informational

resources to adapt adequately (BBC et al., 2010; Gifford, 2011). Scholars and practitioners across the globe agree that more than scientific engineering and organizational solutions are needed because, despite the availability of these innovations, farmers need to adapt at the expected rate. African leaders recently underlined at the Africa Climate Summit 2023 how crucial it is to incorporate citizen science and indigenous knowledge into early warning systems and adaptation plans. (Climate Action Africa, 2023).

Kenya's location in the Greater Horn of Africa makes it highly susceptible to climate variability, posing significant economic risks. The country frequently experiences droughts, often followed by heavy rainfall that triggers flash floods. An estimated 70% of natural disasters in Kenya are linked to extreme weather events, including severe droughts occurring roughly every decade and moderate droughts or floods every three to four years (World Bank, 2023). These recurring climate extremes have had severe socioeconomic consequences, leading to high economic costs, weakening community resilience, and disrupting ecosystems and livelihoods (Government of Kenya, 2023; IMF, 2024).

In Machakos County, where this research was carried out, agriculture is the primary source of livelihood, employing about 73 percent of the population and contributing about 70 percent of the household income (Kenya Climate Smart, 2021). Farming practices in the region vary greatly, ranging from small-scale, intensive cultivation to large-scale farms growing food and high-value cash crops. Farmers use a combination of traditional and modern machinery, and the crops grown are diverse. Unpredictable weather patterns limited agricultural input use, inadequate land preparation, delayed planting, improper weeding, and the use of subpar seeds are all factors that contribute to low crop yields.

Maize and beans are the primary staples in households, and various pulses like beans, pigeon peas, cowpeas, green grams, and chickpeas are grown throughout the district. Under the right conditions, the district can achieve pulse self-sufficiency. However, due to unpredictable rainfall, the region frequently experiences food shortages. Despite the potential for drought-tolerant crops like sorghum, millet, potatoes, bananas, and cassava to improve food security, their adoption remains limited due to prevailing attitudes and dietary habits (Ngugi, 2011).

### **2.1.2 Challenges of Climate Change in Machakos County**

Machakos receives an annual rainfall of roughly 500mm to 1300mm, making it a county classified as an Arid and Semi-Arid Land (ASAL) (Kenya et al., 2021). The short rain usually falls between October and December, and the long rains typically happen from March to May. July is the coldest month, while October and March are the warmest, with temperatures varying from 18°C to 29°C. High temperatures and little rainfall cause moisture stress in the area, though floods occasionally occur along the Athi River (Ngugi et al. 2011).

It is finally accepted globally that the long-term global response to climate change must include adaptation as a critical strategy for protecting ecosystems, human livelihoods, and populations. Specifically, communities must be resilient in the face of climate variability and anticipated changes; this is especially true for those whose means of subsistence—such as the farmers in Machakos—are highly vulnerable to climate change. Preparation entails adapting ecological, social, and economic systems in response to climate change. To put it simply, nations and communities need to create adaptation plans and put them into action to respond to the impact of current and future effects of climate change (2024 UN).

### **2.1.3. Challenges of Communicating Adaptation**

Effective methods of education and communication about climate change are essential for motivating and enabling the public to participate in efforts to mitigate and adapt to climate change, as stated by Mwaniki et al. (2017). However, it is one area that needs more attention, says Lorez (2020). According to many scholars and practitioners, including Mwaniki et al. (2017), a significant barrier to communicating coping strategies in the face of climate change is that Climate change communication "is as complex as science." Moser (2010) argues that the issue of communicating climate change to the public is compounded by the fact that the subject matter is complex – while the climate itself is uncertain and unpredictable!

Sanchez (2016) emphasizes the difficulty of effectively communicating the uncertainties, complexity, and risks associated with climate change. He claims that simplifying such a complex phenomenon requires a lot of work. Furthermore, he observes that fundamental climate change issues frequently require attention due to a misinterpretation of their nature. While the fundamental concept of climate change—global warming caused by human-caused greenhouse gas emissions—is widely accepted, Sanchez (2016) contends that the specifics and potential solutions are frequently oversimplified or dismissed as theoretical.

Otieno and Pauka (BBC et al., 2010) lament that climate change has become a global priority for at least 20 years. They claim this is because the scientific information was communicated as complex, confusing, and sometimes contested. As a result, the public and political responses to the climate crisis could have been faster. Many people believe that climate change still needs to be understood.

Furthermore, Sachs of the Earth Institute (cited by Shome and Marx, 2009; Weingart et al., quoted by Van Der Linden, 2013) contends that social psychologists are aware of the difficulties that individuals and groups face in processing and responding effectively to information about long-term and complex societal challenges such as climate change and new technologies due to their painstaking scientific nature. He suggests that the public's knowledge, attitude, perception, and desired behavior are greatly influenced by the way information is framed and conveyed.

According to Mwaniki (2017), Moser and Wibeck (2012, 2014) suggest that alarmist messages that only focus on the negative impacts of climate change without providing any solutions can often lead individuals to ignore the information, shift responsibility onto others, or rationalize their unsustainable behavior, sometimes attributing it to a higher power. They argue that the absence of cultural narratives or compelling stories that encourage involvement and stimulate interest in climate change, as well as the influence of individuals' worldviews, religious beliefs, and a perceived lack of urgency, all contribute to a lack of adaptation.

Additionally, communicating about climate change and adaptation has been top-down, with scientists churning out information expecting behavior change simply because they have provided the information. Lumosi and Mcgahey (2017) have identified a key communication barrier in disseminating climate change information among vulnerable rural communities. They note that these communities rarely produce climate information or design specific adaptation tools or advice, which hinder their relevance at the local level. Moreover, the top-down approach to messaging and dissemination of new technologies to counter climate

change has not yet brought about transformational change, which is needed due to the urgency of combating climate change.

Indeed, according to Vermeulen et al. (2018), transformative and transformational adaptation concepts have surfaced recently to address the need for significant, non-marginal transitions in agriculture in response to climate change. However, scholars and climate change stakeholders argue that addressing rapid shifts and tipping points in food production under climate change demands more than just incremental adaptation. Whereas there are no one-size-fits-all solutions to effectively communicate climate change in ways that lead to behavior change and increase the capacity to adapt (Nerlich et al., 2010, cited by Mwaniki et al., 2017), this research has borrowed the SBCC approach that has been used in other fields like health to study climate adaptation due to the urgency and need for societal behavioral transformational change. At the heart of smallholders' climate change adaptation and risk reduction measures is the need for humans to modify existing behaviors or adopt new ones for individuals and households to maintain their livelihoods.

This approach can help to identify problems, raise awareness, encourage dialogue, and influence behavioral change (Johnson, 2011; Moser, 2010; Nerlich et al., 2010, as cited in Harvey et al., 2012). Though a critical approach, SBCC is an underutilized discipline in climate adaptation, yet it can help individuals and communities adapt to near- and long-term climate changes (Lee, 2019). The approach was selected for this research as it is the most robust and used approach in advancing effective communication in health campaigns, especially in Africa, where societal changes need to happen.

#### **2.1.4. Social Behavior Change Communication for Climate Change Adaptation**

USAID (2016) defines SBCC, previously known as Behavior Change Communication (BCC), as the intentional use of communication strategies to influence shifts in norms, beliefs, behaviors, and knowledge. Its goal is to help people break old habits and adopt new ones. This approach is research-based, interactive, and theoretical. Chemonics (2019) emphasizes that SBCC is a systematic process that uses research and theory-based strategies to identify opportunities for behavioral change at the individual, community, and societal levels.

Moreover, SBCC is used because it offers an opportunity to study how the numerous factors that influence behaviour change, such as values, beliefs, attitudes, preferences, habits, costs and benefits assessments, social norms, policies, and institutions, are considered in messaging. Among these factors, SBCC distinguishes those that are either facilitators (called enablers) or those that can be barriers of change. Field-based or formative research is meant to identify and test the enablers or barriers of change. In a climate change adaptation situation, such research can help design successful SBCC strategic programs that support climate change adaptation programming and contribute to its success.

Varinder Pal Kaur (2022) posits that an SBCC strategy document serves as a valuable tool in guiding intervention design, pinpointing target audiences, setting communication goals, and selecting cohesive messages, resources, and activities to be delivered across various channels. This study will leverage the practicality of this approach to examine how messages were crafted and to gain insights into the factors that influenced their design.

Additionally, SBCC was selected for the study because of its focus on the community as a unit of change. This approach is necessary for large-scale behavioral change, as it prioritizes the community rather than the individual. According to Abamecha et al. (2012), this community-focused approach has been proven effective for advancing community engagement for sustainable development and behavior change. The approach allows communities to define their needs while implementing collective community action based on negotiated partnerships and joint ownership of the change process. SBCC also emphasizes the community's control over communication tools, empowering them and facilitating shifts in social norms, culture, and policies (Egyankosh, 2022).

Perlman et al. (2013) suggest that the community participation element of SBCC resonates well with longstanding African cultural values like good neighborliness and extended family systems. These values could inspire communities, especially in rural settings, to join forces in overcoming the structural and cultural barriers that impede individuals from adapting to climate change. When it comes to advancing community engagement for sustainable development, this approach has been proven effective for behavior change says Abamecha et al. (2012).

It is not surprising that research and practice are increasingly focusing on the potential of SBCC, particularly social learning, to tackle complex social and environmental challenges, such as climate change adaptation. According to Harvey & Ensor (2015), researchers and practitioners recognize that SBCC's success in driving change in global public health campaigns can be replicated in climate adaptation. This is because it can help modify behavior, as stated by USAID (2019).

### **2.1.5 Current State of SBCC for Climate Change Adaptation**

Van Der Linden contends that rather than bringing about transformational change, public intervention campaigns globally usually only result in small behavioral adjustments. This study addresses this concern. For instance, a 1999 mass public media campaign in the UK, '*Are you doing your bit,*' resulted in minimal shifts in attitudes and behaviors (O'Neill & Hulme, as cited in Van Der Linden, 2013). He contends that the way information about climate change is framed and disseminated greatly influences the public's understanding, attitudes, and perceptions. This sentiment is echoed by Whitmarsh et al. (2013), who highlight the notable gap between public discourse and the lack of substantial behavioral change observed in response to climate change messages. Despite expressing general awareness and concern about climate change in public polls, individuals often hesitate to take personal action.

Van Der Linden (2013) highlights a content analysis by Devine-Wright which indicates that public behavioral change campaigns in the past have primarily relied on a deficit model of human behavior, and this trend appears to be continuing. Van der Linden (2013) states that more and more recent research is highlighting the need for communication interventions to be more locally relevant and designed to involve and engage the public with climate change meaningfully.

Obeng et al. (2013) argue that developing nations face heightened vulnerability to climate change but lack effective communication strategies to address this challenge. They highlight the limited understanding and awareness in these regions regarding the potential long-term impacts of climate change on livelihoods and development. Furthermore, vulnerable

communities frequently lack access to trustworthy information sources that are essential for efficient risk management and adaptation planning, and there is a lack of institutional capacity to produce and disseminate information about climate change. Climate risk communication results from adaptation efforts that typically occur naturally rather than through planned initiatives (Christoplos et al., 2009, as cited in Obeng et al., 2013).

Pirio (2019) asserts that previous attempts to convey the urgency of climate change have been insufficient in their emphasis on simply sharing information, rather than fostering a deeper comprehension of the challenges posed by adaptation, cultivating awareness of potential pathways to adaptation, facilitating dialogue, and ultimately, influencing behavioral change. In Ensor et al.'s (2012) study, they emphasized the importance of effective communication in promoting successful adaptation to climate change. They noted that early climate change communication often presented the issue as complex and abstract here in Africa.

Vogel et al. (2006), discussing the same issue from Southern Africa, provided an example to illustrate that climate information, such as seasonal climate forecasts, has the potential to serve as a valuable tool for early-warning systems and agricultural risk management. However, they expressed concern that the region is not fully realizing this potential due to the complex way the information is communicated.

Effectively communicating climate change adaptation in developing countries presents a unique challenge. The complex intersection of scientific, practitioner, and traditional knowledge systems, combined with power and agency dynamics among rural poor communities, creates a sensitive and intricate landscape for communicators to navigate (Naess 2013 & Kihupi 2003). It is a linear process with no feedback or transactional processes in

which messages flow from the center to the periphery. As a result, Harvey et al. (2012) contend that certain climate communication processes may unintentionally legitimize or prioritize specific types of knowledge, reinforcing structural power relationships.

Certainly, the messages and modes of transmission are centered on the agents of change rather than the recipients. This begs the question of how effective present communications initiatives are at influencing social and perception changes about the difficulty of climate change adaptation in the global south, and particularly in its semi-arid regions. Various researchers have emphasized the importance of effective climate change communication in influencing how different groups respond to the issue of adaptation. McGahey & Lumosi (2018) cite Filho (2009), Moser (2014), and Moser and Ekstrom (2010) in support of this. They say that successful communication can help bridge the gap between scientific knowledge on climate change and public understanding. It can raise awareness, encourage dialogue, and influence behavioral change. Ensor J., et al. (2012) cite Moser & Dilling (2012) and Nerlich et al. (2010) in this regard.

According to Ensor & Harvey (2015), there is widespread agreement globally that adaptation needs to go beyond a focus on information provision and instead become embedded in processes that support learning for behavior change to occur. This is supported by recent research surveying the views of development practitioners concerned with climate change adaptation. In this instance, SBCC would provide such educational procedures. It serves as an effective method to counteract the conventional linear communication approach. Historically, climate information in the region has been utilized in isolation, often presented in "stand-alone" climate outlook forums. This traditional approach operates in a linear manner, with

information transferred directly from the producer to the user, thereby neglecting the broader and intricate social context in which this information is situated. According to Vogel (2006) the way in which climate information is currently being communicated is an inefficient strategy for addressing climatic variability and food security. He believes that different ways of interacting should be discovered to manage climate threats in the area sustainably.

Indeed, the communication of climate information in Kenya continues to face significant challenges. Cultural norms and institutional rigidity often hinder the adoption of climate-resilient practices, as many communities rely on traditional methods to cope with climate variability. Resistance to adopting climate-adaptive seeds, crops, and livestock is particularly evident, driven by deeply ingrained values and motivations that prioritize conventional agricultural practices. Additionally, limited technical capacity and inadequate training on climate information and data management prevent effective interpretation and utilization of climate forecasts. This gap underscores the need for more participatory and localized approaches to climate communication, ensuring that information is not only accessible but also relevant to the unique socio-cultural contexts of different communities (Ministry of Environment, Climate Change, and Forestry 2024; Vogel, 2006).

## **2.2 Situating the study in the field of Communication for Development**

This study is situated in the field of Communication for Development because C4D promotes social development. It refers to the practice of systematically applying the processes, strategies, and principles of communication to bring about positive social change. As noted by Devjournalism (2011), the emergence of communication sciences in the 1950s marked the

acknowledgment of the field as an academic discipline, with Daniel Lerner, Wilbur Schramm, and Everett Rogers among the earliest influential proponents.

As per Devjournalism's report from 2011, Nora C. Quebral is credited with introducing the term "Development Communication" in 1972. Quebral's definition notes that it is the art and science of human communication linked to transformation from poverty to socio-economic growth. This transformation is intended to promote greater equity and individual potential realization.

According to Figueroa et al. (2002), says attempt at defining it came during a series of communication for social change meetings in 1997–2000 between community organizers, social change activists, broadcasters from 12 different countries, and communication professionals. The meetings aimed to explore the possibilities of novel communication strategies for fostering social change and to explore the interplay between social change and communications in the modern era. The team put forward a definition of communication for social change, portraying it as "a process involving both public and private dialogues, where individuals define their identity, articulate their aspirations, and strategize the means to attain their goals.

In 2006, the World Congress for Development Communication developed a new definition during their meeting. This definition is called the Rome Consensus, and it defines development communication as a social process that involves dialogue, the use of various tools and methods, and seeks change through listening, building trust, sharing knowledge and skills, building policies, debating, and continuous learning for meaningful and sustained change.

At the congress, the participants reached a consensus on the key components of a social change model. They stressed that the sustainability of social change requires that those most affected - individuals and communities - take ownership of the process and communication content. The approach should be empowering, horizontal, and inclusive of all members of the community, including those who were previously overlooked. Local content and ownership is critical, and communities must be the agents of their own change. Rather than using persuasion and transmitting information from outside technical experts, the approach should prioritize dialogue, debate, and negotiation on issues that resonate with community members. Outcomes should shift the focus from individual behavior to social norms, policies, culture, and the supporting environment. (World Congress for Development Communication, 2006).

The United Nations has classified Communication for Development (C4D) into four main categories or "strands". These include behavior change communication, communication for social change, advocacy communication, and media advocacy. It is important to note that these strands are not mutually exclusive and can often intersect and overlap with one another (United et al., 2011). For this study, the spotlight is on the strand of Communication for Social Change, also known as Social Behavior Change Communication and participatory communication, recognizing the noteworthy convergence among these C4D approaches.

### **2.3 Review of relevant theories**

Theoretical perspectives for this study were drawn from extensive reviews of climate change communication literature, specifically C4D discipline and participatory communication. SBCC is based on the Social Learning Theory, which explains how people learn new behaviors, attitudes, and actions by observing, imitating, and interacting in social

environments. Using this framework, SBCC interventions aim to encourage changes in behavior by influencing social norms, beliefs, and practices through effective communication strategies. The social learning theory was found relevant since it can be used to investigate climate adaptation messaging and how the farmers are learning about climate change in Machakos County, Kenya.

### **2.3.1. Social learning theory**

Social Learning Theory was applied to examine question two, which explores how experts design and disseminate climate adaptation messages. This theory explains how farmers absorb, internalize, and potentially adopt adaptation practices through observation and interaction. It is also relevant to question three, as it helps understand how farmers' perceptions are influenced by peer interactions and their observations of how others respond to the messages.

The theory is now widely acknowledged as crucial in promoting sustainable resource management and encouraging desirable behavior (Muro & Jeffrey, 2008). Developed by Bandura in 1997, the theory delves into the intricacies of human cognition and the environmental factors that shape our behavior. According to SLT, individuals learn and model behaviors through social interactions, particularly when those interactions are positive and accompanied by rewards. This theory emphasizes the impact of observation and social influence on human learning and behavior.

In 1963, he first formulated the theory, highlighting the idea that imitation is how people learn. Bandura (1997) asserts that imitation is the replication of observed motor actions.

Models are the people being observed, and modeling is the process of learning. People look up to role models in their environment, which can include family members, friends, and peers. Those with whom they can identify and are motivated to imitate. For example, students reinforce their actions by imitating and copying until they form a habit (Bandura, 1997, retrieved Jun 10, 2022). However, Bandura noted that observing models alone cannot lead people to adapt to change. He later introduced the social cognitive theory to emphasize that a three-way relationship between cognitive factors, environmental influences, and behavior determines human behavior.

Bandura (1997, retrieved Jun 10, 2022) introduced the concept of self-efficacy, which states that individual choices, effort, and feelings about those choices are affected by their beliefs about their abilities to perform certain behaviors to achieve specific outcomes. He revised the theory, therefore, and argued that learning is both behavioral and cognitive. Cognitive factors (or personal factors) include knowledge, skill, self-efficacy, outcome expectations, and individual goals (Munroe 2008).

Monroe (2008) later revised the theory in 1986. He contended that environmental factors, including social norms, access to the community, and influence on others (the ability to change their environment), are vital in changing behavior. Behavior factors include practice, frequency, and consistency. Message designers must understand these factors as they plan for behavior change pathways. In determining an individual's behavior during the learning process, Bandura assigned equal weight to the three domains of environment, behavior, and cognition, unlike other theorists who attribute more significant influence to one of the three realms.

This section considers a few aspects of the theory relevant to understanding the messaging of climate change adaptation. One of those considerations is the cognitive (personal) factors that influence change, such as knowledge, skill, and self-efficacy, which are relevant to this research. To begin, recipients must know a foundation for engaging in a new behavior. First, as a prerequisite for change, service providers must recognize the importance of providing critical information so that people understand the risk and the conditions that put them at risk, says Maibach and Cotton (1995).

Secondly, message designers must consider skill-building messages to systematically deconstruct old behavior and bring components demonstrating how to reconstruct the behavior into a new one. Such skill-building messages begin by modeling or explaining what successful behavior performance looks like, preferably using various models. In other words, cognitive, social, and behavioral skills must be identified and modeled. This is extremely helpful in the case of complex behavior adaptation like climate change adaptation. Verbal and behavioral modeling should be used to explain and demonstrate.

According to Bandura (1986 cited by Maibach & Cotton 1995), ideally, recipients should be provided with an opportunity to practice modeled behavior to maximize skill acquisition and confidence applied. This study explored how behavior was modeled through the various communication formats and whether they could build skill and lead to adaptation. For example, the primary communication tool, the weather forecast flier – are the messages modeling behavior? Based on their presentation, the research drew a conclusion on whether they gave farmers a chance to practice behavior to build skills.

At the personal level, the third important concept of social learning theory is self-efficacy. This refers to people's belief in their ability to complete a task. According to Bandura (1986), humans will usually avoid functions that make them feel incompetent while pursuing those that make them feel capable (Bandura, 1986). Self-efficacy in messaging can be influenced by performance mastery, observational learning, and verbal persuasion about one's capability (Bandura, 1986). One question to consider in this case is whether climate adaptation messages promote a sense of ability to perform. Is the farmer willing to change because of the messages? (Maibach & Cotton, 1995).

Regarding self-efficacy, Bharwani et al. (2016) write that the best-known model of individual adaptation identifies three key factors that influence people's engagement with adaptation: their belief in their abilities ("self-efficacy"), their perception of risk, and their perception of the effectiveness of adaptive measures. These factors are all related to adaptation research. Hence, regarding self-efficacy, attitudes, beliefs, and perceptions of the benefits, risks, or seriousness of the issue being addressed by the program are frequently motivating factors. Farmers' attitudes toward new crop varieties, beliefs about the causes of droughts, risk perceptions associated with droughts, or use of the latest crop varieties will drive their motivation to adapt to climate change in this case.

Social learning's fourth and most influential aspect lies in its occurrence within social groups, as individuals learn by observing and imitating others, in contrast to individual learning, which focuses solely on the learning of a single person. Keen (2005, as cited by Ensor, 2015) defines social learning as the collective action and reflection that occurs among individuals and groups as they strive to enhance the management of the interrelationships between social

and ecological systems. As per the theory, personal knowledge is often incomplete and influenced by limited experiences, which may not align with others' perceptions (Egunyu, 2015). To circumvent this obstacle, the theory advocates for knowledge-sharing and collaborative learning among stakeholders. By pooling their insights and exploring their circumstances together, novel and collective forms of knowledge can emerge.

Collins & Ison (2009) also insist that the term social learning has emerged in response to a growing recognition that learning occurs through situated and collective engagement with others. They note that the adoption of adaptive practices by individuals is significantly influenced by the modelling of behavior, a fundamental concept in social learning theory, in the context of climate change communication and adaptation. People are more likely to take on similar adaptive behaviors themselves when they watch and imitate the behaviors of others, especially those they regard as role models or experts. Using this knowledge, message designers can inspire others to adapt to climate-related challenges by showcasing the actions of well-respected community members. Furthermore, the creation of social norms that support adaptive behaviors and raise people's self-efficacy, their confidence in their capacity to carry out such actions—further stimulate behavior change within communities and promotes the widespread adoption of adaptation strategies against climate change.

Lastly, this study looked at environmental factors that influence learning. Here, the issues of consideration are social norms, access to community, and the ability to change others or the environment. The C-Change project (2012) emphasized the critical role of norms in SBCC. The project highlighted the significant impact of perceived norms, social norms, cultural norms, and gender norms on individual behavior. The norms and values of a community or

group can have a big impact on what people do. While social and cultural norms are the views that members of a community hold based on their social or cultural standing, perceived norms are the expectations that people think others have of them. Gender norms also play a role in shaping expectations for male and female behavior in society. As a result, messaging can be assessed based on the anticipated behaviors of male or female farmers.

In the social learning theory, Bandura also states that observational learning from a model (a farmer) is a four-stage cognitive process that involves attention, retention, reproduction, and motivation. Bandura refers to these as the four principles of social learning. First, individuals must pay attention to the model in order to learn something new at a cognitive level. Bandura argues that the learner acquires knowledge by focusing on social behavior. However, the ability to pay attention depends on the accessibility of what is being observed, its relevance, the complexity of the behavior, perceived value, and the cognitive abilities and preconceptions of the observer. This theory has important implications for SBCC programming, as it suggests that messages must be engaging, tailored to the local context, understandable, and appealing to the intended audience(s). To assess attention to the message, the weather advisory flyer was distributed to farmers to gather their perspectives on these factors.

Secondly, messages need to be retention-friendly; people need to be able to store "new" knowledge about the behavior that is being modelled for later use. The behavior is retained by the observer, who can then use it to mimic the behavior in the future. This can be achieved, according to the HC3 primer (2012), by making sure that the messages or the model are memorable or by providing materials for participants to use as a guide after an event. For the

smallholder farmers who are engaging in content that is introducing them to a totally new way of doing things, this is critical. Messages need to be memorable, and materials are given to them for use after meetings with other farmers and service providers. The HC3 primer (2012) suggests that this could involve organizing listening groups or discussion groups for radio drama to reinforce new behaviors. This study investigated the Weather Advisory flier, one of the vital adaptation 'publications' produced for farmers to refer to during farm management in the face of climate change while exploring whether the message designers had other face-to-face forums.

Thirdly, an issue to consider in the theory is the issue of reproduction or repetition. According to Bandura, the observer imitates the behavior in a new social setting and gets input from other observers, which they can utilize to modify the behavior in subsequent situations. Here, the learner needs to practice the new behavior to fully comprehend it, as repeated application of the behavior results in both long-term social change and behavior mastery (HC3, May 3, 2012). The format and communication of messages to smallholder farmers was studied under the guidance of this concept. In general, the study aimed to investigate whether the dissemination pathway encouraged individual farmers to adopt the behavior.

He says that the observer repeats behavior in a different social context and receives feedback from other observers, which they can use to adjust how they perform the behaviors in future contexts. Here, the learner must re-enact the new behavior to understand it because the repeated performance of the behavior leads to mastery of the behavior and long-term social change (HC3, May 3, 2012). This idea guided the study of how messages are formatted and communicated to smallholder farmers. Overall, when it came to the dissemination pathway,

the study sought to examine whether they promoted individual farmers' enactment of the behavior.

The fourth and final principle asserts that an observer's motivation to replicate behaviors is determined by the social reactions and repercussions they experience when they mimic an action. For the behavior to successfully spread, people need to be sufficiently motivated to engage in it on their own. By encouraging community members to share their experiences so that others can benefit from their success, or by showcasing successful characters in a message, SBCC can boost motivation (HC3 Primer, retrieved 9.11.2022). According to the C-Change project, messages can be assessed according to whether the content inspires change.

Trust has also been cited as a significant benefit of social learning theory and social behavior change theories and approaches, particularly in complex subjects such as climate change adaptation. In climate communication, trust is essential, but because weather patterns are unpredictable, people remain skeptical of messages and messengers, including scientists, which hinders public participation. Individuals are more likely to interact with messages they believe in, and building trust is largely dependent on the credibility of the source.

For trust to work, therefore, knowledge mediators, potential change agents and champions play a critical role in SBCC and social learning strategies. These change agents act as primary messengers, secondary interpreters of knowledge, and "champions" of change. They may also be the first to adopt technology or behavior and serve as role models for others. Message designers can also build trust by building relationships during 'co-exploration' sessions. Bharwani & Vulturius (2016) say such a relationship calls for listening to the farmers, for example, understanding the cultural or other environmental factors that influence farmers'

beliefs. This takes time but so does building trust and changing behavior. Studies highlight people's heightened receptivity to messages from sources that match their opinions, experiences, or situations (Stoknes, 2014; Kahan et al., 2011; Malka et al., 2009, as cited in Bharwani & Vulturius, 2016). Furthermore, people's interpretations and reactions to information in climate communication are strongly influenced by their level of trust.

In conclusion, social learning principles can be applied to practically any program that aims to influence social behaviors, especially complex or interpersonal behaviors, as stated by the Health Communication Capacity Collaborative (HC3). The complicated issue of adaptation of climate change calls for a change from previous methods, which is meant to take place during unpredictability brought on by weather variability. When trying to motivate farmers to use new technologies to adapt to climate change, it might be helpful. Although it can be difficult to describe a particular behavior, it can be explained by modelling or demonstration.

Being able to model or illustrate the required changes in behavior makes social learning theory ideal for influencing behavior and adaptation. The theory is regarded as highly effective in shaping behavior and facilitating adaptation through demonstration of the required changes. According to the principles of SLT, an individual learns by observing the behaviors of others and overcomes challenges of changing their behavior by making new behaviors seem more familiar through social encouragement. It was chosen for this study because it helps us understand how farmers best learn about new technologies and the influence of others through social support - in this case, farmer groups where they meet to share their experiences with climate adaptation.

In a peer review investigation into social learning in natural resource management, Ensor and Harvey (2015) noted that employing social learning methods resulted in cognitive learning (acquiring factual knowledge), normative learning (changes in norms, values, and belief systems), and relational learning (building trust, understanding of others' perspectives, and more) across individual, network, and systemic levels. Likewise, Shaw and Kristjanson (2014) investigated social learning approaches in agriculture and found that cooperation among socially diverse groups, including smallholder farmers, women, and indigenous communities, resulted in enhanced adoption of new technologies. Moreover, investigations carried out by Shaw and Kristjanson (2014) demonstrated that social learning can yield numerous advantages, including accelerating learning, contributing to the development of knowledge. These results can play a crucial role in enhancing the adaptive capacities of individuals and communities.

Ensor and Harvey (2015), therefore conclude that recent research involving development practitioners engaged in climate change adaptation indicates a widespread agreement that adaptation should extend beyond providing information to include processes that facilitate learning. Their research emphasizes the practitioners' call for increased local engagement to promote information sharing and knowledge building. It is suggested that adaptation should encourage behavioral and socio-institutional changes. One survey respondent specifically emphasized the need for tools and methodologies that facilitate people's adaptation and encourage different approaches. These sentiments align with a growing body of literature linking climate change adaptation, development, and social learning.

The social learning perspective is valuable, but it can't solve climate change universally. Scholars such as Mudombi et al. (2017), Pahl-Wostl, Harvey et al. (2006, 2013), and Reed et al. (2010) have noted that social learning theory (SLT) is broad and lacks a clear framework. Reed et al. (2010) have also claimed that the definition of SLT is overly broad and could include almost any social process. Furthermore, Allan and Wilson (2009:389), as cited by Mudombi (2017), have pointed out that it's not always clear how SLT translates into practice or what the barriers to social learning. Others, such as Mathevet et al. (2011) and Sterman (1994, cited by Mudombi et al., 2017), argue that impediments to learning can be found in personal cognitive factors that affect individuals' motivation and capacity or in organizational (community) factors that frustrate individuals and stifle learning.

According to Ensor and Harvey (2015), social learning's reliance on local knowledge might lead to inaccuracies due to outdated or incorrect information. The approach's community engagement focus could need more structure, making it challenging to effectively communicate critical climate change information. Despite its limitations, social learning remains essential to enhancing adaptive capacity and seeking lasting solutions to the challenges of climate change within communities.

While recognizing that social learning alone cannot fully address the complexities of climate change, it's important to emphasize its significance as a fundamental component in developing sustainable solutions to the challenge by bolstering the adaptive capacity of communities. The theory was chosen as the theoretical framework for this study because of its diverse contributions and close alignment with the research objectives. One primary reason for its selection is its emphasis on incorporating local knowledge and experiences in the

learning process. This is of paramount importance in climate change adaptation, as it ensures that the messaging strategies developed are contextually relevant and tailored to the specific needs of local communities. By recognizing the value of community wisdom, social learning theory directly addresses the challenge of crafting effective adaptation messages that resonate with the target audience.

Furthermore, the theory's emphasis on community engagement and interaction consistently encourages a participatory approach to messaging. This approach promotes collaboration among diverse stakeholders, such as farmers, scientists, and practitioners, by establishing a platform where different points of view can collaborate to shape the messaging process. This is consistent with the research's goal of involving various actors in developing adaptation messages, resulting in a more comprehensive and inclusive strategy.

The theory's emphasis on collaborative learning processes is also essential in motivating farmers to actively contribute their insights and experiences. This resonates with the research's intention to empower farmers as active participants in shaping the messages that impact their lives. Additionally, social learning theory's attention to power dynamics and equitable participation aligns with the research's ethical considerations, emphasizing the importance of ensuring that all voices, particularly marginalized ones, are recognized and valued.

In conclusion, social learning theory was chosen for this study because it addresses the difficulties associated with messaging related to climate change adaptation. In addition to directly supporting the research objectives, its emphasis on local knowledge, community

engagement, collaborative learning, and consideration of power dynamics also ensures that the

### **2.3.2. Lay Knowledge Theory**

The lay expertise model, rooted in local knowledge or 'lay knowledge,' is a valuable complement to social learning theory. The theory was relevant for the study question one on the adaptation messages shared with farmers and question three on the perceptions farmers have of the messages. Since my research question explored the messages communicated to farmers, the theory suggests an interest in understanding the nature of the information reaching them, how it aligns with their existing knowledge, and how they make sense of it.

This model highlights the significance of engaging with farmers and rejecting the top-down, linear approach to message development. Proponents of the lay knowledge approach emphasize the need for communication efforts to acknowledge the information, knowledge, and expertise already present within communities when addressing scientific and technical issues such as climate change (Lewenstein, 2003). This knowledge is not abstract, but it is rooted in people's real lives and histories, such as specific local farming or agricultural practices. The lay expertise model acknowledges that scientists often overestimate their knowledge, failing to acknowledge uncertainties or the need for additional information to make real-world decisions (Lewenstein, 2003).

Scientists and other message developers must adopt a humble approach to engage farmers and support their participation in bringing about change and effectively adapting to climate change. They should allow farmers to diagnose the problems they face, make well-informed

decisions, mobilize for action, and accept responsibility for the changes they need to see. In this context, development agents should see themselves as change facilitators rather than solution providers, respecting and valuing the knowledge and experiences of farmers.

The deficit model, a scientific communication theory that holds that technical problems like climate adaptation may be solved by simply filling in knowledge or information gaps, gave rise to the lay expert model. According to this concept, the solution is one-way linear communication between communities and specialists. If you keep giving forth information, eventually, people will change. Because of criticism that it was highly simplistic, this strategy gave rise to the lay expert paradigm.

The deficit model, a scientific communication theory that suggests technical problems like climate adaptation can be solved by simply filling in knowledge or information gaps, has been criticized for its oversimplification and inaccurate characterization of the relationship between knowledge, attitudes, beliefs, and behaviors, particularly for politicized issues like climate change. Despite these criticisms, it continues to be part of climate change and research. To address its inadequacies, scholars and practitioners often turn to alternative forms of public engagement, including the contextual, public engagement, and lay expertise (Lewenstein 2003, pg 4).

The lay knowledge model, employing a public participation approach, facilitates the creation of platforms for individuals to express their perspectives, identify shared concerns, and collaboratively seek solutions within their community. This model is particularly suitable for evaluating messaging among smallholder farmers, who have historically been marginalized from participating in their development (Goldsmith & Acosta, 2011). It aids in assessing whether farmers are actively engaged in identifying issues and selecting suitable adaptation technologies and strategies. Recognizing and incorporating farmers' knowledge ensures they take ownership of the process and the outcomes.

Nkoana et. al., (2018) conducted an integrated literature review to explore how local knowledge can be integrated in the efforts to adapt to climate change by development practitioners working with rural communities. They emphasized the importance of considering the specific context within which communities operate and suggested that contextual factors should be the starting point for any discussion on climate adaptation. The authors highlighted the significance of community members' local knowledge about environmental conservation and development as important aspects of the context.

Nkoana et. al. (2018) further says that it is well documented that rural communities worldwide, for example, notice changes in nature. They employ methods such as climate monitoring to determine cultivation seasons and livestock culling, among other things. Members of these rural societies form their worldviews based on their interactions with and knowledge of their surroundings. These worldviews are the lenses through which members of a society perceive and interpret the world around them, either collectively or individually. Practitioners cannot fully comprehend these local worldviews unless they share the same culture, as they are the lived experiences of rural people. However, efforts should be made to elicit such knowledge from these communities.

The lay knowledge model, which advocates for incorporating local and community insights into decision-making processes, has critics and limitations. One major criticism is that it can potentially undermine the scientific approach, which relies on empirical research to generate knowledge, by emphasizing lay knowledge. This type of knowledge frequently relies on intuition and unverified claims (Tayeebwa et al., 2022). Because local knowledge is frequently based on firsthand experiences and observations, it may also contain errors or

misleading information. These might not always be in line with empirical data or scientific understanding, which could lead to the spread of false information and impede the ability to make wise decisions and solve problems.

## **2.4 Review of Previous Research**

In their investigation on social learning and climate change adaptation, Ensor & Harvey (2015) discovered that professionals working at the interface of climate change and development recognize the importance of tools and approaches that facilitate communication across different levels and among diverse stakeholders (such as farmers, NGOs, and government officials). Their findings shed light on obstacles to adaptation regarding the construction and dissemination of messages about climate change and adaptation strategies. Their study revealed a widespread agreement among survey participants regarding the importance of engaging with local languages, values, and cultural systems. Stakeholders emphasized the need for increased involvement of local communities and opportunities for information exchange and knowledge sharing, underscoring that adaptation efforts should encourage behavioral shifts and socio-institutional changes.

According to Ensor and Harvey (2015), successful adaptation was a result of employing communication strategies that contextualized content and used local approaches to understand the perceptions and realities of local populations. Participants in their study emphasized that radio is a particularly useful medium for interacting with local communities and creating feedback loops for group message development. They stress the significance of processes for co-creation of shared knowledge that bring communities and outside stakeholders together. They do point out, though, that a survey of climate change communication initiatives found

that only 14% of them use these strategies, with 56% still depending on top-down, linear approaches.

Dr. Pirio (2019) examined the determinants of success in SBCC initiatives in Africa. By reviewing existing literature, he identified that community participatory communication strategies have played a significant role in fostering behavioral changes at both individual and societal levels in diverse African settings. His findings indicated that interventions employing community participatory approaches consistently achieve better results. On the other hand, his research found that top-down, unidirectional SBCC approaches resulted in consistently poor outcomes and failures. He emphasized that community participatory approaches effectively achieve outcomes in emergencies, even in fragile contexts. Climate change adaptation is a fragile and emergency that can benefit from this approach (Pirio, 2019).

Pirio (2019) concluded that successful SBCC begins and ends at the community level. Although there are national SBCC initiatives, he believes that messages transmitted at the national level must be understood locally. Formative research is required to determine which values and social norms appeal to among the target audiences. Furthermore, community leaders must be involved and feel like equal partners in improving their communities. Participatory approaches must be used to overcome mistrust of messengers, which has hampered the adoption of novel behaviors.

Other factors that lead to successful SBCC projects in Africa, according to Pirio's SBCC literature review, include 1) social networks that help to create and reinforce attitudes, beliefs, social norms, and narratives and 2) system actors such as service providers who influence

behavior and practices of group members as well as their perceptions of others. He emphasizes the importance of viewing behavior not only as an individual factor but also within households analyzed as what he calls discrete units (intra-household), stating that viewing behavior solely at the individual level may limit one's ability to understand behavior as collective and shaped through inter-household influence at the community or local area level. This presents an exciting factor for this research as it assesses how others influence farmers' adaptation actions in the community (2019).

Pirio (2019) suggests that effecting behavior change within social networks necessitates the involvement of insiders who endorse the desired behavior. Development partners, he argues, should collaborate with communities to pinpoint individuals capable of serving as change agents by embracing and exemplifying the desired behavior and motivating others to adopt new social norms, behaviors, and practices. Pirio stresses the importance of communities in identifying respected individuals to ensure inclusivity. Consequently, when engaging with a community, it is crucial to identify influential members who can serve as change agents. These influencers are known as early adopters within social networks in the diffusion of innovation theory, and they frequently include religious leaders, leaders of community-based organizations such as women and youth groups, traditional healers, and traditional leaders. This type of inclusiveness is essential to the success of many SBCC campaigns (2019).

To emphasize this point, Ockwell, Whitmarsh, and O'Neill (2009) argue that although climate communication efforts often aim to induce changes in attitudes, research indicates that promoting shifts in attitudes is unlikely to yield success. They posit that individuals' attitudes are linked to their behavior, which in turn is shaped by social norms. Therefore,

communication strategies that prioritize individual and voluntary actions overlook the impact of social norms and other societal factors that hinder behavioral change.

Similarly, Bharwani and Vulturius (2016) argue that most climate communication efforts today are aimed at individuals to change their attitudes, intentions, and behavior; however, these individuals are members of a social group with values and norms that may contradict these messages and reduce their effectiveness. According to Kahan et al. (2011, as cited by Vulturius & Bharwani 2016), psychological research shows that people will always seek information that confirms their existing beliefs and those of the social group to which they want to belong, and this will shape their risk perceptions.

According to the social learning theory, message designers must understand their end users' needs and tailor messages accordingly. They must create messages that are both relevant and actionable. In the social learning theory, they must co-produce and co-explore with users and use peer-learning approaches. Trust in both messages and messengers would be built because of such a process. Vulturius and Bharwani emphasize this by pointing out that two key factors drive adaptation, these are perceived self-efficacy (Grothmann and Patt 2005, cited by Vulturius & Bharwani) and peer-to-peer learning.

Obeng et al. (2013) discovered after conducting research in Ghana, India, Malawi, and Mongolia that poor mobilization of vulnerable groups to take positive action and erroneous interpretation of scientific findings on climate change resulted from ineffective communication about climate risk. They emphasize the role of participatory communication and social learning theory, suggesting that academics and stakeholders, including recipients of research, should work together to collaboratively create knowledge. They emphasize the

importance of community participation in social learning and co-generation of knowledge to create context-appropriate risk communication strategies (Moench & Dixit, 2007; Vogel et al., 2007, as cited by Obeng et al., 2013).

Masters and Duff (2011) contend that addressing similar challenges in southern Africa requires communication and engagement strategies driven by the desires and aspirations of the communities themselves. Drawing parallels with Nepal in South Asia, where proactive outreach and engagement on climate change issues have effectively enhanced public awareness, they highlight valuable lessons for policymakers and other agents of social change in Africa. They attribute Nepal's success to the dissemination of messages in local languages through public libraries, schools, and government agencies, emphasizing the importance of message ownership and public participation. They argue that Nepal's approach, characterized by a multifaceted bottom-up strategy supporting local communities and other stakeholders, has effectively stimulated behavior change.

Vogel, Moser, Kasperson, & Dabelko (2007) and Moench & Dixit (2007), as cited by Obeng et al. (2013), argue that for effective climate change adaptation, priorities should align with those of the target audience, particularly farmers, rather than being determined solely by scientists or meteorological departments. They observe that climate information frequently fails to connect with stakeholders and that they are frequently excluded from the knowledge development process. Climate information's lack of relevance to local contexts and the failure to incorporate local knowledge are cited as major causes of this disconnect. As a result, there is a risk of misinterpreting scientific findings on climate change, which could lead to missed opportunities to build adaptation capacity.

McGahey and Lumosi (2018) highlighted the increasing global emphasis on integrating climate information into policy and planning in developing countries. They drew on previous studies by Wilby et al. (2009) and Pringle and Conway (2012, cited by McGahey and Lumosi) to support their argument. Despite the growing adoption of "climate mainstreaming" in development planning over the last ten years, Wilby et al. (2009, cited by McGahey and Lumosi 2018) found that the integration of climate information into adaptation planning has not advanced at the same pace as impact assessment methods.

McGahey and Lumosi refer to other researchers, including Tshakert (2007), who observed that adaptation research often focuses on physical science approaches, neglecting the importance of social science research. However, in recent times, there has been a shift towards community-centered climate risk assessment in making choices. This recognition has highlighted the limitations of top-down technical climate information at the local level, as emphasized in the works of Pringle and Conway, Tshakert (2007, cited by McGahey & Lumosi 2018). McGahey and Lumosi (2018) conclude that there has been little attention paid to the critical examination of the effectiveness and limitations of existing communication approaches for driving social and behavioral change in the developing world, as well as the implications of these gaps for climate communication research. There is a clear need to gain a deeper understanding of how to effectively communicate climate change to facilitate behavioral change and social learning processes in the context of developing countries.

In Kenya, several researchers have explored the intersection of communication and climate change. For instance, the study "Climate Change Vulnerability and Adaptation Preparedness in Kenya," carried out by Mutimba et al. (2010), sheds light on the nation's limited

understanding of climate change, particularly evident among rural communities. Those in the rural communities, particularly farmers, are vulnerable to the adverse effects of climate change due to and exacerbated by high poverty rates and significant reliance on climate-sensitive natural resources. According to their study, increasing climate change awareness should be promoted simply for different groups to understand, including youth, women, farmers, and pastoralists, among others, for better knowledge of the issue.

The BBC World Service Trust (2010) studied climate change communication in Kenya. It concluded that the challenges posed by environmental degradation and pervasive poverty already put a strain on Kenyans. The findings supported the perception that most Kenyans need a basic understanding of how to deal with climate change. However, tackling this complex issue requires effective communication. The group made several recommendations for Kenya to effectively tackle the issue of climate change. They suggested implementing communication initiatives such as increasing awareness of affordable technologies that Kenyans can use to reduce the adverse effect of climate change.

The research advised paying particular attention to the needs of the information-poor rural communities. The researchers also suggested giving communities and individuals access to information on strategies to adapt to climate change. The farmers need knowledge and tools to help them deal with the effects of climate change, and the researchers/scientists must communicate in ways relevant to local audiences across a range of news and non-news media (e.g., public service announcements and radio dramas).

In 2010, the Kenyan government launched the National Climate Change Response Strategy (NCCRS) to improve its readiness for reducing vulnerability and strengthening societal

resilience. The primary objective of the NCCRS is to ensure that all government planning, budgeting, and development goals incorporate adaptation and mitigation measures. To aid adaptation, the NCCRS commissioned a communication plan. The creators of the strategy identified through their research that there is a need for more national knowledge of climate change issues and impacts. Key informant interviews and county consultation forums also highlighted several challenges, including the unavailability of information in some locations within counties, information not formally documented, unreliable information, high illiteracy levels within communities, limited access to information, low involvement by mass media, lack of in-depth scientific data, and the absence of a central location or platform for climate change information (Alin & Republic of Kenya, 2012).

The strategists devised an extensive plan that utilized the social mobilization framework to tackle the climate communication obstacle. They defined social mobilization as a large-scale initiative aimed at engaging people in achieving a particular development objective through self-sustaining endeavors. They said that since it is a structured and decentralized process designed to drive developmental change by uniting diverse stakeholders in interconnected and supportive endeavors, recognizing people's actual needs, it could work to drive adaptation (Alin & Republic of Kenya, 2012). This research assessed the current communication strategies aimed at identifying gaps and understand why communities may not be adapting as envisioned in the national strategic communication plan.

In 2013, Kalungu and colleagues conducted a study that revealed improved access to media led to better access to agricultural information and knowledge production for farmers in semi-arid and sub-humid regions. The research was conducted in Machakos County to explore how

farmers perceived climate change. The study found that households in the arid area experienced positive changes in their farming practices, but their productivity remained low. Kalungu suggested further research to identify the reasons for the low productivity despite the observed positive changes in farming practices. This research follows up on Kalungu's findings to explore communication gaps that influence successful implementation of farming technologies and methods adapted to climate change. Regarding communication tools used to disseminate adaptation, this study looked at Kalungu's study on radio use. He attributes the increase in knowledge and agricultural information to the fact that in the recent past, Kenya has had a proliferation of radio stations broadcasting to farmers in rural areas in their languages.

Oriare (2011), another researcher in Kenya, also says that radio continues to be the most favored and -liked medium among rural populations in Kenya compared to other mass-media outlets like TV or newspapers. He says that with confident presenters earning an almost cult-like following from their audiences, radio is also the most trusted source of information on agriculture. It was also the most relied source for information on agriculture, with some presenters enjoying almost fanatically being followed by their audiences. Many organizations, including the government, use it to communicate agricultural challenges. Considering that farmers had to wait for extension officers to visit their fields to receive agricultural information, this is a significant improvement. Feedback on the methods, including radio, that are utilized to spread messages about climate change was gathered for this study.

One such other tool was the regular seasonal weather forecast, an informational tool used in Machakos to inform farmers about the oncoming rainy season and options to manage the

vagaries of climate change. According to Ngotho's research (2014), farmers who receive advanced information regarding the forthcoming growing season are better equipped to make informed decisions that can lead to significant improvements in their crops. This information allows them to adopt advanced technologies, intensify production, replenish soil nutrients, and invest in more profitable enterprises when conditions are expected to be favorable. Consequently, farmers who have access to such information can significantly enhance their agricultural practices and achieve substantial benefits. According to the article, such information also enables farmers to defend their households and farms from the long-term effects of catastrophic weather events. In Machakos County, such unique forecasts and advisories are available through the efforts of the meteorological department and KALRO. The advisories communicate county-specific seasonal climate forecasts to help smallholder farmers manage their farm practices based on the forecast.

Ngotho (2014) notes that as climate change intensifies, the continent's food security and its capacity to foster economic growth beneficial to impoverished Africans, predominantly farmers, hinge on our capability to adapt to increasingly challenging conditions. This comprehensive examination of climate change messaging and its efficacy will provide insights into the effectiveness of existing tools and areas requiring enhancement. Additionally, it will contribute to understanding the strategic selection of messaging tools for climate change among smallholder farmers.

The third question in this study explores how perceptions influence behavior change. The literature review, therefore referred to Climate Change Agriculture and Food Security's (CCAFS) research, which found that farmer perceptions in East Africa that identified certain

limitations in farmers' understanding of climate variability and its impacts on agriculture. The study identified certain limitations that hindered farmers' ability to cope with the changing climate, including a lack of trust in seasonal climate forecasts and a low level of awareness about the potential role of climate information in planning and managing farm activities. These findings were cited in the report by IRIN (2012), highlighting the urgent need for more effective communication and dissemination of climate information to help farmers cope with the challenges of climate change.

The CCAFS research in East Africa further revealed that farmers have limited understanding of climate variability and its effects on agriculture. This results from a lack of trust in seasonal climate forecasts and a lack of knowledge about the applications of climate information in day-to-day planning of farm activities. As a result, the messages on seasonal climate forecasts have not been effective in bringing about adaptation among farmers. The study team of a survey found that more research is required to determine if small producers, such as pastoralists and fishing communities, could adopt messages and programs on adaptation to climate change. The lack of adaptability adds to food insecurity. Bruce Campbell, a program director at CCAFS, commented on the study and stressed the importance of learning more about the elements that encourage and support innovation, as well as ways to reduce the barriers and costs that are frequently unacknowledged when changing agricultural practices for the better (IRIN 2012).

The effectiveness of behavior change communication strategies to decrease vulnerability and promote resilience, encourage climate change awareness and adaptation, and lessen its effects in the area was examined in a study by Okaka at Kyambogo University in Uganda. The study

discovered that behavior has not significantly improved despite awareness of climate change and its adverse effects. According to Okaka (2015), this is mostly because of contradictory laws, policies, and poor messaging, which eventually make it difficult for the local community to comprehend, participate in, and support one another. Furthermore, Okaka (2015) contends that the absence of public participation in the development and dissemination of messages has undermined public campaigns because the primary actors—farmers in this case—do not take ownership of the messages. He asserts that to maximize audience exposure, a strategy that integrates interpersonal and mass media communication is necessary. Additionally, he makes the point that global partnerships for research and development, innovation diffusion, capacity building, financing, and the transfer of green technology, all essential to Africa's development—don't add as much value as they could because most awareness campaign strategies are ineffective and poorly coordinated.

Another study evaluated how farmers in Wote, eastern Kenya, understand various climate information and how this impacts farm management decisions, particularly among smallholder farmers. The study was conducted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in collaboration with the Kenya Agricultural Research & Livestock Institute (KALRO) and the Kenya Meteorological Department (KMD), with support from CCAFS. Their investigations into farmer perceptions revealed specific gaps in farmers' knowledge of climatic variability and its effects on agriculture. These included, among other things, a need for more confidence in seasonal climate forecasts and a lack of knowledge about the potential applications of climate data in the organization and management of agricultural activities (CCAFS, 2021).

According to the research team, significant benefits could be obtained when farmer experience and knowledge are supplemented with more accurate information. The team then conducted training sessions for farmers to change their perceptions of climate information. They claim that there has been a discernible shift in mindset from the widespread belief that climate is "God-given" and cannot be changed to an understanding that there are opportunities to optimize variability, indicating a significant change when farmers are equipped to adapt to climate variability (CCAFS, 2021). This study clearly demonstrates that farmers' adoption and adaptation rates were influenced by their perceptions and comprehension of climate messages.

In May 2009, on behalf of the British Council, the BBC World Service Trust's Research and Learning group undertook research in Kenya to evaluate popular understanding of climate change. The study included 17 in-depth interviews with thought leaders from the government, religious organizations, the private sector, the media, and civil society and 12 focus groups with Kenyan residents. The study's main goals were to find out what people think about climate change and figure out how to adjust communication and media tactics to help Kenyans react to it. They interviewed opinion leaders, media, and government officials and discovered that there needs to be more consensus on adaptation methods.

Through the research, the BBC team discovered that many Kenyans are familiar with climate change and have learned about it through the media and through their own experience with the changes. They said the rains are unpredictable. At the same time, they observed that the complexity of climate change limits its perceived relevance in the minds of Kenyans. They learnt that local leaders are best placed to assist with climate change adaptation due to their proximity to the locals. However, they need to be more informed on strategies and far

removed from decisions at the national level. They noted that farmers still need to familiarize themselves with concepts of climate change. Indeed, most of these terminologies need to be better understood and translated into vernacular or in Swahili, since their lack of familiarity has prevented people from having a voice on the issue.

Their study also showed that Kenyans draw on their existing knowledge to explain the changes they have experienced. They concluded that Kenyan citizens' information and communication needs must be at the heart of any national response to climate change. Nevertheless, their ability to effectively respond to climate change will be determined by the accessibility and quality of the information available. Based on these findings, they stated that public understanding of climate change would enable citizens and communities to discuss the issue, adapt to its effects, and make more informed long-term choices about their future.

Some of the recommendations from their research are that there should be more awareness of global climate change and that messages should be simple and with correct mental models of climate change – so doing, they will take cognizance of people's existing frames of reference, which could be functioning as barriers or facilitators to effective climate change communication. Message creators should also develop and test appropriate climate change terminology in relevant local languages. The BBC research is one of Kenya's more comprehensive climate change communication research projects. However, unlike this study in Machakos County, it needs to holistically address the communication and learning processes. Language barriers and mental frameworks are only two components of learning.

In summary, effective climate change communication is essential for influencing action and addressing the complexities of climate change. It requires a balance between educating,

informing, warning, persuading, and mobilizing, while considering the diverse perceptions, mental models, and cultural contexts of different audiences (Ballantyne, 2018; Armstrong, Krasny, & Schuldt, 2018, cited Amiyo 2023). Early communication strategies, such as the “information deficit model,” focused on science literacy but were critiqued for being one-way and not leading to meaningful behavior change (Nerlich, Koteyko & Brown, 2010). Over time, climate communication has shifted from a scientific focus to a more cultural and inclusive approach, emphasizing dialogue and understanding of local contexts (Mabon & Shih, 2018, cited Amiyo 2023). Research also highlights the limitations of public science understanding models, showing that information alone is insufficient for behavior change, and that communication strategies must engage audiences in a more participatory and context-aware manner.

## **2.5 Rationale of this Study Based on the Reviewed Literature**

This study emerges from a careful exploration of existing literature, revealing significant gaps in the realm of climate communication strategies, particularly within the domains of Social Behavior Change Communication (SBCC) and the lens of the Social Learning Theory in climate change adaptation. Despite the wealth of research in SBCC, especially in health contexts, there is a conspicuous absence of comprehensive studies in SBCC as is related to climate change, particularly in the context of Kenya and Africa as a whole. While SBCC findings have found practical applications in areas like health communication, water, sanitation, and hygiene (WASH), sustainable agriculture, and natural resource conservation, their direct adaptation to climate change contexts remains underexplored. This research aims to bridge this gap by applying SBCC models and theories to the realm of climate change

adaptation, shedding light on innovative strategies that could reshape communication efforts in this critical area.

The study recognizes the evolving communication landscape in arid and semi-arid regions of Africa, emphasizing a shift from traditional top-down message dissemination to interactive, dialogic, and cooperative approaches. This transformation is particularly vital in regions vulnerable to climate change, where the effectiveness of climate information and adaptation strategies relies on their local relevance and usability.

The urgency to bridge these gaps and explore innovative, two-way communication methods is underscored by the immediate need for contextually relevant climate change messaging. This urgency is heightened by the escalating environmental challenges faced by these regions. Consequently, this study aims to address these voids by investigating novel communication strategies that align with the urgency and scale of the required adaptation response. By doing so, this research significantly contributes to the field of climate change communication, providing valuable insights into effective and context-specific methods for delivering climate information in vulnerable regions.

As far as theory is concerned, the study's rationale lies in addressing the gap in theoretical foundations related to climate change adaptation messaging. Despite the expanding body of research in this field, there is a lack of exploration into innovative theories such as social learning and lay knowledge, especially within the Kenyan context. Understanding how these theories intersect with climate change adaptation messaging is vital, providing a theoretical framework that could significantly enhance the effectiveness of communication strategies.

Contextually, according to the Kenya Climate Change Country Profile (Kenya: Climate Change Country Profile, 2023), Kenya is leading the fight against climate change by implementing important frameworks for laws and policies that guide national and local climate action. The country has established notable initiatives, including the National Climate Change Action Plan III for 2023–2027 and the long-term Low Emissions Development Strategy from 2022 to 2050. Additionally, the Climate Change Policy of 2016, the Climate Change Act of 2016, and the Climate Change Amendment Act of 2023 are essential pieces of legislation in this regard. These initiatives demonstrate Kenya's commitment to combatting climate change.

Kenya's priorities, as outlined in various documents, include a variety of initiatives such as adaptation, emissions reduction from deforestation and forest degradation, afforestation and reforestation, landscape restoration, climate-smart agriculture, geothermal and clean energy development, energy efficiency, drought, and flood risk management. These comprehensive strategies reflect Kenya's commitment to promoting low-carbon, climate-resilient development. Kenya is improving its capacity to assess vulnerability across key sectors, protect critical watersheds, implement climate-smart agriculture practices, promote drought-tolerant crops, and improve early warning and response systems thanks to USAID funding (Kenya: Climate Change Country Profile, 2023).

Contextually, another critical rationale is the need to apply the social learning theory to climate adaptation messaging, particularly in African and Kenyan contexts. While social learning principles have been explored in various domains globally, their application in the realm of climate change adaptation messaging in African agricultural settings and climate

change, is underexplored. This study aims to fill this gap by investigating how social learning theory can be effectively employed to bridge the communication gap between experts and smallholder farmers, ensuring the relevance and applicability of climate adaptation messages.

## **2.6 Chapter Summary**

This chapter has discussed how climate change has been communicated for behavior change or adaptation to take place. The study has been situated in development communication and the specific theory used is the social learning/social cognitive theory. The literature has been reviewed from a global, Africa and Kenya perspective. From the literature review, technology and science are not enough to make farmers accept appropriate climate information and that climate change terminology is still poorly understood by the farmers and rural communities.

According to literature, farmers are not given a chance to voice their opinions on climate change issues. Instead, scientists design messages that exclude communities, especially farmers, from contributing to the conversation. However, farmers have valuable knowledge and experience that can be drawn upon to explain the changes they have witnessed. It is important that the information and communication needs of farmers are considered at the center of any national response to climate change. This chapter has also identified two theories, the Social Learning Theory (SLT) and lay knowledge theories, that are used to study climate adaptation messaging. Global and Kenyan research in this area has been examined, revealing gaps in the usage of these theories in climate change messaging. The following chapter will provide an extensive discussion of the research methodology used in this study.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 2.0 Overview

In this chapter, I describe how the study was carried out, systematically outlining the procedure and rationale for collecting and analysing data relevant to the research questions. As a foundation for the procedures, the chapter initially describes the philosophical paradigm used in the research, which is relativism ontology and constructivist worldview. This paradigm informed the choice of the qualitative research approach and case study design that the study implemented. Further, data collection techniques, namely, a document analysis, in-depth interviews, FDGs and Observations techniques are also discussed. The analysis techniques are explained in detail. The research used multiple sources of data generation techniques namely, semi-structured interviews, in-depth focus groups, document analysis and observation, which are also discussed in the chapter. The research used general voluminous data; the chapter illustrates how this data was analysed. In conclusion, the chapter offers information on how ethical issues and trustworthiness issues were dealt with to ensure credibility of the study.

#### 3.1 Research Paradigm

As a researcher, I began my research journey by internalizing and determining my philosophical paradigm, which provided a comprehensive picture of my entire research process. A philosophical paradigm is a set of ideas and precepts that serve as the foundation for theories and methods. Kuhn (1962) defines a paradigm as the underlying assumptions and

intellectual structure upon which research and development in a field of inquiry are founded, (cited in Turyahikayo (2021). According to Schwand (1989, cited by Irene 2014), paradigms are "worldviews and beliefs about nature or reality, knowledge, and values." Irene also cites Guba and Lincoln (1994, 2014), who characterize paradigms as worldviews or belief systems that guide researchers. Vedeler (2000) argues that philosophical considerations come before method selection, providing a better understanding of the benefits and drawbacks of both quantitative and qualitative approaches. He describes paradigms as "theoretical frames."

In selecting a paradigm to frame this research, I turned to the insights of Denzin and Lincoln (2001), who argue that researchers are guided by three paradigms or world views that shape the outcome of their research. They highlight ontology, which addresses the question of "what is reality," as one of these paradigms. Epistemology, which explores how knowledge is acquired and confirmed, is another critical aspect. According to Gall, Borg, and Gall (1996), the field of philosophy known as epistemology studies the nature of knowledge and the processes by which it is obtained and confirmed. The third paradigm is methodology, which pertains to learning about the world. These three dimensions of ontology, epistemology, and methodology characterize different paradigms.

Based on the aim of my research, I chose the relativist paradigm for ontology. The central question here revolves around the existence of reality: "Do things exist independently of our mind, or is our world something constructed from our thoughts?" According to Jwan and Ongondo (2011), there is a continuum of ontological assumptions, with relativism and realism standing on two opposite ends. The argument that realists seek an objective truth by seeing the world objectively is supported, they say, by Richards (2003), Johnson (2008), and Denzin

and Lincoln (2005). Comparatively speaking, relativists adopt a subjective position, acknowledging that reality is internal and reliant on personal experiences and perceptions, and that there is no one correct way to see the world. Denzin and Lincoln (2005, cited by Levers, 2013) add that relativist ontology posits that reality is a finite subjective experience, and nothing exists outside of our thoughts. From a relativist perspective, reality is inseparable from our subjective experiences (Guba & Lincoln, 2005, cited by Levers, 2013).

Moving to epistemology, which deals with the nature of knowledge, I encountered the opposing stances of objectivism and subjectivism. Crotty (1998, as cited by Levers, 2013) posits that objectivism asserts the inherent truth and significance of things, existing independently from human subjectivity. In observing phenomena, objectivity ignores contextual influences and maintains a detached stance. Rehman and Alharthi (2016) state that positivists commit to an epistemological stance of objectivism and a realist ontology. Positivists argue for a reality that is measurable and comprehensible through quantitative methods and statistical analysis, often exploring correlations and causality among variables.

On the other hand, interpretivists/constructivists adopt a subjective epistemology, recognizing that knowledge of an external reality is limited to individual reflections and interpretations. Levers (2013) labels this epistemological stance as interpretivist/constructivist, emphasizing qualitative research methodologies that accommodate diverse perspectives and delve into the meanings attributed to human actions. Constructivists and interpretivists believe in socially constructed multiple realities, where truth and reality are created rather than discovered.

Considering the above discussions, I chose relativist ontology and interpretivist/constructivist epistemology for this research. The relativist paradigm aligns with my belief that reality is

shaped by individual perceptions and experiences, and multiple viewpoints exist regarding climate change adaptation and messaging in Machakos County. I recognize the influence of human interpretations in defining reality and consider both farmers' perspectives and my own as the researcher to be significant. Moreover, the constructivist/interpretivist epistemology resonates with the notion that reality is socially constructed, and our understanding of it is subjective. This approach acknowledges the limitations of accessing an objective reality and emphasizes the importance of exploring diverse perspectives through qualitative research techniques.

In my research journey, I embraced constructivism, where reality is seen as a tapestry of diverse perspectives and knowledge weaved together through social interactions. Using this paradigm as a reference point, I set out on a mission to clarify the complexities of climate change adaptation and promote knowledge of this topic.

To honor the principles of constructivism, I asked the "why" question. Seeking to understand the reasoning behind farmers' perceptions of climate change adaptation messaging—how and why are messages crafted, disseminated, and ultimately interpreted. Recognizing the subjective nature of reality, I engaged in an exploration of the climate change messaging phenomena in Machakos county, immersing myself in the lives of farmers and message designers.

I used triangulation to address concerns regarding subjectivism. As Adom et al. (2016) suggests, I triangulated by interviewing diverse participants – both farmers and message designers – before emerging with my own interpretation. By conducting interviews with diverse participants, I sought a holistic understanding of their interpretations. Yet, in

alignment with the tenets of interpretivism and constructivism, I did not prefer any one interpretation over another. Instead, I sought to comprehend the farmers' and message designers' perspectives on climate change adaptation messaging, allowing their voices to shape the narrative.

Moreover, I ventured into the space of experiential learning. As Rehman and Alharthi (2016) suggest, I engaged in the activities as they are carried out by farmers in the natural settings so that I could experience the phenomenon myself and see others experiencing it. Indeed, to truly grasp the essence of the climate change messaging phenomenon, I actively chose to participate in one of the activities carried out by farmers. Through observation techniques, I not only gathered data but also experienced the phenomenon alongside those directly impacted by it. This immersive approach allowed me to construct meaning from firsthand experiences and the shared experiences of the participants.

In acknowledging the existence of multiple knowledges, I appreciated the richness that diverse perspectives bring to the research process. As Creswell (2003) argues, constructivist researchers often depend on participants' perspectives of the situation under study. While I presented my interpretation of the data, I acknowledged that it was merely one of many possible interpretations. This acknowledgment of multiple realities is a fundamental aspect of constructivism, enabling a deeper understanding of complex issues like adaptation to climate change.

Furthermore, I acknowledge the influence of my own background and experiences in agricultural communication. Researchers cannot be separated from the social reality they are studying, as Grix (2004, cited by Rehman and Alharthi, 2016) suggests. As a communication

for development practitioner who has worked closely with farmers dealing with the effects of climate change, my personal perspective could influence my interpretations. To avoid potential biases, I gathered data from multiple sources, including extension officers, agricultural officers, farmers, NGO staff, and seasonal forecasts. This approach enabled me to gain a comprehensive understanding of the climate change communication process, with insights from a diverse range of participants. In the end, my research contributes to a broader tapestry of knowledge through the convergence of various perspectives, the interplay of diverse experiences, and the acknowledgment of subjective biases, where the voices of the participants echoed alongside mine.

### **3.2. Research Methodology**

The qualitative approach is the most appropriate research method for this study, as it is in line with the social constructivist paradigm, which acknowledges the existence of multiple viewpoints on social issues. This method allows for a deeper exploration of social phenomena, considering various perspectives and contextual factors (Ong'ondo & Jwan, 2011). The relativist ontology chosen for this study recognizes that human behavior is context-dependent and cannot be universally generalized.

Qualitative research methodology is a unique approach that digs deeper to understand people's experiences, emotions, behaviors, and feelings, along with social movements, cultural phenomena, and inter-country interactions. In contrast to quantitative research that relies on statistical analysis to draw conclusions, qualitative research aims to answer the questions of "why" and "how" instead of "how many" or "how much." For instance, when examining

farmers' perceptions, experiences, and conduct, a qualitative approach was more suitable for collecting pertinent information.

Agreeing on the same issues, Denzin and Lincoln (1994, p. 2) claimed that “qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter.” It is, moreover, apparent that the qualitative research is concerned with multiple perspectives when Van Maanen (1979, p. 520, cited by Rahman, 2016) defines it as, “an umbrella term covering an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world.” Therefore, qualitative research appears to be an overarching concept under which a variety of issues may be placed (Rahman, 2016).

There are some basic reasons that led me to consider this approach. According to S. Chérif et al. (2016), when it comes to assessing farmers' attitudes, feelings, and interpretations of climate change, qualitative approaches provide more profound insights into their response towards adaptation. The team conducted research in Zagouge, Cote d'Ivoire, and concluded that a better understanding of phenomenological analyses that focus on individuals and their subjective experiences is necessary to enhance adaptive capacity and reduce vulnerability.

The researchers contend that many works associated with perceptions on climate change focus on scientific causes whereas attitudes of rural populations are often overlooked. However, given the high rate of illiteracy in Africa, which shapes perceptions, such local knowledge is the key mechanism (Kosmowski et al., 2016, cited by Cherif, 2016). It is these perceptions and phenomenological analyses which emphasize the farmers' individual and

subjective experience that I used as I interacted with female farmers, young people and agricultural officers, among others. Their attitudes and perceptions were especially important to this research and could only be filtered through a qualitative approach.

In the context of climate change communication, this approach allowed the farmers to give feedback on how they felt about the climate change phenomenon, the messages, tools used to communicate to them and their perceptions of climate change which could be shaped by their specific culture and social setting. Their understanding and knowledge of this phenomenon and how it affects their capacity to adapt. Tenny et al. (2022) says that accurately capturing complex phenomena such as experiences, attitudes, and behaviors can be challenging with quantitative methods. Alternatively, a qualitative approach allows participants to express their thoughts, feelings, and experiences in detail, particularly in relation to a specific event or period. The authors emphasize that one of the key advantages of qualitative research is its ability to tell a story, often from the perspective of those directly involved.

As per the relativist ontology, the qualitative approach helped me to incorporate multiple realities, attitudes, and experiences of farmers in-depth, rather than statistically. Flick (2014) posits that qualitative research is concerned with analyzing subjective meanings and social production of issues, events, or practices through the collection of non-standardized data and the analysis of texts and images, as opposed to relying on numerical data and statistics. Rahman (2016) supports this perspective, indicating that qualitative research is particularly useful in investigating complex and dynamic social phenomena that cannot be easily captured through quantitative measures. The stress here is on how people make sense of the world

(Rahman 2016). Basically, I explored the themes and patterns, which could be difficult to quantify.

As a social researcher, my aim was to gain a rich and in-depth understanding of the farmer's inner experience with regards to climate change adaptation. My focus was not on obtaining information that could be generalized to larger groups, as quantitative research typically does. Instead, I used a qualitative approach to explore the cultural and social factors that shape the messages associated with adaptation of climate change and the communication needs of farmers. This approach helped me understand the assumptions made by message designers and the incentives that facilitate or hinder the implementation of new farming approaches, considering factors such as education, information, and traditional local practices.

Moreover, understanding the farmer's experience in Machakos, on their farms, during their farmer meetings – created the ideal setting to understand their behavior. Hence, at some point I found the farmers on the farms as they did their activities and they were able to point out the soil, the crops, the technologies among other things. They were really in their social structures since I met them during their group meetings and understood by observation and discussion about the power structure and how communication was taking place. This data was well documented and from the rich description, I found patterns and meanings.

I drew on Jwan and Ongondo's description – that sees qualitative research as “*an approach to inquiry that emphasizes a naturalistic search for relativity in meaning, multiplicity of interpretations, particularity, detail and flexibility in a phenomenon that a researcher chooses to focus on...*” (2011 pg 3). Denzin and Lincoln (2002) argue that a qualitative research approach that is interpretive in nature can provide a more comprehensive understanding of

human experience. This is achieved by examining human behavior in the context of its social structure. This approach is particularly useful when studying the farmers and their way of life. By studying their social context, a more detailed understanding of their behavior was gained.

Sutton and Austin employ the term "ethnography" to denote the direct observation of research subjects. This approach entails researchers observing participants in their natural environments over an extended period. A significant characteristic of ethnography is that natural settings are used, which are not adapted for the researchers' interests. In ethnography, the natural setting or environment holds equal importance to the participants. This method offers the advantage of explicitly recognizing that environmental constraints and context influence behaviors and outcomes in the real world (Taylor & Francis, 2007, as cited in Sutton & Austin, 2014). As has been noted, although this research was not entirely ethnography since the observation was not over a long period of time, I borrowed some aspects of it. An example of ethnographic aspect involved observations to determine how messages were communicated during a demonstration and farmers meeting with experts to understand the language, tones, and understand body language of both groups.

While there are various other types of documents, this research analysed physical objects found within the study setting (often called artifacts). Examples include flyers, posters, agendas, handbooks, and training materials. Of specific interest to the research was the weather advisory pamphlet, which is the primary tool used by government and other technical bodies to inform farmers about seasonal weather forecasts.

In conclusion, I settled for qualitative research as it uses an explorative approach to problem solving. In this method, researchers explore subjects which are complex, climate change is complex! Rahman (2016) claims that when studying such complex subjects, researchers use methods that encourage people to express themselves by using techniques that allow participants some degree of freedom and spontaneity rather than making them choose from a list of pre-determined responses, none of which may be appropriate or accurately describe the participant's thoughts, feelings, attitudes, or behavior. Ultimately, qualitative data is a valuable source of detailed and well-supported information that provides rich descriptions and explanations of processes that can be observed in local contexts (Miles & Huberman, as cited Sutton & Austin (2014). This approach, therefore, produced a thick and detailed description of participants' feelings, opinions, and experiences, and interprets the meanings of their actions (Denzin, 1989). As a researcher, I used this data to gain a better understanding of the complex issues that I studied, and to develop more relevant solutions that are tailored to the needs and experiences of the farmers. In this research, observations during farmer meetings, conversations with farmers in focus groups, one-on-one interviews with experts and some farmers, were all recorded using tape recorders and notes and all this information entailed thick descriptions from which I got the feelings, opinions and experiences of the research subjects and interpreted the meanings of their actions.

In summary, the qualitative research design proved to be a fitting methodology for investigating complex phenomena in depth and obtaining a well-rounded understanding of individuals' perspectives and experiences. Specifically, the qualitative approach provided valuable insights into the communication barriers impeding adaptation and how small-scale

farmers respond to climate adaptation messaging. Additionally, it facilitated the exploration of participatory approaches' potential to drive transformative changes among smallholder farmers.

### **3.3. Case Study**

A case study, according to Yin (2009), is an empirical analysis of a phenomenon in its actual setting. Because case study research entails a comprehensive examination of a phenomenon, it employs a variety of data collection techniques. Several factors justify the use of a case study for this research. First, the interpretivist/constructivist and relativist ontology and the qualitative research approach align with the case study methodology.

Case studies, according to Kim (2005, cited by Yin, 2009), are among the research techniques appropriate for the constructivist paradigm. They emphasize gaining a thorough understanding of the phenomenon being studied by spending a significant amount of time with research participants in their natural environments. Rather than focusing on cause-and-effect relationships or universal truths, this method is in line with the exploration and description goals of qualitative research (Adom et al., 2016).

The research objectives of understanding human interaction within a social unit, exploring farmers' perceptions of climate change, and analyzing how messages are structured and disseminated are well-suited for a case study. The study focuses on understanding the "how" and "why" of climate change adaptation messaging, which is a typical context where case studies excel (Yin, 2009; Darke et al., 1998, cited by Potter & Von, 2010).

The case study approach was the ideal choice for studying small groups of farmers in Machakos county due to its compatibility with qualitative descriptive research. As Stake (cited by Hyett et al., 2014) suggests, case studies are well-suited for understanding human interaction within a social unit. By employing case studies of selected households in Machakos county, I intensely examined small farmer groups comprising 7-15 members. This focused approach enabled me to draw meaningful conclusions about that group within their unique context. The research did not aim to discover universal truths or establish cause-and-effect relationships. Instead, the emphasis was on exploration and description, capturing the variations of the farmers' attitudes and responses to climate change adaptation messaging.

The qualitative nature of the case study approach allowed for a comprehensive exploration of the farmers' interactions, experiences, and perceptions regarding climate change adaptation. I gained valuable insights into their communication dynamics and decision-making processes by spending considerable time with the research participants in their natural settings, such as their farms and during farmers' meetings. The case study approach also supported various data collection methods, such as observations, interviews, and pertinent documents like brochures and seasonal weather advisories. These multiple data sources enriched the research, providing a holistic view of the farmers' experiences.

In conclusion, the case study approach proved to be the most appropriate and effective method for studying small groups of farmers in Machakos County. Its alignment with qualitative descriptive research allowed a detailed exploration of the farmers' context-specific interactions with climate change adaptation messaging. By understanding the human

dynamics within these small farmer groups, I gained valuable insights that would have been challenging to capture using other research approaches.

### **3.4 Study Area and Population**

The study was carried out in Machakos County, which borders the following areas: Embu to the north; Kitui to the east; Makueni to the south; Kajiado to the southwest; Murang'a and Kirinyaga to the northwest; Nairobi and Kiambu counties to the west. The County is located between longitudes 36° 45' East and 37° 45' East and between latitudes 0° 45' South and 1° 31' South, according to Eunice & Mwangi (2019). Situated between 1000 and 1600 meters above sea level is the County. With 264,500 households and a total population of 1,098,584, it occupies an area of 6,208 square kilometers. 177 people are concentrated in every square kilometer. Most of the population in Machakos County are the Akamba people.

Drought and semi-drought conditions are a persistent issue in Machakos District. Despite allocating a significant portion of cultivated land to food crops, the district has had to rely on food imports, particularly maize grain and maize meals, to feed its population during times of drought or semi-drought. These food imports have been provided as famine relief on some occasions, while on others, people have been able to buy food through the sale of livestock, sisal, and other cash crops, as well as labor remittances. KALRO Katumani Research Station is in Machakos County, Kenya. The name "Katumani" is often associated with dryland agricultural research, particularly in the development of drought-resistant crops like Katumani maize. While Katumani is not a designated administrative region, it is a well-known research site in the semi-arid Eastern Kenya region and is frequently referenced in agricultural and

climate adaptation studies. The exact villages where the FGD's were conducted was Kinatwa, Ichanda, Muua and Mwanja villages which are located around KALRO Katumani.

### **3.5 Study Pre-planning and Sampling Procedure**

I started this research by visiting the National Research Office for a research permit from the National Council for Science and Technology (See Appendix 3). I then proceeded to KALRO Katumani to interact with the research officers who worked on developing new drought-resistant varieties in the area. Since they know the landscape well, I used snowballing to get the first contacts of message designers and farmers, leading me to other appropriate contacts. The officers gave me two contacts, one of whom was a message designer from the Ministry of Agriculture and the other from the private sector. They also gave me a contact person who knew the villages well and would help me navigate the area while helping to identify the first farmers' group with whom I was to conduct the FGDs.

I intentionally chose communities around KALRO Katumani, located in Machakos county, as the research site. This aligns with qualitative research principles, where selecting the research sample is deliberate (Patton, 1990, 2002). The sampling technique I employed is known as purposive sampling. This method aims to select cases that are rich in information to provide insights into and understanding of the phenomenon under investigation (Merriam, 1998). The Katumani location chosen in this research is information-rich in climate change communication between farmers, message developers, and researchers. Indeed, KALRO Katumani is located here with the primary goal of carrying out agricultural research and producing approaches and technologies suited to the region.

In addition, several development partners and stakeholders have used joint poverty-reduction initiatives to promote the adoption of improved technologies and innovations. Therefore, many of these institutions work directly with farmers or through KALRO Katumani to deliver agriculturally based solutions for farmers to help them cope with climate change variabilities. However, although these technologies have been developed and shared with farmers over the years, the adoption of these technologies still needs to grow (Mwangi & Kamau, 2014). According to these researchers, there needs to be a more adequate understanding and documentation of factors contributing to this low adoption. This study is one such attempt to understand and provide documentation related to communication factors that could contribute to the slow adoption of technologies and innovations in the face of climate change.

In qualitative research, it is essential to understand that every research setting has a unique mix of people and contextual factors. The study aims to describe a specific context in detail rather than generalizing it to other contexts or populations. Representativeness in this qualitative research is secondary to the participant's ability to provide information about themselves and their settings. I sought to understand how this challenging topic of climate change adaptation is framed and communicated to smallholder farmers. In this study, the sampled individual groups represent the audience targeted by the climate change messages. There is more emphasis on the messages communicated to the farmers.

I selected cases based on my greatest potential for learning, adhering to Stake's (2005) recommendation that case selection should provide a 'opportunity to learn'. To accomplish this, I purposefully sampled farming households and farmer groups that I participated in the focus group discussions about. The focus group discussions were important in helping to

understand messaging from the perspective of the targeted audience. I selected five pre-existing farmer groups that KALRO and the private message designers work with around Katumani in Machakos. Silverman (2013) observes that other than convenience and accessibility, purposive sampling allows the researcher to choose a case because it illustrates some feature or process in which we (researchers) are interested.

To select the farmer groups, I employed two specific criteria. First, I looked for groups that demonstrated transparent administration and effective management. This implied that the groups were well-coordinated and facilitated efficient communication among their members. Second, I considered groups primarily focused on learning new farming technologies.

I used the snowball approach of purposive sampling to choose the households for my research. This means that I started with a small group of people who were easy to contact and accessible. Then I expanded the sample by asking each participant to suggest other potential participants for both focus group discussions (FGDs) and key informant interviews (KIIs). For the KII specifically, I started with four households suggested by KALRO, government, and private sector extension officers. They also gave names of the first farmer groups for the FGDs, who recommended other farmer groups. According to Stake (2005), the researcher identifies some (at least two) relevant individuals to the study in snowballing strategy. Teddlie and Yu (2007) argue that this method allows one informant to refer the researcher to another, providing a good introduction for the following interview. The households were selected based on specific criteria, which included small-scale farmers residing in the vicinity of KALRO Katumani, individuals with at least five years of farming experience, operating

small-scale farms ranging from 1 to 3 acres, and those who have already been exposed to new farming technologies and methods.

### **3.6 Instrument Testing**

Before I embarked on my study, I conducted an instrument testing on July 2017 where I pre-tested the research instrument on one farmer group. I held an FGD with a farmer group and conducted KII in a household. These were the first contacts that were suggested by the KALRO program officer. My goal was to test the research instruments. Indeed, I got valuable insight that led to revising and fine tuning the research instruments to capture and align with my research questions.

I had two major outcomes from this instrument validation testing phase. First, the instruments were too long. The FGD took close to 2.5 hours to complete, while the FII took 2 hours. Secondly, I realised that my questions were too many and repetitive and sometimes vague so that I had to keep repeating to clarify to the farmers what I meant. I adjusted my instruments by compounding the guiding questions since I achieved the same purpose even with few questions. I also took time to rephrase the guide to remove redundancies. The validation confirmed that my proposed instrument was not too complicated but was appropriate for farmer level interviews. I just needed to adjust my instruments slightly, otherwise it confirmed the feasibility of the overall research design.

### **3.7 Data gathering techniques**

To conduct a qualitative study and derive maximum benefit from it, I utilized methods that allowed farmers and other research participants to freely express themselves and be spontaneous. This was preferred over forcing them to choose from a limited set of predetermined responses, which may not accurately describe their thoughts, feelings, attitudes, or behavior. The research techniques employed in this study were non-standardized, flexible, and primarily involved the collection of textual data. These techniques are further described below.

#### **3.7.1. Semi Structured Interviews**

Semi-structured interview schedules were employed because they allowed for a thorough and comprehensive examination of the phenomenon being studied. Interviews that are semi-structured typically go well when the interviewer has already determined which aspects he wants to be sure to cover (Kohlbacher, 2006). In this case, I already had a set of predetermined questions since I knew what issues I wanted to explore. However, these were just guides since I allowed open-ended discussions with the farmers and message developers. This worked well because it provided flexibility, leaving room for open-ended discussions, allowing me to delve deeply into farmers' perspectives on climate change adaptation messaging. This approach encouraged farmers to share their experiences, challenges, and innovative strategies. According to Morse and Richards (2002), open-ended questions give each person the space and time to talk about their understanding and perceptions.

Embracing this participant-centered approach had a profound impact, promoting a sense of ownership and empowerment among the farmers. It empowered them to play an active role in the research process, making their contributions even more meaningful. As Rubin & Rubin (2005, cited by Carter, 2020) emphasize, the flexibility of unstructured interviews proved ideal, enabling a broader exploration that led to the generation of additional insights and valuable data. This collaborative journey with the farmers not only enriched the research but also created a vibrant and dynamic atmosphere for uncovering the heart of climate change adaptation messaging from the very voices experiencing it firsthand.

Moreover, the complex nature of climate change and attendant issues demanded a data generation technique capable of unraveling the intricate layers within farmers' experiences and the semi structured interviews proved an invaluable asset. These interviews helped me to reach deeper into the depths of farmers' insights. By engaging in follow-up questions and seeking further explanations, I unraveled the layers of complexity within farmers' personal and group experiences. Giving me deeper understanding of their perceptions of climate change messaging.

Furthermore, the semi-structured interviews provided a platform for farmers to share their stories, insights, and perspectives on climate change adaptation. By actively listening to their narratives and analyzing the underlying meanings, I was able to uncover patterns, themes, and shared understandings that contributed to a deeper understanding of the subject I was exploring. This qualitative approach ensured that the experiences of farmers are acknowledged and integrated into the research findings.

Additionally, climate change adaptation is not solely an individual endeavor but often involves collective actions within farming communities. The semi-structured interviews facilitated the exploration of not only the individual, but group experiences as I engaged them in the FGDs. The conversations helped in identifying shared challenges due to cultural or religious norms and beliefs, common strategies, and potential areas for collective action.

Of great interest as well was that the semi-structured interviews allowed me to capture the contextual richness of farmers' experiences. Through the open-ended questions, farmers, especially during the FGDs, shared detailed narratives, anecdotes, and local knowledge, even in their mother tongue, that might never be captured by more rigid data collection methods. This contextual depth enhanced the understanding of the complexities and intricacies of climate change adaptation at the farmer level.

I administered the semi-structured interviews within the FGDs', among a few individual farmers, the Agricultural Officer, Extension officer both in government offices and NGO office (*See Appendix 1*). The interviews with the government officers and NGO officer were critical in understanding how the messages were designed and implemented, the messages communicated, and the level of farmer participation. Furthermore, the interviews were critical in validating the data from the focus group discussions which were conducted with the farmers.

In summary, the open-ended interview guide served as a format to guide the discussions while allowing flexibility to provide detailed responses. I also asked probing and follow up questions to obtain further details on specific aspects that emerged during the interview, or when the interview digressed from the topic. The responses were recorded using a digital

voice recorder with the participants' consent. Short notes were also taken during the interviews on emerging themes and issues that cropped up and those that needed further follow up.

### **3.7.2 Key In-depth Interviews (KII)**

It is critical to explore what influences farmers' selection of farming decisions. To gain further insight on this issue, I carried out seven key in-depth interviews that were open-ended: two with two female farmers, one was with a male farmer and one with the Meteorological Officer and two with two agricultural officers and a last one with the private extension officer. They discussed their role in the messaging process, how farmers perceive and understand climate change, how this perception is formed, what innovations have been made available to farmers, how they designed the messages, what was used to inform the design of the messages, how farmers reacted to the messages, and how they disseminated the messages.

In conclusion, I chose to use both semi-structured and key informant interviews because of the qualitative nature of my research which aimed to gather rich and detailed information. Both methods are valuable in exploring complex research topics, climate change adaptation messaging and capturing diverse perspectives on the subject. I chose to use both interview approaches because of my research objectives and the expertise I sought to tap into during the data collection process.

**Table 3.1: Symbols used to indicate data source**

<b>Composition</b>	<b>Nos</b>	<b>Research Name</b>
Female farmers	2	II 1 & 2
Male Farmer	1	II 3
Message Designers – Agricultural Officer	2	A01 & AO2
<b>Research Officer</b>	1	RO
Meteorological Officer - Message Designer	1	MO
Extension Officer – PO	1	EO1

### **3.7.3. Focus Group Discussions (FGDs)**

The FGDs were an additional data generation technique, where I used the semi-structured interviews to dig deeper into the subject under inquiry. It was during the FGD that I checked the farmers' responses to the messaging of the seasonal weather focus flier. I showed them the flier and requested their feedback on how it is designed and communicated. This allowed for a seamless integration of data collection methods, eliminating the need for separate meetings with the farmers. By adopting this strategy, I was able to efficiently gather information without disrupting the participants' schedules.

To ensure the FGDs were conducted in line with established guidelines, I actively participated in all sessions. The recommended participant range of eight to twelve individuals, as suggested by Krueger and Casey (2000), was adhered to throughout the discussions. In total, I successfully conducted four FGDs, engaging a total of 40 farmers. The groups consisted of men and women of different age groups and educational levels illustrated below.

*Table 3.2: Number of Focus Group Discussion Participants*

<b>Composition</b>	<b>Male</b>	<b>Female</b>
Kinatwa	7	3
Ichanda	8	4
Muua	6	2
Mwania	6	4
<b>Total</b>	<b>27</b>	<b>13</b>

Majority of the farmer participants were old. Indeed, a significant majority of were over 45 years old. Table summarizes the ages of the participants:

*Table 3.3: Age of Focus Group Discussion Participants*

<b>Age</b>	<b>18-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-45</b>	<b>45-66</b>	<b>TOTAL</b>
<b>Male</b>	0	1	3	3	20	
<b>Female</b>	0	0	1	3	9	
<b>TOTAL</b>		<b>1</b>	<b>4</b>	<b>7</b>	<b>28</b>	<b>40</b>

*Table 3.4: Educational Level*

<b>Class/Form</b>	<b>0-8</b>	<b>1-4</b>	<b>College</b>			<b>TOTAL</b>
<b>Male</b>	5	20	2			27
<b>Female</b>	8	4	1			13
<b>TOTAL</b>	<b>13</b>	<b>24</b>	<b>3</b>			<b>40</b>

The participants of the focus group discussions were actively involved in farming activities on small plots of land, ranging from one to three acres in size. The crops cultivated on their farms predominantly consisted of maize and beans, with a smaller number of farmers also experimenting with cassava, sorghum, and Napier grass. These farmers shared a common

interest in addressing the challenges posed by climate change, regularly coming together to exchange knowledge on new agricultural techniques.

In terms of education, most of the participants had attained at least a secondary level education, while a significant number had completed primary education. A smaller proportion of the participants had received higher education, having attended college. Among the female farmers who participated in the focus group discussions, the majority had completed primary level education. The educational background of the participants is summarized in Table 3.4.

The FGDs were strategically conducted at venues that were most convenient for the farmers, namely their own homesteads where they regularly gather. This approach not only ensured their comfort and ease but also fostered a non-threatening environment conducive to open and candid discussions. Throughout the FGDs, I employed a semi-structured interview guide to guide the conversation. Whenever necessary, I accurately clarified questions in Kiswahili, the local language, and utilized follow-up probes to facilitate participants' understanding or seek further clarification (refer to Appendix one for more details).

Employing an open-ended interview guide, I allocated sufficient time for the participants to share their feedback, enabling them to express their experiences and emotions. In certain instances, multiple farmers enthusiastically participated in answering the questions, which was encouraged to ensure that all perspectives were heard, and valuable insights were captured. To maintain focus and avoid distractions, I used a digital recorder to accurately record the discussions. Additionally, my proficiency in shorthand, which I acquired in high

school, proved invaluable in swiftly capturing key points and emerging issues both by shorthand notation and digital recording methods.

During the FGDs, a qualitative research approach was employed, aiming to elicit participants' perceptions, attitudes, beliefs, opinions, and ideas related to the complex phenomenon of climate change and the available adaptation options. The farmers, who were already acquainted with one another, engaged in open and unrestrained dialogue, thus facilitating a rich and comprehensive exploration of their experiences. This participatory process yielded in-depth insights, enabling the generation of detailed and contextually rich descriptions of their individual and collective encounters with climate change, the messaging and associated challenges. The farmers spoke freely since they were already familiar with each other. They indeed provided an in-depth understanding of the phenomenon that provided thick descriptions of their experiences.

As part of the data generation technique employed during the FGDs, an additional component involved collecting farmers' feedback on the communication aspects of the seasonal weather forecast flier. The fliers were obtained from the agricultural officer and presented to the participants during the FGDs. Subsequently, the fliers were circulated during the FGD, encouraging farmers to provide their feedback on how the information was communicated to them. This approach represents a method of data collection that relies on participant feedback and evaluation.

By presenting the fliers during the FGDs and allowing the participants to share their thoughts and insights, I aimed to gain a deeper understanding of how the messages and the flier itself

were comprehended and interpreted by the farmers. This approach provided valuable qualitative data that shed light on the farmers' subjective experiences and perspectives related to the communication of climate adaptation messages through the fliers.

The analysis of the weather-based agro-advisory flier played a significant role in this study as it represents a specific response to the challenges posed by climate change. Understanding the farmers' knowledge of this crucial tool, designed to assist them in adapting to weather changes, was essential. The agro-advisory in question is a regularly produced seasonal forecast and weather-based advisory flier distributed by the Kenya Meteorological Department within Machakos county to provide access to climate information. It serves as a concise summary of recommended agricultural practices agreed upon by a team of agricultural experts from the Ministry of Agriculture, Kenya Agricultural Research & Livestock Organization (KALRO), and climate experts from the Kenya Meteorological Department (KMD). These recommendations are deemed most suitable and feasible for adapting to upcoming seasonal forecasts.

Small-holder farmers in Machakos, just like those in other sub-Saharan Africa countries, depend on rain-fed agriculture. Over time, they have adjusted their planting patterns and farming calendar to the onset, duration, and end of the rainy seasons. However, with changing rainfall due to climate change, their planting patterns and farming calendar no longer match seasonal rainfall distributions, which often leads to crop losses. These seasonal weather forecasts are thus crucial for the provision of early warning information and, if used by farmers, can enable them to adjust their planting seasons and farming calendar.

According to Jones et al. (2000), timely and accurate access to climate information services (CIS) approximately three to six months in advance is a prerequisite for agricultural production and mitigating risks associated with climate variability. The World Bank also explains that Climate Information Services provide climate forecasts accompanied by agronomic advisory services meant to counteract the uncertainties bedeviling farmers as they make farm decisions against climate risks (World Bank, 2016, quoted by Mutune et al., 2018). According to O'Brien et al., 2000; Klopffer et al. (2006, as quoted by Mutune et al. 2018), previous studies have acknowledged the potential of climate forecast in agriculture when it is accompanied by strategically formulated responses for climate risk adaptation. Such climate Information services influence farmland preparation, planting dates, crop varieties, harvesting time, and marketing.

Hence, by exploring the farmers' perceptions and interpretations of the agro-advisory, which is designed to provide them with the necessary information for making informed decisions related to agricultural practices and risk management, the assessment of the flier aimed to provide a rich and comprehensive understanding of the farmers' interactions with the weather-based agro-advisory. I showed the farmers the weather advisory flier, who gave views and perceptions of the information provided. Specifically, I sought their feedback on whether they had ever seen the flier, where they had seen it, font sizes, language, how familiar they were with the content, and their general view of the contents. I used the flier to triangulate data, to dig out more information of how the climate change messages were framed, packaged and communicated to farmers through the flier.

During the semi-structured interviews at the FGDs and the in-depth one-on-one interviews, I used open-ended interviews, observations, and discussions, to uncover the farmers' perspectives, knowledge gaps, challenges, and potential areas for improvement related to the agro-advisory.

The agro-advisory is produced just before the short or long rains to advise farmers on these issues. In Kenya, and Machakos where the study was carried out, the climate information services, what is referred to as the seasonal forecasts or weather advisories, are provided by the government, international agencies, research, academia, non-government organizations. The Kenya Meteorological Department (KMD) is the national meteorological agency mandated to collect and store national climate data and manage the climate information provision framework. The CIS is provided through newspapers, bulletins, radio, television, trained personnel/intermediaries, short media messages (SMS), and the internet. A seasonal forecast is a significant form of climate information that entails probabilistic precipitation and temperature indicators estimations in the forthcoming seasons on two to three months' time scales (Ziervogel & Calder, 2003, as cited by Mutune et al., 2018). (World Bank, 2016, as cited Mutune et al., 2018). This forecast is critical to smallholder farmers because of the vulnerability they are exposed to due to fluctuations in weather each season. However, their potential benefit can only be realized if the weather forecasts are accessible, accurate, and relevant for the farmers' decision-making (Hansen 2002, cited Mutune et al. 2018).

Ultimately, FGDs emerged as a powerful tool in my quest to investigate the intricacies of climate change adaptation and messaging. Bryman, (2012) notes that FGDs are instrumental in identifying participants' definitions/descriptions of key study parameters. Unlike the

quantitative method, the FGD uses group dynamics in gaining insights into the probable range of responses within target groups. FGDs allowed me to ask exploratory questions of “why” and “how”, inquiries inherent in this study.

Additionally, engaging with farmers in these dialogues, I bore witness to the knowledge inherent in the community. Each participant's contribution added a unique dimension to the discussions, enriching my understanding of the dynamics in climate change messaging. These FGD's not only yielded invaluable data but also offered a glimpse into the farmers' experience in the face of climate challenges.

To enhance the depth of data generated, I employed a triangulation of research techniques. This approach involved integrating multiple methods, such as observing farmers' interactions, seeking feedback on the weather advisory, and utilizing semi-structured interview guides. By doing so, I was able to gain a more holistic understanding of the participants' perspectives and insights on climate change messaging. The combination of these diverse techniques strengthened the credibility and depth of the research findings, presenting a deeper understanding of climate change messaging as perceived by the farmers.

In conclusion, the FGDs provided a valuable platform for exploring climate change adaptation and messaging in depth, capturing diverse perspectives as farmers interacted over the issues affecting them, thus uncovering the social and cultural dimensions that influence adaptation practices.

### **3.7.4. Observations**

I used participant observation, which is a qualitative method with roots in traditional ethnographic research, whose objective is to help researchers learn the perspectives held by study populations. As a qualitative researcher, I presumed that there would be multiple perspectives within this farmer community and was interested both in knowing what those diverse perspectives are and in understanding the interplay among them. This is why I used observation of a group of farmers to explore these diverse farmers' views.

Observation is a data gathering technique commonly used in qualitative research. It involves carefully observing behavior, actions, and interactions of individuals or groups in their natural settings in a purposeful and systematic manner (Kaluwich 2005). Observations can be either structured or unstructured, depending on the research objectives. In structured observation, researchers use predefined categories or criteria to guide their observations and record specific behaviors or events of interest. On the other hand, unstructured observation allows researchers to be more open and flexible, capturing a broader range of behaviors and interactions without predefined categories.

I adopted an unstructured observation approach and attended innovation and technology transfer meetings to document the communication process between innovation actors and farmers, as well as interactions among farmers. Specifically, I observed a farmer group session in Mwanja, one of the research sites, focusing on face-to-face dissemination during a demonstration meeting. This forum facilitated learning and knowledge-sharing, allowing me to capture the nature of discussions, language use, and the communication strategies employed by agricultural experts. I also observed how farmers engaged with new farming

techniques through hands-on demonstrations, how they asked questions, and how they interacted with both agricultural experts and fellow farmers to understand and apply the information. I was taking notes on the real events, actions, conversations, and environmental context, including non-verbal cues during the interactions. Then I captured these observations into notes captured in thick descriptions, later organizing the data by emerging patterns.

The selected group was one that utilizes demonstrations to communicate farming innovations. The farmers gather at one member's land – where a small section has been set apart as a demonstration plot. This is where they interact with the innovation transfer actors and with each other, observing and asking questions about new farming ideas and technologies. Additionally, I actively 'listened' by both observing and participating, to some degree, in the farmers' activities. Since participant observation always takes place in community settings, I joined the farmers' demonstration day and farmer training session and observed how communication was happening to try to learn what life is like for the "insiders"- farmers, while remaining, inevitably, an "outsider." I did not participate in the discussion but was present as an observer. This method is distinctive because as a researcher, I approached farmers in their own environment rather than having them come to me – maybe in an office.

While in these farmers-extension exchange settings, I made careful, objective notes about what I saw, recording all accounts and observations as field notes in a field notebook in as much detail as possible. I held informal conversation and interaction with the farmers and innovation transfer officers – an important component of this data gathering technique.

In addition, at during the key in-depth interviews and FGDs, used the semi-structured to analyze the messages of the regularly produced seasonal forecasts/weather-based advisory flier produced by the Kenya Meteorological Department and circulated Machakos County to give access to climate information.

### **3.8 Thematic Data Analysis**

The goal of qualitative data analysis is to reach some inferences, lessons, or conclusions by condensing large amounts of data into relatively smaller, more manageable bits of understandable information (DeCarlo, downloaded 31.7.2023). Even though this research is based on fewer participants than a survey would have, it yielded several pages of transcripts. This section explains how I made sense of that data by employing an inductive thematic approach to analyze the massive qualitative data accumulated during the research process. Inductive thematic analysis stands as a widely employed method in social, behavioral, and health sciences due to its capacity to offer a structured and systematic means of handling sizable volumes of qualitative data. And so given the richly descriptive nature of the data I had amassed, the application of this approach proved instrumental in effectively organizing and structuring the abundant information at hand.

Due to dense and rich data, all the information cannot not be used in a qualitative study, therefore, Guest, MacQueen, & Namey (cited by Cresswell & Cresswell, 2018) suggest that thematic analysis applies “winnowing” to the data. I found this analysis method useful as I was then able to focus on some of the data and disregard other parts of it by “winnowing” it. According to Guest, MacQueen & Namey, this process, too, is different from quantitative research in which researchers go to great lengths to preserve all the data and reconstruct or

replace missing data. In qualitative research, the impact of this process is to aggregate data into a small number of themes, something between five and seven themes (Creswell, cited by Creswell & Creswell 2018). This flexibility to data analysis was also attractive to me because I could apply it to the various types of qualitative data, including interviews, focus groups, observations, and written documents – that is the weather advisory. It also gave me space to adapt it to suit different questions.

I also chose it because it aligned with my preferred qualitative research design. Caulfield (June 22, 2023) says that thematic analysis is a method of analyzing qualitative data. He adds that the analysis is usually applied to a set of texts, such as an interview or transcripts. A researcher closely examines the data to identify common themes – topics, ideas and patterns of meaning that come up repeatedly. I looked across all the data to identify the common issues that recur and identify the main themes that summarize all the views collected (Jwan and Ongondo, 2011).

There are various approaches to conducting thematic analysis, but the most common form follows a six-step process: familiarization, coding, generating themes, reviewing themes, defining, and naming themes, and writing up. The process consists of reading through textual data, identifying themes in the data, coding those themes, and then interpreting the structure and content of the themes (Jwan and Ongondo, 2011; Guest, MacQueen, & Namey, 2012).

Regarding this process, my data analysis begun with putting in place a plan to manage the large volume of data collected and reducing it in a meaningful way so that I could carry out a

thematic analysis. I needed to match the themes from the thick description of data emerging with the 3 research questions. I have discussed the steps I went through in the section below.

#### *Translation and Transcription*

The interviews were carried out in Kiswahili. A digital recorder and short-hand notes were used to record and capture the discussions. After the data gathering season, the first step was therefore to translate to English and transcribe the interviews. It took two and half hours to transcribe and translate each of the 4 FGDs and 3 KIIs with farmers to English. Interviews carried out with the Extension Officers, Agricultural Officers were carried out in English and just needed transcribing. One of the challenges experienced was that the farmers did not have certain words in Kiswahili, and I had to record the word in Kikamba and spend a bit of time trying to find the right words to describe the term in English. However, this was to my advantage as I had time to really interact with the data, giving me a deeper appreciation of the issues raised even before I started the analysis.

#### *Familiarization*

As part of the data analysis process in my research, I dedicated significant effort to familiarizing myself with the collected data. I engaged in extensive reading and repeated listening to the recorded interviews, taking notes, and annotating the material to gain a deep familiarity with its content and context. I also went through the notes from the observations made during the farmer meeting. Reading and listening repeatedly to get the general overview and feel of the data. By immersing myself in the data, I also identified potential codes and themes that emerged from the participants' responses and interactions. Throughout this stage, I maintained an open and unbiased approach, allowing the data to guide me and

avoiding premature assumptions or interpretations. Additionally, I made sure to understand the context in which the data was collected, and one time reached out to the scientist at KALRO to clarify information about the process of message designing. Writing brief summaries for each research question helped me organize my thoughts and insights, contributing to the rigor and comprehensiveness of my data analysis.

### *Data Coding*

After gaining a profound understanding of the data, the next step was to conduct a manual analysis through coding, a process that involves systematically labeling specific segments of data and grouping them based on their relevance to the study (Strauss & Corbin, 1990). In qualitative research, data coding is a crucial procedure used to organize and categorize the raw data collected from various sources, such as interviews, focus groups, and observations. The main objective of coding is to identify emerging themes, patterns, and key concepts within the data, allowing researchers to make sense of the information and draw meaningful conclusions. As Gibbs (2007) aptly puts it, coding is how researchers define and understand the content and context of the data being analyzed. It involves carefully identifying passages in the text or other data items, searching for underlying concepts, and establishing relationships between them.

Therefore, since coding is not just labeling, I took time to link my data to the research questions and back to other data, a very iterative process. Therefore, I took the cue from Gibbs description and started using the three coding techniques listed by Strauss and Corbin (1998) for analyzing text data, namely: open, axial, and selective. I began with open coding where I went through each transcript and highlighted the chunks which were distinct in

relation to the study (Cresswell, 2007). At this point I did not limit myself, and several codes emerged from the data, and each was assigned phrases that captured a particular issue relevant to the study.

As a researcher, I remained open to various interpretations and allowed multiple codes to emerge from the data. I used markers to distinguish the codes that were relevant to the research objectives. Each code describes an idea, or a feeling expressed in a part of the text. I highlighted everything that came out as potentially interesting, while highlighting all the phrases that matched the codes as I went through the text. I then collated all the data into groups identified by the code which allowed me to gain a condensed overview of the main point and common meanings that recurred throughout the data.

About 50 codes emerged from interviews with farmers, message developers and extensionists. Upon completing the initial coding process, I extracted various data segments and assigned them to specific codes, each representing a distinct concept. Consequently, these segmented data were organized into separate files for effective data management.

During the axial coding phase, I analyzed the data files to explore relationships and connections between the codes identified in the open coding stage. This involved a critical examination of the initial level coding and merging of several codes, as described by Jwan & Ong'ondo (2011). Some codes were downgraded, while others were promoted to form categories, resulting in a reduction in the number of codes. The iterative process required going back and forth between the data and the emerging categories, leading to a comprehensive understanding of the data. This iterative process involved revisiting the

original data multiple times to ensure accuracy and thoroughness in the identification of broader themes and categories.

#### *Searching for Themes:*

In the third phase of coding, the categories were organized into themes, a process known as selective coding (Cresswell, 2007). These themes aligned well with the research questions formulated during the study's conceptualization. During this stage, I carefully reviewed and grouped the different categories and codes into cohesive themes by cutting and pasting the relevant data. I ensured that the themes, codes, and data all accurately represented the original data and captured the focus of the study.

The final step involved crafting a research report, as discussed in chapter 4, which presented a cohesive and comprehensible narrative that explained the data to the reader (Cresswell, 2007; Jwan & Ong'ondo, 2011). This report provided a detailed account of the thematic analysis process, and the insights gained from the quantitative data, contributing to a comprehensive understanding of the research topic.

#### *Analysis from Observations*

Since I conducted unstructured observations, I did not use predefined categories; instead, coding was an iterative process. I identified and recorded key behaviors without imposing a predetermined framework. For instance, I observed patterns of eye contact, language use, and how farmers responded to one another and to the innovation actor. I then labeled these observed phenomena with short, descriptive terms. Additionally, I examined power dynamics, emotional expressions, and social influences. To deepen my analysis, I triangulated these observations with interview data, allowing me to uncover underlying meanings and cultural

factors shaping the interactions. In my findings, I employed thick descriptions- rich, detailed narratives that provide context to the study, while explaining in detail what I observed, and incorporating direct excerpts from field notes to support emerging themes.

### **3.9 Field Constraints**

I conducted research in Machakos County, in the catchment area of Katumani KALRO research centre. I faced two main challenges as I conducted the interviews. Firstly, I was using pre-existing farmer groups who have pre-determined meeting days. Unfortunately, due to the rainy season, some of the farmer groups would not meet on those days since farmers needed to prepare the land for planting. However, I was still able to meet with them albeit the challenge of meetings being postponed.

The farmers also expected to be paid for coming for the meeting – a practice I realised had been promoted by the numerous NGOs that work with the farmers in this area. They give them allowances whenever they visit their groups. Fortunately, I had the support of the agricultural officer in the region who explained that I was a student, and my assignment did not allow me to give allowances for information.

### **3.10 Trustworthiness**

The trustworthiness of the study was ensured through a comprehensive approach, bolstering the credibility and reliability of the research findings (Bassegy, 1999). Validity and reliability, often utilized as criteria in quantitative research, are complemented in qualitative research by concepts like credibility, transferability, dependability, and conformability, as well as triangulation (Yin, 2009).

In this research, credibility is demonstrated by giving a detailed account or description of the research process, while providing transparency and a chain of evidence through quotes and figures as recommended by Maxwell (2005, cited by Yin 2009). The research report included a thorough account of the research methodology, outlining the steps taken in data collection and analysis. By providing transparency and clarity on the data collection techniques, such as semi-structured interviews, participant observation during farmers' meetings, analysis of weather advisories, and Focus Group Discussions, readers can assess the rigor and appropriateness of the chosen methods for generating the data. Additionally, Yin (2009) recommends demonstrating a certain chain of evidence through the reports, which is provided in this research in terms of quotes and figures. Furthermore, I have given clear and detailed descriptions of the steps followed in the research process, maintaining detailed records of the research design, data collection, coding decisions and analysis procedures.

Dependability, I kept a journal documenting my potential biases, and assumptions as the researcher who had deep interest in the subject of study. In addition to ensuring that the research is dependable, I have explained my background and interest in this climate change messaging research. Indeed, I have worked for many years in the field of agricultural communication and have a passion for promoting participatory communication that allows local communities to be involved in their own development. It is possible for this passion and interest to influence the research process. Acknowledging this interest at the beginning helps to show dependability of research. It is comforting to note that though researchers might have an influence on the study, this does not rule out its trustworthiness. This reflexivity contributes to the overall transferability of my research (Jwan and Ong'ondo, 2011).

The taped transcriptions were downloaded as they are. Thick description refers to the practice of providing rich and detailed descriptions of the research context, participants, and phenomena under study. The term was popularized by anthropologist Geertz (1973), who emphasized the importance of capturing the cultural context and the intricacies of human behavior to gain a deeper understanding of the social phenomenon being studied. He continues to say that thick description goes beyond merely reporting observable behaviors or events and delves into the underlying meanings, symbols, and cultural norms that shape those behaviors. It involves recording not only what happened but also why it happened, the emotions and motivations of the participants, and the broader social and cultural context in which the events occur.

In essence, I used thick description by painting vivid pictures of the research setting and the farmers, message designers and extensionists involved in the research. This is to enable my readers to immerse themselves in the world of the participants and grasp the complexity of their experiences as they go through climate change adaptation challenges. I have tried to use descriptive language, quotes, even in farmers' mother tongue, and detailed narratives to capture the subtleties of the data, making the findings more and more relatable. As a matter of fact, thick description also provided a deeper level of insight into the research phenomenon, enhancing its credibility and transferability of my findings, while helping my audience to appreciate of the cultural and social factors influencing the study of messaging in adaptation. I employed triangulation as a means of strengthening the trustworthiness of the study, using multiple data generation techniques and theoretical perspectives (Halcomb & Andrew, 2005; Yin, 2009). The data triangulation approach involved using various methods such as Key

Informant Interviews, participant observation, analysis of the weather advisory, and Focus Group Discussions, providing a comprehensive understanding of climate adaptation messaging (Jwan & Ong'ondo, 2011). Furthermore, the research employed theoretical triangulation, incorporating multiple development communication theories like the social learning and Lay knowledge theories, enriching the interpretation of the study phenomenon (Halcomb & Andrew, 2005).

Moreover, investigator triangulation played a crucial role in ensuring objectivity and rigor in the study. I did this by seeking feedback and critical examination of field notes from "peer debriefing" from colleagues at Moi University. For example, they reviewed data collected from my field observations, ensuring that interpretations were not influenced by my perspectives as I shared it with them, and they scrutinized. This process allowed for an unbiased assessment of assumptions, further solidifying the trustworthiness of the research – as recommended by Bloomberg (2007). The process of investigator triangulation typically involves researchers working together to collectively analyze the data, discuss emerging themes, and reach consensus on the interpretation of the findings. This collaborative approach allows for a more thorough examination of the data and encourages critical discussions that challenge assumptions and promote reflexivity. Even though my peers were not available for in-depth analysis, I occasionally invited them to give me feedback on their perceptions of my findings. This was to address potential biases that might have arisen from my own interpretations and to ensure that the study's conclusions are well-supported and robust (Morse, 1991).

I ensured confirmability and dependability by maintaining a transparent and well-documented audit trail of the research process. The inclusion of journaling, field notes, and transcripts allowed readers to assess the reliability and trustworthiness of the study's conclusions, further contributing to its transferability. The audit trail, including journaling, field notes, and transcripts, allows readers to assess the study's conclusions and ensure the research's reliability (Bloomberg, 2007).

Furthermore, the combination of qualitative methodologies and rigorous validation techniques lends credibility to the study's findings, making it a valuable contribution to the field of climate change communication and qualitative research (Bassey, 1999). The research process, with its emphasis on transparency, thoroughness, and replicability, provides a solid foundation for researchers, academics, and peers to refer to and build upon this study's insights (Maxwell, 2005; Yin, 2009).

### **3.11 Ethical Considerations**

Arifin (2018) asserts that participant protection through appropriate application of ethical principles is essential to any research project. Qualitative studies are particularly sensitive to ethical questions because of the length of the research process. Arifin contends that ethical considerations become even more important when conducting in-person interviews with people who are vulnerable. The small farmers in the case of my study would be considered vulnerable. He says that they become distressed while expressing their feelings during the interviews. I took cognize of this factor and developed some guidelines to ensure ethical guidance for undertaking qualitative research.

The National Council for Science and Technology (NCST) granted me permission to carry out the study in accordance with the legal and ethical requirements and provided me with a research permit (a copy of which can be found in Appendix 4). Additionally, I asked for and got verbal approval from Machakos' major agricultural stakeholders, who act as the region's gatekeepers for agricultural groups. They gave me permission to enter the groups to carry out the semi-structured interviews and focus groups.

Moreover, this study adopted the terminology of "participants" to refer to the individuals from whom data was gathered, acknowledging their pivotal role as co-constructors of meaning and knowledge. The utilization of participant-centered language underscores their active engagement and contribution to the research process, recognizing them as valued partners in the journey of knowledge creation.

My goal was to make sure that the farmers and other research participants participated voluntarily to further uphold ethical standards. To achieve this, consent forms were given to the participants to obtain their consent to participate in the study (Johnson, 2016). The purpose, objectives, procedures, potential risks, and benefits of the study were disclosed (Miles, Huberman, & Saldaña, 2014). By signing the consent form, participants signified their voluntary acceptance to engage in the research. The informed consent forms were crafted to maintain transparency and respect for participants' autonomy (Creswell, 2013). They conveyed the significance of the study and its potential contributions to both academic knowledge and practical applications in the context of climate change adaptation in rural Kenya. Additionally, the forms outlined the potential benefits that participants may derive

from taking part in the research, fostering a sense of purpose and appreciation for their involvement (Yardley, 2018).

Importantly, participants were explicitly informed of their right to withdraw from the study at any point should they feel uncomfortable or apprehensive about any aspect of their participation, as is suggested by Tracy (2013). Further, Moi University's contact information was provided in case they needed clarification and for transparency. This emphasis on voluntary participation ensured that participants felt empowered to make autonomous decisions regarding their involvement, instilling a sense of trust and cooperation between the researcher and the participants, as Creswell (2013) suggests.

Additionally, during data collection, the participants were informed of their right to refuse to answer any questions if they believed doing so would violate their right to privacy or personal comfort (Yardley, 2018). This commitment to respect participants' boundaries further reinforced the ethical principles guiding the research process and underscored the researcher's dedication to safeguarding the well-being and rights of the individuals involved (Johnson, 2016).

In summary, the attention to obtaining informed consent from the research participants reflects the adherence to rigorous ethical principles in qualitative research. The use of participant-centered language and the comprehensive disclosure of information in the informed consent forms reinforced a collaborative and respectful research relationship, paving the way for meaningful and insightful contributions from the participants (Creswell, 2013; Tracy, 2013).

In this research, paramount importance was given to upholding the highest ethical standards throughout the data collection process (Creswell, 2014; Johnson, 2016). Before the initiation of any conversation or observation, information about the study's purpose and objectives was provided to the participants, ensuring informed consent and voluntary participation (Mertens, 2015). Transparency and trust were fostered by explaining the researcher's presence and role in the process, establishing a collaborative and respectful environment (Yardley, 2018).

Furthermore, to enhance ethical conduct, the participants were approached for permission to audio record interactions, granting them full autonomy over their involvement (Tracy, 2013). Additionally, participants' consent was assiduously sought for any visual documentation (photography or filming), acknowledging their right to manage how their images were used in the study (Miles et al., 2014; Johnson, 2016, cited by Sutton & Austin, 2014). By adhering to these rigorous ethical protocols, this research ensured that the rights, autonomy, and dignity of the participants were upheld, making their invaluable contributions to the study a result of informed and willing participation (Creswell, 2014; Mertens, 2015).

As for anonymity, I was not interested in specific names, therefore, anonymity was maintained by using codes or abbreviations e.g., AO to describe the participants in the research. I ensured that the identities of the participants were concealed in this way. There is no identifiable data that was collected, like names or home. In my responses, for example, I did not write telephone numbers or names of the participants. Where it is necessary to have names, I did not make any connection between data and the participant. As for confidentiality, I am the only one who knows who the participants are – I ensured that I had

removed all identifying information from my report and used codes whose meaning are only known to me.

### **3.12 Chapter Summary**

To sum up, this chapter has provided a thorough overview of the research methodology used to investigate smallholder farmers' messages about climate adaptation. The choice of a qualitative research approach was supported by the philosophical paradigms of constructivism, relativism, and ontology. Relevant information was gathered using a variety of data generation techniques, such as semi-structured interviews conducted during focus group discussions, document analysis, and observation. The rationale behind the sample size and selection process was thoroughly justified. The chapter also discussed the coding and thematic analysis of the voluminous data collected. Moreover, the study's commitment to maintaining trustworthiness and adhering to ethical considerations was highlighted. The subsequent chapter will present the data thematically, offering further insights into climate adaptation messaging in the context of smallholder farming communities.

## CHAPTER FOUR

### FINDINGS

#### 4.0 Overview

In the chapter (and the next 2), I present the findings of the study based on the thematic analysis of qualitative data obtained through triangulation of research methods, specifically Key Informant Interviews (KII), Focus Group Discussions (FGDs), participant observations, and Semi-Structured Interviews (SSI). This methodological triangulation allowed me to gain a comprehensive understanding of climate adaptation messaging among smallholder farmers in Machakos county, ensuring that the data was corroborated and cross-validated, enhancing the credibility and reliability of the results. The research findings are also informed and supported by the theoretical considerations and draw insights from the literature review on climate change messaging and small-scale agriculture. This theoretical underpinning served as a guiding framework throughout our data analysis, enabling us to identify recurring themes and patterns with a deep understanding of the broader context.

Additionally, the findings in this and the other two chapters are aligned to these research questions: What climate change messages are communicated to smallholder farmers in Kenya? How are the climate change messages communicated to smallholder farmers in Kenya designed? What are the perceptions of the small holder farmers of the climate change messages in Kenya?

While some of the concepts covered may overlap, a theme-by-theme presentation was used for analytical purposes. The data is presented in narrative form with quotations, summaries, and paraphrases from the data sources. Texts that are quoted are those that I deemed to be the

most concise and useful. All 4 types of data sources are cited in the presentations to give validity to the information. In Table 4.1, I present the symbols that indicate the sources of the data that feature in this Chapter – and the other two chapters.

***Table 4.1: Sources of data***

<p>WA1 – SSI &amp; KII – with Seasonal Weather Advisory 1.  <b>FGD 1 – SSI at Focus Group Discussion in Kinutwa Sub-location</b>  FGD 2- SSI- Focus Group Discussions in Mua.  FGD 3- SSI -Focus Group Discussion in Ichanda Sub-location with Farmers  FGD 4 – SSI- Focus Group Discussion in Mwanja  AO 1 – KII - Agricultural Officers 1  AO 2 – KII - Agricultural Officer 2  RO – KII- Message Designer 1  MO – KII- Meteorology Officer  FF1 – KII -Female farmer 1  FF2 – KII - Female farmer 2  FF3 – KII - Farmer 3  PSE 1 – KII - Private Sector Extensionist 1</p>
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#### **4.1 Messages communicated on climate adaptation.**

This section describes responses to the first question: What climate change messages are communicated to smallholder farmers in Kenya? The scope of this question included: a description of the climate change adaptation messages they receive, namely, the seasonal weather forecasts, drought resistant crops, and new farming techniques. Others are the non-verbal and unintended messages communicated on climate change. The KII and the semi-structured interview guides at the FGDs revealed 3 key adaptation messages discussed below.

##### **4.1.1. Seasonal Weather Forecast**

The message designers and extension officers reported providing farmers with a quarterly seasonal weather advisory just before each rainy season. They explained that the Seasonal forecasts provide a range of possible climate changes that are likely to occur in the season ahead. This advisory contains weather forecasts for each season and suggests innovative

farming practices to cope with weather changes. The farmers confirmed receiving these weather forecasts from meteorological officers during the focus group discussions (FGDs). The forecast includes information on rainfall patterns, distribution, and amounts of rain, guiding farmers on the optimal time for crop planting (KII and Semi-structured interviews). In FGD5:2 said “We are taught by KALRO how it will rain... For example, right now, we are waiting for the ninth month before the rains, so they provide us with a report on the expected rainfall.” An example of the seasonal weather forecast:

**March-April- May 2018 Rain season (MAM)**

This time Makindu and surrounding areas like Kalii are expected to receive near normal to below normal (depressed) rainfall. Kalii area is expected to experience the onset in the 3<sup>rd</sup> to 4<sup>th</sup> week of March and cessation in the first week of May. The March to May 2018 rainfall is predicted to be poorly distributed over most parts of the watershed. May generally will be dry (WA1).

The MO1 explained that the long rains March to May 2018 (MAM) seasonal rainfall at Makindu station was the highest recorded in the last 50 years. He said that this season constitutes an important rainfall season in Kenya, particularly in Machakos county. He explained that the flier given to farmers in that season constituted the amounts of rainfall for that season, the distribution and amounts of rains to be expected. Short Rains, which were being expected by time I went to the field, would come in October-November-December (OND).

The MO1 shared some older seasonal weather forecasts, below. These affirmed and helped me to understand further how seasonal forecasts are presented:

**October-November-December 2012 (OND)**

Kalii falls in Makindu area and the long-term average for Makindu during the OND season is 250 mm. Kalii received 118 mm of rainfall.

**March- May Rain season reads 2013:**

This time Makindu and surrounding areas like Kalii are expected to receive near normal to below normal (depressed) rainfall. Kalii area is expected to realise the onset in the third to fourth week of March and cessation in the first week of May. The March to May 2013 rainfall is predicted to be poorly distributed over most parts of the watershed. May will be generally dry.

In the KIIs, the MO1 and MO2 concurred that usually when the weather advisory forecast is released, they expect three types of rainfall. The rainfall that may be above normal, the rainfall that may be normal and the rainfall that may be below normal. Due to the invariability of the rains, the MO1, MO2, Extension officers and agricultural officers concurred that decisions farmers make based on these predications is very critical.

#### **4.1.2. Drought Tolerant Crops and Disease Control**

So, based on the type of rains they predicted, the experts come in to help farmers make appropriate farm decisions that are adapted to the weather variabilities. As the AO2 said in the KII:

Our ministry plays a crucial role by advising farmers on the most suitable crop varieties for specific seasons, so they can optimize their yields. In the case of normal rainfall, we recommend specific varieties and provide guidance on the appropriate structures needed to support that type of rainfall. Similarly, if there's above-normal rainfall, we suggest varieties best suited for our region and advise farmers to ensure they maximize their yield potential under those conditions. Additionally, we advise farmers to up water collecting structures on their farms. Our advice primarily revolves around helping farmers plan their agricultural decisions, enabling them to effectively utilize the available rainfall for each season (AO2).

Due to the increasingly poor rains, distribution, and amounts, and based on the weather outlook, farmers are increasingly advised to engage in dry planting after preparing their farms. The focus is on early maturing and drought-tolerant crop varieties such as, pigeon peas, cowpeas, dolichos, sorghum, pearl millet, pigeon pea, and finger millet. Farmers are advised

to opt for certified seeds of these crops which mature faster. Conversely, due to predictably poor seasons, farmers are discouraged from planting maize.

**Table 4.2: Drought resistant crops provided in the weather advisory flier.**

Crop	Variety
Green grams	N2, N22 6 & KS20
Pigeonpea	Mbaazi 1 & Kat 60/8
Cowpea	M55 & K80
Dolichos	DL1002
Sorghum	Seredo & Serena
Pearl & Finger millet	KAT/PM 1, 2, & 3; KAT/FM 1

The other information to help farmers cope with climate change includes instructions not only on appropriate crops, but also insights into disease management. Disease control measures include information on how to monitor for aphids in cowpea and fruit trees and addressing shoot fly and stalk borers in sorghum. Farmers are advised to report any outbreaks to agricultural extension officers. They also receive information on the correct pesticides to use during the upcoming seasons to fight disease outbreak and frost. This information is also shared by various seed companies through the radio.

Additionally, farmers are encouraged to try out organic agriculture which is more sustainable in the face of climate change. Asked about what he thinks should be done to reduce the risk and adverse effects of climate change, one extension officer from a local NGO had this to say:

We are impressing them to do more sustainable farming like organic agricultural. We encourage farmers to go in and rehabilitate the land and to come up with other ways of managing water catchments - along the rivers. So that is the reason why we are encouraging them to go for inputs which may be able to sustain their farming, for

example to use a lot of synthetic fertilizers which are retained in the soil longer, even when rains are short. We also carry out a lot of campaigns on issues like tree planting, and dry land farming technologies (**PSE1**).

Beekeepers are encouraged to harvest honey and clean up hives before the rains, while fish farmers are advised to harvest fish and conserve water. Poultry farmers are reminded to be vigilant about viral diseases, particularly the Newcastle disease (NCD), and to vaccinate their birds accordingly. As an incentive to use the new technologies, farmers are encouraged to take advantage of the subsidized farming input provided by the government; look out for the government grants provided through the Equity bank and AFC to the necessary inputs and increase productivity and finally farmers are encouraged to take up fish farming and benefit from support from the fisheries department under the economic stimulus program.

#### **4.1.3 Farming Innovations and New Techniques**

In response to the challenges posed by climate change, farmers are also advised to adopt various farming innovations and techniques to enhance their resilience. Both KII and FGD's highlighted that farmers are regularly exposed to other information related to rain harvesting and simple irrigation techniques, as essential strategies to adapt to the challenging realities of climate change. The agricultural and extension officers emphasize the significance of water management practices and innovative approaches to help farmers cope with changing weather patterns and maintain agricultural productivity in the face of climate variability.

According to AO 2, farmers are encouraged to prepare their land before the rain to store rainwater effectively and conserve moisture. This involves harvesting run-off water from roads and uncultivated areas, as well as implementing various measures such as repairing

terraces, rehabilitating dams, and constructing zai pits, tied ridges or contour furrows to collect water, along with small water pans within their farms to harvest surface run-off. Additionally, farmers are advised to practice double digging, carry out timely weeding, and use mulching where possible. When the weather forecasts are reduced or below normal rainfall, farmers are advised to take advantage of the limited water available.

The "*tumbukiza* method" is recommended for livestock farmers to improve pasture growth and production. To use this technique, the field must be prepared by digging pits, combining topsoil with farmyard manure, and planting Napier grass cuttings. Livestock farmers can enhance pasture growth and boost output by using this strategy. Owners of fruit orchards and banana plantations are urged to take precautions like pruning, cutting, and burning fruit stalks, constructing negarims, and harvesting water before the season. These findings were corroborated by Research Officer 1 (RO1), who is also one of the message designers, during the KII. According to RO1, once the weather forecast is disseminated to the livestock keeper, they are expected to determine the amount of hay to stock based on the predicted amount of rainfall.

Farmers are also taught how to use Conservation tillage technology to mitigate against climate change. In this method, farmers use a combination of methods: no tillage, the soil is permanently covered, and they practice crop rotation. During the tour of farmer FF3's farm, he showed me how conservation tillage works. The farm is covered by mulch – which consists of dry material from his previous farming activity. The farm is full of animal manure which he says is waiting to be spread across the farm and mixed with the mulch. The farmer explains that when the soil on his farm is minimally disturbed, it can retain moisture for a

long period, in case the rain fails, crops are still able to reach maturity with the little soil left on the ground. Through CA, farmers are taught how to clear bushes using herbicides rather than digging. FF3 explains that he uses herbicides to clear bushes rather than digging. “The first time I cleared the bushes and used herbicides to clear the short weeds. After that I planted seeds. For the Napier grass, I was shown how to dig Zai pits (he points at it), which is a deep hole which helps retain water,” said FF3.

FF3, who is implementing the technologies illustrated how these new innovations are working on his farm by leading me to his small water pan. It is located at the lower part of his farm and covered by a nylon dam liner. It has an inlet and outlet, and water is fed into the farm through gradient. He attributes the healthy crops in his farm to the water he harvested and says, “My maize crop would not have been this healthy if I had not harvested water and used this runoff water to water my crops. This water is from the roof tops, the road, and other places on the farm. I collect it and can use it and get enough harvest to feed my family and sell to neighbors” (FF3).

On other parts of his farm, this farmer and others have constructed simple technologies to conserve water like the tied ridges – which are soil and moisture conservation structures that involve farmers constructing small rectangular basins formed within a furrow of the cultivated small fields to increase storage and allow more time for rainfall to infiltrate the soil. The tied ridges are a furrow, a long, narrow trench made in the ground by a plough, where the farmers plant seeds and are used for irrigation. For irrigation, the water flows and collects here and is used when necessary – it is also used for planting seeds or irrigation.

In conclusion, farmers receive messages on new technologies, particularly those related to rain harvesting and simple irrigation methods to adapt to climate change challenges. Through this information on innovative approaches and support from the advisory, it's expected that farmers are better equipped to navigate the impacts of climate change on their agricultural practices and access financial resources to enhance productivity.

## **4.2 Chapter Summary**

This chapter first explains the research tools used to gather data on climate adaptation messaging reported in chapter 4-6. These include key informant interviews, semi-structured interviews, focus group discussions, and observation of farmer-extension officer interactions. The chapter then reports the findings on the adaptation messages communicated to farmers to help them cope with climate change. Farmers, messengers, and extension officers all concurred that the messages are about seasonal weather forecasts and adaptation options to cope with the changes, which include new drought resistant crop varieties, pest and disease management and simple technologies to conserve water. Farmers reported experiencing changes in local climate over the last decades, such as rising temperatures and more variable rainfall, resulting in reduced production and income. The next chapter reports the findings on how these messages are designed.

## CHAPTER FIVE

### CLIMATE CHANGE MESSAGE DESIGN

#### 5.0 Overview

In this chapter I present findings to the second research question, which is: how are climate change messages disseminated to smallholder farmers in Machakos county Kenya designed? The scope of this question included issues related to: how are messages designed? Who designs? What informs the design? What communication tools are used to communicate climate change adaptation messages? What experience do farmers have with the various communication channels?

#### 5.1 Climate Adaptation Messages Crafted from Regional-to-National-to Local Levels

The process of crafting messages begins with professionals crafting them at the regional level and subsequently passing them down to the broader national audience through the Kenya Meteorological Department before finally reaching the local level, where farmers receive the information. MO1 described this approach as follows: MO1 described it this way:

Normally the conversation starts from the regional level, that is the Great Horn of Africa. Like this season already the technical people are in Kampala doing the regional forecast - we call it the Great Horn of Africa. From there we shall prepare the national forecast; from the national forecast we will come to the county. We meet stakeholders in a county forum to localize it and from here we disseminate it to the farmers (MO 1).

Once the forecast is produced at the regional level, as illustrated by MO1, a national one is developed by Kenya Meteorological Department (KMD) at national level. Hence, before the start of the season the meteorology department in Nairobi announces the national weather outlook. It is the data from the Kenya Meteorological Department that informs the county

team, who then decide how the forecast will affect the farmers and come up with a seasonal weather advisory for this specific area, in this case around KALRO Katumani Machakos.

Hence, at this local level, a seasonal weather advisory is developed in response to the national forecast, by a team of scientists from the Kenya Meteorological Department (KMD), Kenya Agricultural Research and Livestock Organisation (KALRO, International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), ASARECA, officers from the Ministry of Agriculture and, the Extension officers (MO1).

During the KII, the AO 2 also shed light and said that the national advisory is shared at the sub county level with agricultural players in a workshop known as Participatory Scenario Planning (PSP). These include various technical people from different sectors like livestock, agriculture, fisheries. The idea is to try and mix knowledge from the relevant agricultural sectors – the crop scientists, extensionists and from the livestock officers - after combining all that the knowledge, they come out with a seasonal weather advisory which is shared to be adopted by to farmers.

The MO1 further explained that at the PSP stakeholders assess what has been given from the National Met department and then contextualize it to southeastern Kenya, where Machakos is located. Then from there they narrow down to their own sub county and look at the implications and the best way for farmers to mitigate rain distribution. MO1 says:

We ask: if the players at regional or national level are saying the rain is below normal - what does that mean for the farmer? It means the rain will not be enough, farmers are supposed to plant drought resistant crops which require the least rain and extraordinarily little time to grow. The farmers are supposed to harvest little rainwater and ensure that all the structures are repaired so that any little rain is conserved in the farms (MO1).

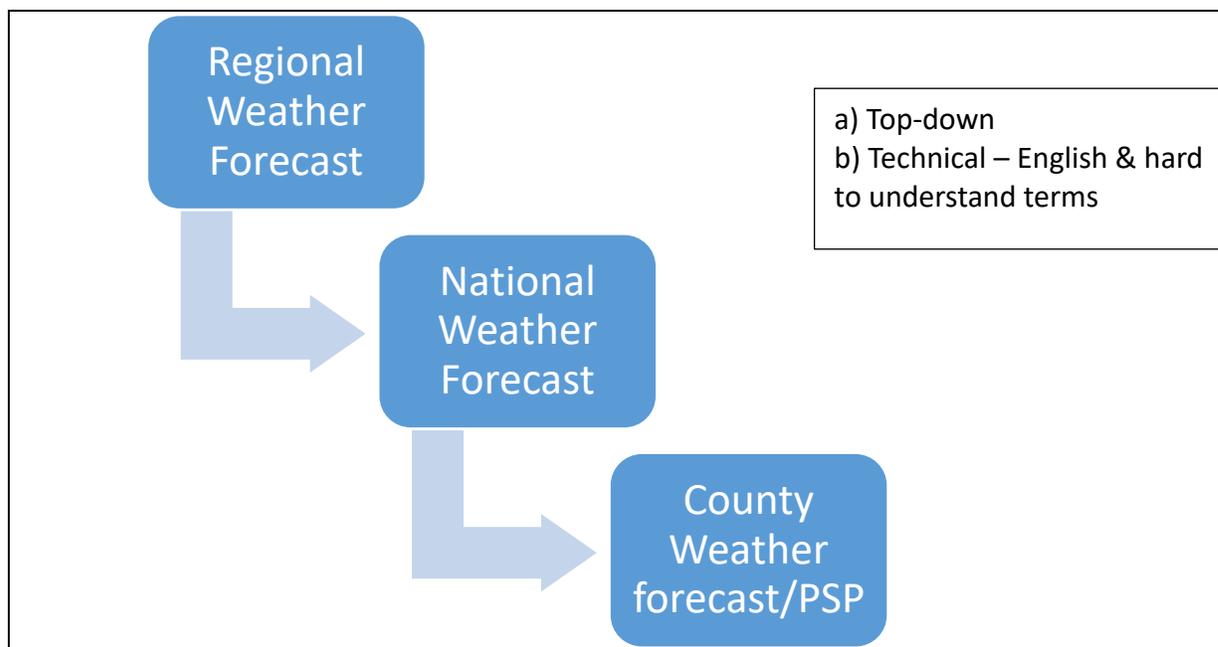
Farmer representatives are also invited to the PSP where the local weather advisory is prepared. The farmers are on the ground and are really the ones who follow up what is happening in the environment, according to the MO1. He said that farmer representatives play an important role, contributing to their traditional knowledge of weather patterns and observations of plants and animals, which enriches the advisory's content. For example, they observe the plants- how the trees and animals are behaving and from this, they can tell whether the rain will be coming. They interact with them and mix the traditional and the scientific knowledge to decide on the forecast. The MOI says:

Farmers have their own traditional way of observing weather and climate patterns and have adaptive strategies, so we invite them to share at the workshop. We give the technical bit and interact with the traditional person who gives his own forecast, based on their observation of how the animals are behaving to predict whether the rain is coming (MO1).

The AO2 explained that they train the farmers during their farmer group meeting so that they understand the information that is produced at the PSP. By so doing, the experts said that farmer representatives can interact and engage with the weather advisory messages. They expose them to important terms, for example, explaining that when they say the rain is below average or below normal. The AO1 explained that the insights and knowledge shared during these workshops are critical in interpreting the climate forecasts into a locally relevant and practical weather advisory for farmers.

The figure below illustrates how the messages are designed from Regional, National to county level.

**Figure 5.1 Message Designing Process**



In summary, according to MO1, the PSP is part of a process of collective sharing and interpretation of climate forecasts. It is conducted as soon as a seasonal climate forecast is made available by meteorological services. In a workshop setting over one to two days, meteorologists, community member representatives, local government departments and local NGOs share their knowledge – both local knowledge and scientific information – on climate forecasts. The participants discuss and appreciate the value of the two perspectives and collectively find ways to interpret the information into a form that is locally relevant and useful.

On the motivation leading to messages being designed as advisories, participants during the FGD and KII said that they were responding to the challenges the farmers faced in the face of climate change. The agricultural officers both said that without the right information, farmers

had continued to use the same approaches to farming they had always used previously and really burnt their fingers as they would lose their crops due to variability in climate. They were uncertain about climate change and how they need to adjust their farming. The AO2 said:

Many farmers faced significant challenges when it came to making informed decisions regarding climate change adaptation. It was common to observe farmers planting the Katumani maize variety despite excessive rainfall. Unfortunately, this variety would reach maturity while the rain was still pouring, resulting in suboptimal yields. Conversely, some farmers opted for the pioneer variety, which required approximately three months or more to mature. In cases where the rainfall season was short, this longer-maturing variety would perish during the flowering stage. These circumstances prompted stakeholders to recognize that farmers were struggling to make basic farm management decisions, such as selecting appropriate seeds, determining optimal planting times, and choosing suitable fertilizers or pesticides. These challenges were particularly evident due to the increasing variability in climate conditions (AO2).

The key issues emerging from KII and corroborated in the FGD's is that messages are designed from regional, national, and county levels then passed on to farmers. The design is influenced by the need to build farmers' resilience in the face of climate change. The messages are packaged primarily as a seasonal weather advisory and distributed to farmers through Radio, printed pamphlets, and farmer groups.

### **5.1 Language used to Communicate Climate Adaptation Messages.**

During the FGDs and the KII, farmers concurred that apart from the messages being designed top-down, the language was also hard to understand. MO2 acknowledged that even though they have tried to simplify the messages on new technologies, the terms they use are still too technical for the farmers. He said that farmers say the language used is difficult for them to understand: "In an effort to engage farmers, our language has been simplified over time. For instance, referring to the months of October, November, and December as 'OND' has become

a familiar term for them. However, it is undeniable that the language and symbols used still present challenges for farmers" (MO2).

Many farmers expressed difficulties in comprehending the contents of the seasonal advisory flier where the information on new technologies is communicated. This is due to the use of English language and, more significantly, the inclusion of technical terms to describe crops. The inclusion of terms such as dolichos, pigeon pea, green grams, pearl, finger millet, Serodo, and Serena perplexed the farmers, as expressed by one participant in FGD4:2 who said, "I don't understand these terms, I wish these words were written in Kikamba." The farmers acknowledged their reliance on input shopkeepers to interpret these messages since they themselves lacked understanding, as revealed in FGD3:3.

Hence, the KII with the message designers also corroborated what farmers said in the FGDs, as he noted that the language is intended to be simple and straightforward. However, since the beneficiaries are not involved in the design process, the information ends up being technical and not farmer friendly. According to him, the jargon used on the flier is due to farmers not being involved in its design. The figure below shows the text used to describe the recommended drought-resistant crops for a season – on the weather advisories.

**Table 5.1: Content of drought resistant crops included in the weather advisory**

Green grams	N2, N22 6 & KS20
Pigeonpea	Mbaazi 1 & Kat 60/8
Cowpea	M55 & K80
Dolichos	DL1002
Sorghum	Seredo & Serena
Pearl & Finger millet	KAT/PM 1, 2, &3; KAT/FM 1

**(WA1 – Weather Advisory 1)**

The farmers pointed out that with this kind of language, the flier is only useful when someone reads and translates it for most of them. So, on many occasions, the Agricultural Officer must come and explain the contents of the flier. Some other farmers who are unable to understand the language share it with their family members to assist them to comprehend the information.

For instance, during the session where FGD3:5, a 65-year-old woman, was shown the flier and asked about her understanding of its contents, she responded by stating, "*I do not possess formal education, hence I am unable to comprehend the contents.*" Furthermore, she mentioned that she only understands the information when someone within the group explains it to her or when her grandchild at home reads and explains it to her. An additional participant aged 30 highlighted their role in assisting with reading and interpreting the weather advisory message. When asked whether they would comprehend the advisory without someone available to explain it, the young man responded by stating that he had completed Form Four education and possesses a good understanding of English (FGD3:6).

When probed about the language being challenging, a female farmer expressed her belief that individuals involved in scientific fields struggle to convey their ideas in a simplified manner. She commented, "*There is a challenge in just explaining some scientific words. Maybe*

*technical language is difficult to explain.*" (FGD 4:3). This perspective was consistently echoed across all four focus groups where farmers provided feedback on the seasonal weather advisory leaflet.

Upon probing the issue of jargon, farmers suggested the substitution of certain words with simpler alternatives or the inclusion of diagrams and pictures for illustration purposes. For instance, they recommended capturing clear photographs of the new crop varieties instead of relying solely on textual descriptions. When asked about their reasoning behind the desire for simplified language, the farmers expressed concerns regarding older individuals who may not be familiar with terms such as "cowpeas," as emphasized by a participant in FGD 2:5.

For example, farmers recommended using the image of 'black bean' to replace the word 'dolicho', which they had no idea what it was. Or using language that they understood, e.g., by using the term '*njahi*' (black bean) which they use and understand rather than dolicho – the technical name for the black bean. They also recommended translation from English into local languages of the weather advisory, which they said had useful information but is currently not helping those who do not have language access.

It should be written in another language like Kikamba or Kiswahili so that when you read it, there is someone who knows. Someone else does not know what dolichos are. When it is just written '*njahi*', then we will just understand that it is '*nzavi*'. In our language, it is '*nzavi*' (FGD3:4).

An additional concern raised by farmers during the feedback on the weather advisory flier pertained to its use of small fonts and absence of visual elements, despite being a tool they frequently utilize and refer to when implementing new technologies. This issue was compounded by the fact that a significant proportion of farmers, particularly older individuals,

experienced visual difficulties. Consequently, the availability of the flier did not prove beneficial for these older members.

The farmers highlighted various language barrier issues, including: i) excessively small fonts, particularly challenging for older individuals, ii) absence of visual illustrations, resulting in laborious reading experiences, and iii) excessively technical language, rendering some proposed technologies, such as certain food crops, incomprehensible. In many instances, farmers had to rely on others for interpretation or translation of the content. Therefore, tailoring the information to meet their needs is of utmost importance if successful adaptation is to be achieved. Message designers had not proactively sought farmers' preferences to ensure the provision of relevant and accessible information.

## **5.2 Dissemination tools**

This section discusses the dissemination tools used, namely, the seasonal weather advisory flier, Radio, TV, and face-to-face tools including demonstrations and farmer-to-farmer meetings and the challenges and opportunities farmers expressed about each of these tools.

### **5.2.1. Seasonal weather advisory flier**

This is a short-term climate information tool meant to help farmers make decisions in their daily farming activities, in the face of climate change. In the area under study, it is communicated through various formats, mainly through a pamphlet which is a one-page flier distributed to farmers and through vernacular radio stations. The message designers concurred that it gives the seasonal forecast and appropriate farming technologies to use in response to the upcoming rainy season. The forecast is meant to help farmers decide when to sow, how to

sow, what to sow and other appropriate farm management techniques to adapt during a season (see appendix 2).

It is a technical guide designed to help farmers each season by providing crucial information on rainfall patterns, including when the rains will start, when they will end, and the expected amount of rainfall. Additionally, it offers guidance on the most suitable seeds to plant, particularly in the Machakos town area. To ensure accessibility, we simplify this information into easy-to-understand language. By understanding the expected rainfall, farmers can make informed decisions about what to plant and the best farming practices to adopt within the given season (MO2).

Probed on how the farmers access the advisory leaflets, the meteorological officer said the leaflets are distributed to agricultural offices in the county where farmers are expected to pick them. Upon further inquiry, it was revealed that the weather advisory pamphlets are prominently displayed on notice boards within agricultural offices, allowing farmers to access them during their visits. The AO1 emphasized the strategic placement of these fliers in agricultural offices because farmers visit seeking assistance. When questioned about the approximate number of farmers exposed to the advisories in these offices, the agricultural officers provided an estimation, stating, "we expect around a hundred or two hundred people. And this estimation is specific to one local area. It should be noted that agricultural offices are present throughout the county" (AO1).

During the FGD and KII, the flier was presented to the farmers. Upon being presented, most farmers expressed unfamiliarity with its existence, indicating that they had never seen it before. Furthermore, they revealed that they rarely visited agricultural officers' premises where the flier was supposedly displayed on noticeboards. Even among those who had visited these offices, most claimed not to have noticed the flier on the noticeboards.

As the contents of the flier were read aloud to the farmers and further discussion ensued, they expressed their desire for it to become a regular tool that could guide their decision-making processes in farming. The farmers expressed the need for a reliable tool that could assist them in making day-to-day management decisions on their farms, considering the multitude of uncertainties arising from change of climate. They particularly emphasized the confusion caused by the influx of diverse technological solutions advocated by different organizations.

One farmer explicitly stated,

"I don't have a tool I can use to guide my day-to-day decisions – I wish I had this tool because I lack direction on a day-to-day basis. I wish I could have immediate answers to help me make certain decisions as I farm. Too many uncertainties – diseases and other attacks on my crops. Sometimes I experience crop losses due to incorrect decisions" (FDG 3:2).

Despite its pivotal role in aiding farmers' adaptation to climate change, the ministry faces constraints in producing and disseminating advisory fliers to all farmers due to limited resources. This was corroborated in all the KII with extension officers and agricultural officers. According to AO1, the availability of funds is of paramount importance for ensuring the production of an adequate number of advisories for distribution. Ideally, each farmer should possess an advisory translated into their mother tongue, serving as a reference while engaging in their seasonal farming activities. He highlighted that advisory production is contingent on the financial support received from donors and the government. He further emphasized that there was a time when a substantial quantity of printed advisories was feasible; however, this scenario has changed due to irregular sponsorships, resulting in a reduced production rate.

Initially, they used to receive funding of at least over 1 million Kenyan Shillings to facilitate the production of the advisories. However, at present, the funding has dwindled to approximately 300,000 Ksh, which is markedly insufficient to generate a significant impact on designing, disseminating, and monitoring the effectiveness of adaptation messages. Distributing them extensively to all farmers for accessibility is not feasible, leading to the practice of sending them to the main office for farmers to come and read and have the officer explain the content. So, using the same brochure, he or she can teach several farmers (MO1).

Probed on how they monitor the usefulness of the advisory, one message designer confirmed at the KII that monitoring the usefulness of the weather advisory has faced challenges due to lack of funds to produce it regularly and carry out monitoring and evaluation.

Insufficient funds have posed a challenge to monitoring and evaluation processes. For instance, our account is limited to only 20,000 Kenya Shillings, which is inadequate for conducting effective monitoring and evaluation activities. It is essential to engage with farmers in different villages to assess the impact and effectiveness of our messages, packaging strategies, and identify areas of improvement. These interactions encompass various aspects that require adequate resources and funding to ensure comprehensive evaluation (MO1).

### **5.2.2. TV & Radio channels**

The message designers all noted that the same printed advisory is communicated to farmers through what is known as a radio advisory. It is read over the radio three to four times a day within a given period and before the onset of the rain. The program is produced by the Kenya Meteorological Services in conjunction with Agricultural Sector Development Support Program (ASDSP). The radio session is interactive and broadcast on *Mbaitu* FM and *Musyi* FM. The Meteorological officers and the extension officers visit the radio stations which

broadcast in vernacular - Kikamba language, and share the seasonal weather forecast which has been translated into vernacular.

MO2 says the radio program is formatted in a way that the officer first reads the forecast, then advice farmers on what to plant, land preparation and water harvesting approaches, if necessary. “We give information on the rain patterns, including the onset of the rains within the county, duration, amount and distribution of the rainfall and the seeds and crops to plant based on the weather forecast,” said MO2.

To further clarify issues, the program producer puts himself in the shoes of farmers and asks the message presenters questions. At the same time, farmers call in to ask questions. Hence the program is interactive between the presenter of the radio program, the MO, and the listeners, who are primarily farmers. Often the farmers ask questions concerning the seed and crop varieties, the appropriate technologies and farming practices for the season under forecast.

When asked how they interacted with climate adaptation messages on radio, especially the seasonal weather advisory, farmers said it’s not their ‘go-to’ platform for such information. Some of the emerging issues on the radio broadcasting included that farmers do not consistently listen to radio. Secondly, farmers do not know about the existence of the radio weather advisory. When asked if she listens to *Mbaitu* FM, the main radio broadcasting in Kikamba, a female farmer in FGD3 turned and asked the other focus group members if *Mbaitu FM* has information on farming, meaning she does not listen to the seasonal weather advisory broadcasting or other programs advising farmers on better farming technologies.

The farmers further noted that there are too many radio stations, they are spoilt for choice. They get overwhelmed, and do not know where the agricultural programs are broadcast. Indeed, from the KII with this female farmer FF2, she noted that listening to radio has become challenging because of the proliferation of radio stations in the country. The freedom of airwaves is therefore becoming a double-edged sword since the farmers lose track of when certain useful programs will be taking place. No wonder some farmers said that although they listen to the radio on agricultural programs, the listening is sporadic because of this challenge.

There are very many stations nowadays. By the time I tune into a station, the program is over because I was on another station. So, by the time I come back, the agricultural program is over...yet I just tuned in (FF 2).

Farmers also noted that they preferred the visual to the audio. Therefore, they are conflicted and lose the chance to listen to an important program like the weather advisory as they watch entertainment programs on TV. Indeed, the visual nature of TV makes it a preferred channel when the farmer must choose between it and the radio. Asked why they preferred to watch the TV rather than listen to radio, FF2 said “TV had more entertaining programs than radio. On TV I see action going on, while on radio I must train my ear to listen and pay attention”.

Indeed, in some of the homes where electricity has been connected, the TV set is more popular than the radio. Probed further about radio and TV, FF3 confessed that when he comes home tired and wants to unwind, watching TV is more relaxing than listening to radio. Another farmer, FGD 4:5 confessed he no longer owns a radio since he bought a TV. In FGD1, farmer 4 said he does not listen to agricultural programs on radio much and he explained that sometimes when listening to radio on a farming program and a good program is on TV and vice versa, loses focus on one depending on his interest (FGD1:4). In addition, the

farmer noted that radio and TV timings compete for his attention and when this happens, the TV wins.

Probed further on the matter of TV, farmers noted that they cannot rely on TV for several reasons. Firstly, the government has introduced pay TV. This information was corroborated through KII by FF1 who noted that she once watched an agricultural show on QTV, a local TV channel, which she found extremely useful. However, the channel was disconnected since she could no longer afford to renew her subscription, as she explains below:

I used to watch an agricultural show on QTV. I remember the presenter explaining about pumpkin farming. The presenter demonstrated how to plant pumpkins. Demonstrating that each hole should hold 4 seeds. The person explained, as he planted, that if each hole produces around ten pumpkins, another one ten, another one ten, in those four, you will get forty. Then sell one for fifty. I went to my farm and tried it out (FF1).

Secondly, the radio and TV lacked an immediate feedback mechanism – where they could give feedback on the products and new technologies they are advised to try on their farms. In other words, if a farmer purchases the products based on the messages and instructions received via radio and TV, they have no one to consult when they get on the farm to practice what they were advised on these platforms. If they miss out on some instructions or steps, then that is just it. They are not able to follow up or interact with the people who present on the radio for instant feedback on the performance of the recommended products.

### **5.2.3 Face-to-face dissemination tools**

The study revealed that face-to-face tools, namely, farmer meetings and demonstration farms play a crucial role in the effective dissemination of climate change-related information to smallholder farmers. These face-to-face interaction channels have emerged as key tools in

enhancing farmers' understanding and adoption of climate adaptation strategies. Demonstrations are organized in response to specific demands or occasions when extension and agricultural officers need to showcase new technologies or innovative approaches. On the other hand, farmer meetings involve regular gatherings of farmers at designated plots, typically occurring once a week.

The central purpose of demonstration farms is to provide a platform for instructing farmers on various agricultural techniques and technologies. They serve as showcases for introducing new and improved crop varieties that are better suited to changing climatic conditions, according to AO2. He said that these demonstration farms offer valuable insights into addressing emerging challenges such as pests, diseases, and soil management, helping farmers develop effective strategies to tackle these issues.

Most of the plots are in one of the members' farms, others are established at KALRO, where agricultural research is ongoing. In Ichanda sub location focus group, one of the farmers has 'donated' his land as a demonstration farm where farmers meet on a weekly basis. Occasionally, the organizers hold farmer field days on the demonstration plots.

In the KII, AO2 mentioned that demonstration plots are experiential learning platforms where farmers meet the experts and learn through touch and feel (experiential learning) in a plot dedicated for demonstrating the use of new agricultural technologies. Farmers in Mwanja explained that the demonstration plots are not theirs, they belong to KALRO, in Katumani. So, they usually go to Katumani as farmer groups. A farmer in Mwanja FGD explains they receive from the demonstration farms in this way:

Here in Mwanja, we have put up a demonstration plot in Katumani. We usually start and plant with the agricultural officers from KALRO, who teach us how to do it. After planting, we keep coming to check the demonstration plot. We carry out a lot of treatments on the farm, we do the watering and monitoring to see how the crops are turning out. We also have a plot without treatment, and we come in to learn and compare both plots. During the learning, each person picks out the one that they like, and they replicate the same activities on their farm (FDG 4:3).

This information is corroborated by my observations from the farmers' group which I attended in Mwanja. The event was really an experiential learning forum where about 20 farmers gather every Thursday to learn about conservation tillage, one of the approaches being promoted by several NGOs in the area to help farmers adapt to climate change. Farmers sit in a circle, the 'expert' sits amongst them and explains to them about any new technology – in this case when I visited, the expert from Syngenta, an agricultural input company, had come to train farmers how to use herbicides for weed management.

At the farmers' meeting, I observed that the expert spoke to farmers in Kikamba, explaining slowly about the new weed management approach. He kept pausing to receive questions from the farmers – who engaged animatedly with him and each other. It was more of a conversation. He broke down content in simple terms, and when he is not able to explain, other farmers in the group took over to explain to their peers. Since the group was small enough, every farmer's voice was heard. The 'expert' had an opportunity to study their facial expressions to see if they understood and asked them for feedback – just to clarify if they did understand what he was saying. The 'expert' removed some herbicides from his bag, held them up and explained their purpose to the farmers. The herbicides were passed around for farmers to touch and read for themselves and ask questions. Some of the farmers at that point explained their fears to the Syngenta salesperson.

I also observed that the ‘expert’ stood up and led farmers to the ‘trial’ plot where the farmer has planted ‘*ndengu*’ (green gram). He put down the spraying equipment, asked two farmers to mix the herbicides with water as others watched – while another farmer was reading the label for instruction. He then directed the two farmers to spray the weeds as others watched. All this while, conversation about different issues was going on. Farmers asked questions, joked, and laughed freely around. They were expected to develop their critical thinking and decision-making skills since they were expected to do trial on this farm and implement on their own farms back home if they liked what they saw. Asked to explain what prompted them to change from their old ways of farming, some farmers explained it was the demonstration and meeting one on one with the agricultural officers and extension officers.

They had this to say:

We used to plant crops, and it would dry up because we did not know how to do it because of changing weather. But agricultural officers showed us how we can make things work. For me, it is just how they used to explain that recently prompted me to plant drought resistant crops and try new ways that would help me with the emerging climate change related challenges. They showed us, for example, how to dig the holes (zai-pits), apply manure, mix soil and the spacing between plants. We use a rope to measure the distance when planting. These were techniques of planting in the dry season or when the rain is scarce. During the demonstration, my peers and I can touch the soil and plant seeds on the plot (FDG 4 :3).

Another FGD 4 explains, "you see this mango tree, it is the '*kienyenji*' (local) one. This one here is the new variety. The teacher showed us how to graft. Everyone prepares theirs and labels it with their name. The one that grows successfully indicates that you have done the correct thing. You are educated." (FDG4:1)

In terms of farmer meetings, farmers are supported through farmer groups, which are either created by the ministry of agriculture, while others existed for other social or economic

purposes but are used as vehicles of social change for climate change adaptation. During the KII, extension officers from both the public and private sectors emphasized that both farmer meetings and demonstration farms have served as essential components of extension and outreach efforts in technology transfer. They provide a means for agricultural experts, extension officers, and experienced farmers to share their knowledge with others in the community and have become crucial forums for sharing information.

This development is primarily attributed to the heightened uncertainties arising from climate change. The presence of these extension and agricultural officers contributes significantly to farmers' comprehension of new technologies. This insight was gathered from FGDs, where several farmers expressed how they had gained from the exchange. Notably, farmers underscored the role played by agricultural officers in enhancing their grasp of innovative farming methods, particularly in the context of climate change. These officers offer prompt clarifications on the intricate issues they confront as they confront the uncertainties linked to climate change concerns. FGD2:3 said: *“When we meet in our regular agricultural groups, the agricultural experts teach us about these weather and climate issues, the seeds to plants, rain distribution and markets for our products”*.

During the FGD's, farmers kept talking about the myriads of uncertainties they faced due to climate change, noting that at the extension-farmers' meetings, they bring to the fore these uncertainties associated with the distribution of rain, the right inputs to use on their farm. While on their own, they have so many voices speaking to them about the solutions to the myriads of challenges affecting them, but the face-to-face demonstration meetings give the only opportunity for dialogue with the expert and with each other, to clarify issues.

Through the KII, both the private sector and government extensionists gave the same emphasis that peer-to-peer influence is powerful since farmers have a way of influencing each other. According to PSE1, “the approach is grounded in the belief that seeing their peers thrive in adopting new practices significantly motivates other farmers, especially those initially hesitant about change. This program taps into the power of using champion farmers as compelling examples of what can be achieved.”

This dynamic learning process is particularly evident in the context of conservation tillage, as highlighted by FGD4:2 who said on conservation tillage: “when we looked at it from our farmer friends, we truly see it has advantages. That is why you see most farmers are adopting this CA technology- because they really like it”. Initially, farmers began experimenting with this technique in small ways. However, as they observed the tangible success achieved by their peers, their confidence in the method's efficiency grew, according to FGD4:3. According to AO2, this trend of gradual adoption transforming into wholehearted acceptance underscores the influence of peer-driven success stories. They found it a particularly good avenue because they are very sure when they reach ten, fifteen or twenty farmers, they are guaranteed or sure that other farmers are going to implement. These small groups of farmers will then bring the rest on board to see what has happened and how things work.

According to the private sector extension officer, Bio-Vision has implemented a strategic program using "champion farmers." These trained farmers serve as catalysts for the dissemination of agricultural technologies by organizing farmer exchange visits and facilitating direct interactions between local farmers and “champion farmers”. The PSE 1 said

that “such face-to-face engagements provide a rich platform for experiential learning, enabling visiting farmers to witness firsthand the outcomes of successful technology adoption. Moreover, these experiences are captured through videos, which are subsequently shared with other farmers visiting Bio-Vision's offices.”

According to PSE1, the impact of these success stories goes beyond videos; they serve as tangible proof that fellow farmers have triumphed in implementing new techniques. This tangible evidence bolsters the credibility of success narratives, especially among the laggards in the community, further reinforcing the notion that peer-to-peer learning is a catalyst for transformation. At the same time, they record the work of these farmers on video and share the success stories with farmers who visit their offices. The PSE 1 officer says that the exchange helps because farmers still doubt the video stories, saying they are just that: *stories!*

We have champion farmers whom we have trained in various technologies for the last seven years when we began operating in this area, that is in the year 2010. For example, we found a farmer who started a project on poultry keeping but had kept away from poultry due to the many challenges - challenges associated with disease and feeds. Indeed, he was just a real representation of many farmers who kept away from poultry because of the cost of feed (PSE1).

The extension-farmer to farmer exchange during demonstrations and farmer meetings is facing a myriad of challenges. During the KII with the extension officers and agricultural officers said that even though the need for information on new technologies is urgent, and the information on new technologies available at the research center, the capacity to share that information is through the face-to-face approach is inadequate. This is because the number of extension workers to farmers is dismally low, therefore only a small population in the study area benefit from their service. The research findings revealed a significant challenge in the

outreach efforts of extension officers and agricultural officers. In the KII and FGD, extensionists and farmers concur that the ratio of extension officers to the farmers is unproportional. They revealed that in Machakos, there are 325 groups which constitute 9600 farmers. The extension workers and officers from the Ministry of Agriculture cannot reach all these farmer groups or individuals and only reach those their resources allow, according to AO1.

Even when extensionists combine forces with the officers from the ministry of agriculture, it is still not possible to reach all the farmers. While these officers intend to engage with farmers regularly or during emergencies to provide explanations and education, their reach is limited to a select number of groups serviced through demonstration plots or farmer-to-farmer and farmer-to-extension fora. Indeed, the AO2 highlighted the growing difficulty in reaching farmers through extension services facilitated by the Ministry of Agriculture.

This sentiment is further substantiated in the FGDs, where a 65-year-old farmer in FDG 6 reminisced about the past abundance of extension officers compared to the present scenario. Older farmers across different groups echoed this sentiment, recalling a time when numerous extension officers would traverse the countryside on motorbikes to provide technical assistance to farmers. These officers were actively sought after by farmers who anticipated their visits and sought answers to their complex inquiries. The historical context was marked by the colonial government's practice of selecting community members for extension training, resulting in officers who lived and worked within their own communities. In contrast, the current extension officer is often perceived as a distant figure, separated by geographical and linguistic barriers, which is a marked difference according to FGD4:6.

### **5.3 Chapter Summary**

In this chapter, I presented the emerging issues from the study based on the research question 2, which was: How are the climate change messages designed to smallholder farmers in Machakos county, Kenya? How are the messages disseminated? Notably, the chapter uncovers the top-down approach in message design and the challenge of technical language in weather-based advisories. Traditional communication mediums such as TV and radio are identified as lacking in farmer-friendly content delivery. Additionally, the research highlights the role of face-to-face interactions, encompassing both peer-to-peer and extension-to-farmer learning platforms. The scarcity of available extension workers and the significant obstacle to these face-to-face channels. Moreover, the findings reveal that the weather advisory fliers is limited as a tool due to limited resources for widespread distribution. Generally, farmers are expected to see it as they visit the agricultural offices. These findings offer a comprehensive understanding of the existing obstacles and gaps in designing and disseminating climate adaptation messages. The next chapter discusses farmers' perceptions of climate change, the adaptation messages and the dissemination channels.

## CHAPTER 6

### FARMERS' PERCEPTION OF CLIMATE CHANGE AND MESSAGES

#### 6.0 Overview

In this chapter, I discuss the answers to my third question, which was: How do small-scale farmers in Kenya perceive the messages about climate change? This question covered a range of topics, such as how farmers perceive climate change, what influences this perception, attitudes towards adaptation technologies, and how farmers perceive various messaging tools.

#### 6.1 Farmers Believe Climate Change is Happening and has Devastating Impact

All farmers concurred that they had experienced climate change, with very devastating results. FGD 2: 6 put it aptly and said:

Back in the day when I was growing up in Yatta, the sun was hot beginning early July, August, September till early October when signs of rain would be seen. But now, when you go there, it has changed, it's cold when it is supposed to be hot and hot when it is supposed to be cold! And the sun has become too hot. You even put on clothes that are appropriate because of the heat (FGD2: 6).

During a Key Informant Interview (KII) with a male farmer, he highlighted the severe impact of climate change and variability. According to him, he observed these changes starting in 2011 when there was a noticeable reduction in rainfall. He explained that the timing of the rain became unpredictable, sometimes arriving unexpectedly and, at other times, failing when they were anticipated (FF3).

He continues to express the frustration of planting in the advent of unpredictable weather. He says that farmers prepare to plant, then the rains come late, or the rains are less than expected, this really devastates them. He gives an example of what happened to him in 2008, he planted

but reaped food that even he could not feed his cows, leave alone feeding his family! But in 2009, it was better because he harvested 3 bags of maize, and very little beans. But in 2011, he says he got a good harvest.

Hence, while the belief that climate change exists isn't debated, the source of climate change is what farmers contested. As illustrated by this farmer, the consensus is that the climate has indeed changed over the years. However, differing opinions persist regarding the origins of this change and the corresponding adaptation measures. This section is a narration of what farmers and agricultural officers see as perceptions held by the community towards climate change and the adaptation messages.

## **6.2 Climate Change is a Divine Punishment**

Farmers think that climate change is caused by God. In other words, they believe that climate change is a result of divine punishment and that humans are powerless to stop it. Only God has the power to undo it (FGD4:7). Farmers in FGD 2 particularly pointed to Kenya's 2007 post-election violence as an excessively large sin against God which brought His wrath over Kenya. "During the post-election violence, Kenyans killed each other, and blood was spilled throughout the nation. Even if Uhuru, Raila and Ruto came here, I will tell them this was an excessively big mistake, it is bad, God is not happy with us and is punishing us" said FGD2:4.

According to PSE1, some farmers also use the bible to explain this concept of climate change being a punishment from God for sins committed by humans. To confirm this statement, farmer FGD 3:5 said, "We humans used to oversee the Garden of Eden until we messed up

through disobedience, '*tukaanza kuharibu*' we started destroying. Others think that it is punishment because of misuse of the environment.

Other farmers believe climate change has occurred because the community neglected their 'god' and the cultural and traditional practices of maintaining religion. The community is therefore, reaping from this neglect of traditional values and beliefs, specifically, they had neglected to sacrifice by the traditional tree called '*dhembo*' as stated well by FGD 3:1:

We have forsaken our traditional god, that is why we are suffering. We saw on TV that a sacred tree was cut and destroyed near Kiambu. At our place that tree is called '*dhembo*.' In this place we had such a tree and people used to come to make their sacrifice here. When we were young, people used to offer sacrifices at the tree during drought seasons, and it would rain. But this does not happen anymore, people have even cut down these trees. We no longer follow our customary laws which required us to slaughter goats to appease our god. (FGD3:1).

As noted, therefore, those who believe climate change is because of divine will also say that only prayers can help sort it out. Humans are powerless over its effects and solutions, they say and recommend that the community prays to God in every way possible because He has the answer to the climate change, and when every person prays, the rains will come as before (FGD3:1). PSE1 said that this worldview is formed because most of the community members here are church goers and those who do not go to church are influenced by their peers.

Some other farmers attribute climate change to destructive human activity. They say that they have now understood and are able to associate cutting trees with climate change. They thought the change in climate was natural, but after getting information from experts, they know some of them are contributing towards climate change (FGD3:4).

### **6.3 Drought Resistant Crops Are for the Poor and Not Real Food**

As noted in chapter 4, innovation players provide several solutions to help farmers adjust to climate change. Among these are drought resistant crops such as sorghum and cassava. It emerged, however, that the community in Machakos has negative perceptions of new drought resistant crops and technologies due to cultural beliefs. They have a problem with the crops that the agricultural and extension officers ask them to plant, claiming the crops are alien to their region and culture. For example, one farmer stated that while they were being advised to practice sorghum farming, their children were not used to the taste. And that everyone in the community considered sorghum “a poor man’s meal.” Indeed, according to the AO1, the farming community generally refers to cassava and sorghum ‘orphan crops.’ They have therefore abandoned these crops which have the potential to build their resilience due to their ability to withstand harsh conditions.

They acknowledge that though cassava does very well in their soil, their children cannot accept it because it is for ‘poor people’. The perceptions they have towards these drought resistant crops was demonstrated by an incident where they rejected the cassava seedlings which were being promoted by a non-governmental organization as an alternative to maize. Farmer FGD3:4 said, “Even though cassava does very well in our soil, our children do not accept it. We believe that one is supposed to leave goat milk for its young, not for human consumption, yet these NGOs are asking us to use it for human consumption!” Clearly,

therefore, they rejected the dairy goats saying rearing them cannot work since they believe that goat milk is for its kid and not for human consumption (FGD4:2).

Another farmer explained that maize was the only crop considered as food (*liu*) in their community, while other food crops like cassava and sorghum are called (*kivulani*), meaning a snack. He noted:

Maize is the only crop considered as food here. It is called “liu” in Kamba. Other food crops are called *kivulani* (snack), this *kivulani* is not seen as real food. You see, maize can be turned into ugali, *githeri* (mixed maize and bean) or cooked on its own. That is why we plant maize only. Someone can sleep hungry if they plant only cassava, and they will say, ‘I did not have food since I did not have maize...’ (FGD4:3).

In conclusion, farmers say the regular weather advisory contradicts local beliefs about the climate and the technologies to use to mitigate climate change. As the examples show, they have a problem with the crops that the agricultural officers ask them to plant, claiming the crops are alien to their region and culture.

#### **6.4 Farming is not profitable**

Youth do not believe farming is profitable. Hence this demography has shifted away from agriculture to urban centers for white-collar occupations.

You find that people who are learned don’t want to farm, they believe farming is not profitable and go to the urban areas for jobs. Farming has been left to the over 50-year-olds, those who have retired. You know that this is an advanced age, meaning these farmers do not fully understand what is happening (RO1).

As highlighted by PSEI, "despite receiving training, the dynamic younger generation remains hesitant to adopt agricultural practices due to the prevailing belief that farming lacks financial viability, causing them to prioritize alternative employment prospects." According to the

PSEI, young energetic populations “just listen to our training, but they do not implement it because they think there is no money in farming. They think that money is just in the white-collar jobs” (PSE1).

### **6.5 Messages belong to Experts**

Although the MO2 said that they involve a few farmers in PSP, farmers interviewed in all the groups feel left out in the message design and do not believe the weather forecast and advisory is localized. They said they have never been invited or consulted to give views on the climate or weather issues, yet they believe they have something to share and said they would be glad to give their input on the weather forecasts and solutions to counter the change in climate. In fact, they say the forecast is not relevant to them.

We are frustrated at never being consulted or invited to provide insights on climate and weather issues, even though we have valuable knowledge to share. We have never been invited to help with message design. We do not believe the forecast is relevant to us. It must be for a different location and the weathermen need to come and consult with us (FGD5:3).

Farmers lamented that, despite actively engaging in discussions on climate change solutions among themselves in the presence of the ‘experts’, during their farmer forums, their voices and ideas are largely overlooked by stakeholders responsible who develop messages and strategies to address climate challenges.

From the KII with the message designers and the FGDs with farmers, both groups see this whole process as ‘belonging’ to some experts in Nairobi, with the message designers explaining that they believe this has led to the slow pace of adaptation of the new technologies. MO1 said that this lack of ownership could also emanate from the fact that the

messages are developed from elsewhere and brought to the farmers to consume the information. He puts it this way:

The pace is slow because most of the discussions and functions related to farming and climate change take place in hotels, far away from where farming is taking place. These workshops are held in big hotels in Nairobi, these experts do not even come back and explain to the farmers what they discussed (MO1).

For example, asked what carries the day if there is a dissonance of the forecast between traditional knowledge and scientific knowledge, the message developer says the scientific forecast carries the day. “Obviously, scientific knowledge is superior to the traditional knowledge,” said the MO1.

## **6.6 Distrust of Seasonal Weather Forecast**

The research findings, as revealed through a combination of KIIs and FGDs, showed a prevailing sense of scepticism towards seasonal weather forecasts. The MO2 confirmed that farmers distrust the seasonal weather forecast broadcasted on radio. He said that even though the weather advisory (which contains advice on the amounts of rainfall and the crops for the season) is meant to help farmers make farm level decisions, most of the farmers are hesitant to take the weather forecast seriously. Probed on the farmers indicated they claimed the predictions are not accurate, they say that many times the seasons are opposite of what the meteorological department predicts or forecasts. Farmer FGD2:3, says “We do not trust the weather forecast because they are not accurate. Some seasons we harvested nothing, there was no rain, yet the seasonal forecast had indicated the rains would be heavy”.

Another farmer in FGD4:6 commenting on the same issue says that the predictions do not tally with reality. He said that weathermen had predicted it would start raining last week March to the 1<sup>st</sup> week of April 2017. They were caught off guard when it instead started raining on 16<sup>th</sup> of March. Then from there the rain disappeared. Even after this 3<sup>rd</sup> week it did not rain again, yet farmers had already planted. “This is the fourth week, and the weathermen were telling us to wait for rains. We have already planted, and the crops are starting to grow, but they will wither if it does not rain”, said FGD4:5.

While certain farmers make efforts to change their farming practices and adopt the new technologies, the prevailing uncertainties surrounding rainfall and the vagaries associated with the conditions that arise when rains fail act as substantial impediments to adoption. Indeed, the recurrent crop failure season after season, in addition to other associated challenges like new pests and diseases brought about by climate change have been a great discouragement. With the advent of climate change, farmers are required to use more fertilizers and pesticides, as said by this farmer:

There are more pests and diseases attacking our crops with this climate change. The air has also changed, there is a cold wind (frost) that appears even when it looks hot...if you look out there (points at the horizon), you can see a white like mist over the hills. It kills our crops within minutes! Somebody tries to venture into a business-like tomato farming, but the tomato is wiped by either frost or pests. That discourages farmers and they abandon new ventures (FGD1:3).

AO2 believes that most farmers fall into the category of laggards due to such uncertainties and are slow to accept new ideas to help them cope with climate change. “The slow response to climate change messages is because there are many laggards among the farmers. They are taking too long to trust the weather forecasts and the advisory we give on new technologies, but we are not tired of trying to reach them”.

## 6.7 Dissemination Tool/Messengers not Farmer Centered

In the context of the messengers, the findings highlighted several concerns raised by farmers that shed light on their limited trust in the messengers. First, there was the persistent problem that many extension officers were from regions outside of their locality, which made people doubt their credibility. These officers were thought to be unfamiliar with the local environment and soil because they came from different regions. Farmers emphasized their own long history in these areas and their in-depth knowledge of the different soil types, which led them to occasionally doubt the advice of outsiders who might not understand their unique environmental complexities. One participant said, "if you take advice from an outsider, it may be a total waste, so I take their advice with a pinch of salt, in small doses, so I can wait and see what happens" (FGD4:2).

Secondly, they are also skeptical of presenters of agricultural programs on both TV and radio who recommend certain varieties of seeds for dry weather conditions. They believe that presenters are out for profiteering and do not really care about them. They think the shows are sponsored by private companies driven by commercial interest in marketing products to farmers. Most of these companies sell seeds and pesticides and owners really do not care about what happens to farmers:

We do not listen to the radio because the people on the radio just speak about seeds and herbicides so that we can buy them to make profits. They do not care about us. For example, they tell us to only plant certain maize varieties and use only certain inputs. If it is beans, they say use only this bean variety; or only this fertilizer; or only this brand of herbicide. But they do not tell us, in case there is excessive rain, what action to take – so that is why we do not listen to radio (FGD3:2).

The study revealed that farmers distrusted the radio presenters because they promote specific crop varieties and inputs and often fail to provide solutions when these promoted options result in crop failure. Hence, the disconnect between advertised solutions and actual outcomes contributes to the erosion of trust. Participants in the focus group discussions consistently expressed their disillusionment, noting that despite radio messengers endorsing some of the varieties as suitable for their region, they encountered massive crop failure when they planted.

The resulting disappointment is exacerbated by the absence of support from these messengers when crop failures occur. This sentiment was articulated by a participant from FGD5:2, who stated, "These people tell us that certain varieties are good for this area, but when you plant, they fail. It is so discouraging for farmers. They are not available to help us when our crops fail."

Farmers frequently go to agro-dealer shops as their first stop for information and problem-solving, where they can describe problems on their farms and get diagnoses from agro-vets. This reliance, however, is problematic because many input dealers lack technical knowledge regarding agricultural inputs, frequently giving farmers inaccurate diagnoses that prove costly. "Just like the salespeople from the input companies, agro-dealers just want to sell us their products...they pretend to want to help us, but they offer us solutions primarily to promote their own goods" FGD 3: 3). According to these farmers, they mislead them many times.

Asked why farmers continue using old technologies in the face of climate change, the Private Sector Officer says:

There is confusion which is brought about by many input providers who give them different information about tackling the vagaries of pests, disease, and related issues. And this confuses the farmers. So, you find a farmer goes for a particular brand of chemical, and whatever he describes, or she describes to the agro dealer, that is what he gets and maybe it could be a different problem... so he continues pumping the chemical, which is not working, yet he got the wrong prescription for the problem, some of these problems could be non-chemical options. The farmer ends up stopping the activity (PSE1).

As far as feedback on the weather advisory flier is concerned, they said the adaptation information communicated through the flier underscored a lack of understanding of farmers' specific user needs, and a confusion about on the ability of technical people to explain adaptation messages in familiar language. *"I don't know whether science people don't have the language to express themselves or something. There is the challenge in just explaining some words. Maybe some technical words are difficult to explain"*, said FGD 3:4.

The farmers highlighted various language barrier issues, including: i) excessively small fonts, particularly challenging for older individuals, ii) absence of visual illustrations, resulting in laborious reading experiences, and iii) excessively technical language, rendering some proposed technologies, such as certain food crops, incomprehensible. In many instances, farmers had to rely on others for interpretation or translation of the content. Therefore, tailoring the information to meet their needs is of utmost importance if successful adaptation is to be achieved. Message designers had not proactively sought farmers' preferences to ensure the provision of relevant and accessible information.

Peer-to-peer learning emerged as highly effective during farmer meetings and demonstrations. Indeed, through the KII, both the private sector and government extensionists gave the same emphasis that peer-to-peer influence is powerful since farmers have a way of influencing each other. According to PSE1,

“the approach is grounded in the belief that seeing their peers thrive in adopting new practices significantly motivates other farmers, especially those initially hesitant about change. This program taps into the power of emulation and inspiration, effectively using the successes of champion farmers as compelling examples of what can be achieved”.

## 6.6 Marginalizing Women from Climate Messaging

The study unveiled a significant aspect of gender and climate adaptation. Both genders in the FGDs and KIIs stated that, traditionally, a woman’s role was to take care of household chores, such as cooking, fetching water from the river, and small-scale subsistence farming.

"Women are in charge of domestic chores, collecting water and firewood, cooking, and looking after children and the elderly. We are engaged in small agricultural activities, including planting and harvesting crops, as well as tending to small livestock" (FF2).

Asked about the traditional roles that men take, participants in the FGD’s said that they are expected to hold roles that are primarily related to agriculture when it’s a commercial crop or when they are rearing larger livestock. Meaning that men are expected to be in income generating activities, that is why they leave the rural areas in search of wage-based employment. Men are also meant to take on community leadership roles, men frequently take on leadership roles in their communities, participating in decision-making and advocating on behalf of the community. In the community, they participate in infrastructure development initiatives – e.g., when the community needs infrastructure like road or irrigation. They attend such infrastructure meetings that bring development to the community. “*Sisi wanaume ndio tunashugulikia mambo ya development, uwa tunakutana mara kwa mara kuzungumzia maswala you uendeleshaji...*” It is us men who take the role of ensuring development is happening, we meet regularly” (FF3).

Therefore, regarding training and capacity-building platforms that disseminate information on new technologies and approaches for climate change mitigation, it was observed that while farmer outreach meetings, such as demonstrations, were attended by either spouse, men predominantly participated in these meetings, leaving women behind to tend to the farm. Thus, women, who are the primary workers on the farms, are often excluded from attending agricultural meetings, primarily attended by men. According to the agricultural officer (AO1), this poses a huge challenge because the men do not share the information or lessons with women. This becomes an even bigger challenge when a spouse has attended a demonstration meeting where sight, smell and touch are used to build the capacity of farmers to use new technologies. The one who attends is not the one implementing!

Hence, the collective perceptions emerging from the FGDs consistently highlight a recurring pattern where women find themselves excluded from capacity-building meetings and farmer groups. This phenomenon appears to be rooted in the perception held in the community that women possess a limited grasp of technical matters. Consequently, attendance at such events is predominantly reserved for men who are perceived to be better educated than women. This gender disparity in participation was acknowledged by AO1 during KII, highlighting their efforts to encourage the attendance of both spouses for equitable information dissemination.

The findings from the KII with AO1 and AO2 revealed that in the few instances when a woman participates in training sessions independently of her husband, she may subsequently share the acquired information with him to seek financial support for implementing new technologies. However, this presents a significant challenge as men typically hold control over resources and decision-making processes, often exhibiting reluctance to support

unfamiliar ideas. Consequently, female farmers encounter difficulties in successfully implementing the new technologies. But they said they had observed that in female led households, where women control resources and decision-making, there has been a greater potential for change and adoption of new technologies.

Apparently, the same traditional norms assigning women roles contribute to women's limited exposure to pertinent climate adaptation messages aired on radio and TV broadcasts. During interviews, women emphasized their limited availability of time compared to their husbands, as their responsibilities extend beyond farming to encompass multiple burdens in the household and community. Engaged in various tasks such as nurturing children, tending to livestock, collecting firewood and water, as well as cooking for their families, women find themselves occupied throughout the day. Consequently, they lack the opportunity to listen to radio programs.

Furthermore, most of the agricultural programs are aired in the evening. Many ladies in both FGD and KII noted that even though they are fatigued from their day's activities, they still shoulder the responsibility of cooking and attending household chores in the evenings when some of the programs are aired. As a result, the agricultural programs on radio fail to align with the women's daily routines and thus fail to reach their intended audience effectively. A female farmer put it this way: *“when I come home from the farm, I must cook for the family, fetch water and firewood, take of the children’s homework so many other tasks, I do not even have time to listen to the radio (FGD 2: 6).*

Although climate smart messages are broadcast on radio and TV, women have little access to these gadgets. Women disclosed that radios and televisions are typically owned and

controlled by the male members, specifically their husbands, within their households. During an FGD session, a female farmer from Group 2 shared that her husband exclusively operates the radio, determining which programs to listen to, as he is the one who purchased it. This sentiment was echoed by other female farmers across all the discussion groups.

## **6.7 Chapter Summary**

This chapter delves into the perceptions of smallholder farmers in Kenya regarding climate change, the adaptation messages, and the dissemination tools. The findings highlight how religious beliefs, and cultural norms influence farmers' perceptions of climate change, the adaptation messages, and the dissemination pathways. These include culturally acceptable food practices and prevailing gender norms on farmers' ability to adapt is reported. Additionally, the findings reported here show how farmers lack trust in the seasonal weather forecasts occasioned by unpredictable weather. The chapter also highlights findings on the perceptions farmers have about the messengers, whom they do not trust because they ask them to adopt certain technologies for their personal monetary gain. The subsequent chapter is a discussion of the findings narrated in chapters 4,5 and 6.

## CHAPTER SEVEN

### DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

#### 7.0 Overview

In this chapter, I first present a summary of the key findings drawn from chapters 4, 5 and 6. I then use the research findings, along with insights from the reviewed literature and relevant theories, to draw conclusions and make recommendations. I also provide a suggestion for future studies based on my findings and experience while carrying out this study.

#### 7.1 Summary of key findings

*Table 7.1: Summary of Key Findings*

<p><b>1. What climate change messages are communicated to smallholder farmers in Kenya?</b></p> <ul style="list-style-type: none"> <li>• The messages communicated on climate change adaptation are namely: the seasonal weather forecasts; messages on drought resistant crops and new farming techniques.</li> </ul>
<p><b>2. How are the climate adaptation messages communicated to smallholder farmers in Kenya designed?</b></p> <p>Message design is top-down– they are designed from regional, national then local level and designing does not involve farmers.</p> <ul style="list-style-type: none"> <li>• Communication dissemination tools: <ul style="list-style-type: none"> <li>❖ Weather advisory fliers</li> <li>❖ Radio and TV</li> <li>❖ Face to Face – Demonstrations &amp; farmer to farmer meetings</li> </ul> </li> </ul>
<p><b>3. What are the perceptions small holder farmers hold of the climate change messages?</b></p> <ul style="list-style-type: none"> <li>• Farmers have experienced climate change and its devastating effects on their farms.</li> <li>• Religious and cultural beliefs – climate change is a punishment from god because of the people have sinned – so no human intervention can stop it and its effects.</li> <li>• Hard to understand message because of technical/jargon language.</li> <li>• Are not farmer-centered, especially the seasonal weather advisory flier and the radio &amp; TV. They do not provide for immediate feedback – which is critical for complex messages:</li> <li>• Radio is not a channel of choice!</li> <li>• Farmers prefer interactive face-to-face dissemination – but this approach is hindered by reduced no of extensionists There is no ownership of the climate change messages, they say the messages belong to the experts.</li> <li>• Farmers distrust the message and messengers (channels) because of the top-down messaging.</li> <li>• Due to cultural norms, women are perceived as family care givers and take care of related chores, so they are left out of the messaging processes, while they are the real farmers. They are not involved in the messaging process. Rejection of some adaptation solutions like the drought resistant crops because they are considered as ‘real’ food – e.g. cassava, sorghum and goat milk</li> </ul>

## **7.2 Discussions**

Overall, the key findings of my research are based on the 3 main questions of this study. Namely: What climate change messages are communicated to smallholder farmers in Kenya? How are the climate adaptation messages designed and communicated to smallholder farmers in Machakos county, Kenya? What are the perceptions small holder farmers hold of the climate change messages? The key findings discussed in this chapter show the prevalence of top-down communication methods, the influence of cultural and religious factors on adaptation decisions, the critical role of source and message credibility in shaping adaptation, and the significance of gender dimensions within the messaging process and how the cultural norms influence adaptation. These findings are exhaustively explored in the subsequent sections numbered 7.2.1 through 7.2.4.

### **7.2.1. Top-Down Messaging**

Based on my research findings, I concluded that the messages intended for farmers are created elsewhere and then presented to them to consume. This top-down approach has resulted in a lack of trust in both the messages themselves and the messengers. Additionally, the use of technical jargon and unfriendly dissemination channels has made it difficult for farmers to understand the messages. These factors have led to an overall sense of farmer isolation and disenfranchisement. Indeed, participants in the study noted that this resulted in a slow rate of adaptation. This section discusses these issues in detail.

Due to top-down messaging, farmers feel left out. Indeed, some interviewees argued that although they debate potential solutions to the problems caused by climate change among themselves and during farmers' meetings, their views are not incorporated in the messages. Talking about this issue, an interviewee said that they had knowledge and solutions to the climate change challenges, yet their opinions are not sought or incorporated. They are not asked about their views on weather or climate issues, or even about the options or techniques they might employ to lessen the effects of climate change. Indeed, the fact that farmers reject drought resistant crops, which is one of the solutions provided to cope with climate change, is a reflection that their views on the solutions are not sought. It appears that message designers just aim to cover information gaps. They don't seem to care for farmers' views. Farmers' lack of involvement in the communication process and the top-down approach is the reason they perceive climate adaptation messages as "distant." They claimed to have something to offer and expressed a willingness to participate or voice an opinion regarding the weather forecast and any accompanying solutions, but their opinions are not used.

This data backs up Gurzu's claim that smallholder farmers complain particularly about the lack of representation of their voices in climate negotiations, particularly regarding policies for adaptation. Gurzu asserted this prior to COP 26, a significant global assembly wherein global leaders, flanked by their advisors and skilled negotiators, agree on new or beefed-up policies to tackle the climate crisis across sectors" (Gurzu, 2021). This Devex news item does, in fact, support the notion that scientists and policymakers typically meet in faraway geographical locations to tackle the climate crisis without the active role and participation of small holder farmers.

No wonder in this study, farmers and agricultural officers regard the entire process as "belonging" to a group of experts in Nairobi because adaptation methods are debated in a large hotel without their input. FDG 5:4 put it this way: *"The pace is slow because most of the discussions and functions related to farming and climate change take place in hotels, far away from where farming is taking place. These experts do not even come back to farmers to explain what they discussed."* Gurzu therefore concludes that while important, these discussions do not involve smallholder farmers, who are busy working the land, feeding themselves, and the communities. They don't have time or the means to go to COP, he says (Gurzu 2021).

Gurzu references Mr. Mudzingwa, the national coordinator at the Zimbabwe Small Holder Organic Farmers' Forum, who starkly highlights the futility of meetings between local policymakers and farmers on climate change adaptation. He states that top-down frameworks are inimical of farmers' practices and are a poignant reminder of the issue at hand (Mudzingwa, cited in Gurzu, 2021). This sentiment echoes the findings of this research, underscoring the frequent dismissal of farmers as illiterate and their subsequent exclusion from communication, despite their invaluable practical knowledge.

This finding supports the statement made by Lumosi and Mcgahey (2016), which I came across during my literature review. They highlighted that one-way, top-down communication can be a significant obstacle to adaptation. According to them, climate information is frequently communicated in a one-way format to vulnerable rural communities, resulting in another communication barrier. They noted that communities must be more involved in

producing climate information or designing specific adaptation tools or advice; otherwise, if this is not done, the messages lose local relevance (Lumosi & McGahey, 2016).

The top-down approach to messaging comes across as condescending. In their accounts of the events surrounding message designing, some interviewees said that scientific knowledge carries the day where there is dissonance between their forecast and that of the farmer, further perpetuating the feeling that the 'expert' knowledge is superior to the farmers. This finding aligns with the claim made by Ogunyiola et al. (2021) that scientific knowledge is always regarded as being superior to knowledge held by indigenous people. Consequently, traditional or indigenous knowledge is disregarded, and scientific knowledge is frequently used in the policy decision-making processes (Steenwerth et al., 2014, cited by Ogunyiola, 2012).

Unfortunately, these forms of communication perpetuate the historical marginalization of semi-arid regions like this one of Machakos and developing countries in general, which are vulnerable to climate change (Wilby et al., 2009; Tucker et al., 2015). This finding strengthens the view by Gurzu (2021) and Harvey et al. (2012), whose literature reflects the sensitivity surrounding power and agency dynamics and unintentionally legitimizes and reinforces structural power relations, a concern raised by scholars in the literature review.

One other barrier to adaptation due to top-down messaging is that farmers feel left out of the process, they do not take ownership of the technologies being shared, saying the messages and technologies belong to external 'experts.' If a bottom-up strategy were employed and farmers were consulted, they claimed to have solutions they have used successfully over the years to address the issue of climate change. They claimed to employ methods like climate monitoring to ascertain the best times for farming, culling livestock, and other activities.

Members of this community develop their worldview through their interactions with and understanding of their immediate environment. These worldviews, both individually and collectively, act as the lenses through which farmers see and understand the environment in which they live. Unless they share the same culture, practitioners are frequently unable to completely understand these local worldviews, as they are based on the lived experiences of farmers. However, attempts should be made to obtain this knowledge from the indigenous people. In their own words, farmers stated:

We have lived here all our lives; we know our environment. Some of these officers come from different areas, that have different soils, but *tunajua mchanga yetu* – we know our soils. Sometimes we check how they are teaching us then we go try on a small portion of our land to compare their advice with your knowledge (FGD 4:2).

The results align with those of Ziervoge (2016), who authored a paper stating that farmers have long possessed a profound understanding of climate change through observing the stars, wind patterns, cloud movements, and the position of the moon and sun. This knowledge empowers them to forecast weather and climate trends. According to Ziervoge, this knowledge has been gained over numerous decades and passed down through generations. Additionally, this knowledge tailored to the local climate and needs and includes coping mechanisms against natural disasters like weather vagaries. She says that scientists must take this knowledge into account, collaborate with farmers, and develop solutions to combat climate change.

The difficulty has most likely stemmed from the fact that such indigenous knowledge is passed down orally by elders rather than being documented. According to Ziervoge (2016), conventional socialization processes are used to transmit this knowledge from one generation

to the next. The younger farmers in the focus group in this study, however, were unfamiliar with these procedures. How does one then integrate this indigenous knowledge, which is not published, to current indicators and responses to climate variabilities and change? Especially when such knowledge that is meant to support farm decisions and adaptive measures is dynamic and nurtured by observation? Ziervogel asks (2019).

Nkoana et al. (2018) argue that elders, as local experts, leaders, and gatekeepers should be included in any development practice because they have institutionalized, accumulated, and have knowledge that has been passed down through word of mouth through long periods of interaction with the local environment. They assert that because these elders are still the ones with knowledge, they are the key to any adaptation effort's success. According to them, these elderly people hold the key to the success of any adaptation effort because they still are holders of that knowledge. They therefore must be part of any steering committee and can assist outsiders to make sense of the culture's dos and don'ts. The same champions can also communicate the objectives of the adaptation efforts to the rural communities in a language they understand.

Top-down messaging often results in technical and scientific jargon, making it difficult for farmers to understand and apply the information. This issue is evident in farmer feedback on the weather advisory flyer, where the content was filled with complex terminology. As a result, the message design itself becomes a barrier to adaptation, preventing effective communication and uptake of climate-smart practices. This finding is in line with a related one by Ensor et al. (2012) that emphasizes the technical language used in science as the main barrier to successful adaptation. It makes sense that farmers in this study requested images

and plainer language to convey technical ideas. For instance, they suggested replacing the word "dolicho," which they had no idea what it meant, with the image of a "black bean." Or by using terminology that they could comprehend, such as "*njahi*," a phrase they are already familiar with and would prefer use than the formal name for black beans, "dolicho."

It is also noteworthy that most farmers who could not understand the language rely on others to interpret for them. When farmers rely on third parties to translate or interpret the text meant to help them make day-to-day choices, I concluded that adaptation is impeded since this a guide meant to help farmers make decisions on the spot. They require information immediately! This result supports Sanchez's (2016) claim that one of the hardest things is communicating the uncertainty, complex, and risky issues related to climate change. He points out that it can be difficult to explain a complex phenomenon like climate change in a simple manner. mentioning that significant climate change issues get lost in the chaos brought on by a correct understanding of what climate change is.

The BBC (2010) corroborates the same conclusion, stating that the public and political response to the climate crisis was delayed due to "complex, confusing, and at times contested scientific information." They claim that a lot of people still view climate change as an abstract idea. This result is in line with the findings of the same BBC study, which concludes that the comprehensibility of language will determine Kenyans' capacity to effectively address climate change, as complicated terminology can hinder adaptation.

It is impossible to overstate the significance of observed modeling in the process of acquiring knowledge in social learning. This process extends beyond written behavior to include live demonstration. It is clear from using the seasonal weather advisory flyer as a textual model

that it does not encourage knowledge acquisition or retention. This is so because learning requires the process, which involves an observer's memory of the modeled behavior. The flyer lacks any graphics or photos that could help people remember the content and is very technical. This discovery supports Bandura (1977), who says that the most important factor to promote memory retention is visual imagery and verbal coding, with visual imagery being particularly important early in development when verbal skills are limited. Once modeled behavior has been transformed into visual and/or verbal codes, these memories can serve to guide the performance of the behavior at appropriate times.

Another author, Petterson (2015) says that visual images are superior to verbal images when content is emotional, holistic, immediate, spatial, and visual saying that in the absence of actual thing, the next best reference is a visual presentation of that thing. The interviewees even suggest the use of photos, or images of, for example drought resistant crops would be a more pertinent reference for meaning than the written word, which is even very technical.

Obviously, language complexity prevented farmers not only from understanding, but demonstrates that farmers are not participants, and don't have a voice on the issue of climate adaptation. The fact that the interviewees suggested using simple, local language and using relevant mental models e.g., photos to represent the drought resistant crops, is a clear demonstration that the messengers had not taken cognizance of their existing frames of reference. It shows that farmers were not consulted on such a simple issue, neither did message designers start by learning about their preferences, a key requirement in the communication strategy process.

To effectively communicate messages about climate adaptation, Naess (2013) suggests using approaches that are more user-friendly than simply sharing information. These approaches should involve a convergence of traditional and scientific knowledge systems in climate change messaging. Keen et al. (2005, as cited by Muro & Jeffrey 2008) emphasize the need for researchers and practitioners to change their approach to natural resource management by implementing participatory learning strategies. This would enable individuals to meet, interact, learn collaboratively, and make collective decisions.

Pirio (2019) believes that putting people at the center of the planning, implementation, and evaluation of new practices contributes to the development of a sense of collective empowerment that fosters a trusting relationship with system actors. Hence, the SBCC approach calls for promoting two-way, collective community action based on negotiating and partnership and create joint ownership of the change process. This approach recognizes farmers as co-creators of knowledge rather than passive recipients, making climate resilience strategies more sustainable and impactful. Additionally, the communities will not only create the messages but will determine the communication tools. When a community has control over their communication tools, they feel more empowered. This power allows them to shape social norms, policies, and culture. Delphine et al. (2018) found that this is a critical factor in promoting equal engagement and trust among all stakeholders involved in a project. Scientists trust farmers, and farmers trust scientists, and this engagement will result in strategies that work.

For meaningful engagement in climate adaptation, it is essential to allocate time and resources to foster collaboration between those who produce scientific knowledge and those who use it.

According to Delphine et al. (2018), regular interactions between scientists and end-users help build trust, enhance the practical application of information, and ensure its relevance. Additionally, they emphasize the need for capacity-building among trainers to strengthen their messaging skills. Integrating Social and Behavior Change Communication (SBCC) into this process enhances the effectiveness of climate messaging by prioritizing two-way, participatory communication rather than top-down information dissemination. SBCC aligns with social learning theory, which highlights the importance of deliberative, multi-stakeholder engagement in environmental and natural resource management (Daniels & Walker, 2001; Schusler et al., 2003, cited in Selin et al., 2007). Through SBCC, communication becomes a dynamic exchange where farmers and other stakeholders actively participate in shaping and contextualizing climate adaptation messages. By ensuring that communities co-create knowledge and influence communication tools, this approach empowers them to make informed decisions, fostering long-term behavior change and climate resilience.

According to Selin et al. (2007), various other researchers such as Lee (1993) and Wondolleck & Yaffee (2000) support the idea that promoting knowledge sharing, joint learning, and co-creation among stakeholders is crucial when dealing with complex and uncertain natural resource management issues like climate change. Social learning, as presented by Röling (2002), Ison et al. (2004), and Woodhill (2004), is an interactive approach to decision-making and problem-solving that can help address these challenges.

In addition to the Social Learning Theory, this study also highlights the great need to utilize Lay expertise model, which is also an SBCC theory. The theory emphasizes beginning with local knowledge, sometimes called "lay knowledge". The Lay Model theory is seen as a

remedy to the one-way communication model, known as the deficit model, where information flows from experts to public to change individuals' beliefs, behaviours and attitudes for polarized issues such as climate change. The lay knowledge model, which literary uses a public participation approach, would help farmers to create opportunities for self-articulation. The farmers will express their opinions, recognize shared issues, and look for solutions within their community, much like the social learning theory suggests. Goodsmith and Acosta (2011) argue that this is a highly suitable strategy for small holder farmers. Furthermore, it can help in the process of identifying the appropriate technologies and options that farmers can adapt to climate change– such as the most suitable drought resistant crops that will be appreciated in the community. In other words, farmers' participation from the beginning to the end of a project ensures they are involved in the problem identification and solutions- and therefore take ownership of the results.

The specific principle that guides the Lay Knowledge process is that a development project starts with people's existing local knowledge, local practices, perspectives, and expectations. Rather than scientists starting the other way round, as is the case in this study- top-down approach – where they develop the strategies from the region or national level then to farmers, the project will work better if they start with where the people are, the farmers' local knowledge then build on that knowledge.

When it comes to trust building, the lay knowledge theory and social learning messaging approaches are suitable. For example, even when the rain does not come as expected, the farmers will trust the message and messengers since they are part of the process. When people own the process, they will also own the risk and not feel as though the project belongs

to some strangers. Indeed, Obeng et. al.'s study underscored the critical importance of knowledge co-generation and social learning between researchers and communities, saying it helps farmers feel they are part of the decision-making, reducing distrust (2013).

Another key factor that works as a barrier to adaptation because of top-down messaging is that the message dissemination is focused on non-farmer-centered dissemination pathways, further isolating farmers from crucial messages that would help them adapt. This is evidenced by the fact that the most important and primary dissemination tool designed with the intention of directing daily decisions and actions to manage agricultural activities on farms in the face of climate change, is obviously inaccessible to many farmers as it is placed in the agricultural offices, far from where the farmers live. Indeed, blatant disregard for the viewpoints of farmers in the selection of dissemination techniques may explain this outcome. This supports the findings of Lumosi & McGahey (2016), who found that in the past, farmer-centered, one-way dissemination strategies were used in attempts to disseminate climate information to farming communities.

Another unanticipated finding was that radio is not the channel of choice for climate adaptation messages in study. Surprisingly, most of the interviewees in this community do not regularly listen to radio or watch television for weather and adaptation information, yet the agricultural programs, specifically the ones on technology adaptation, needed continuous conversation. Afterall, these are complex, new technologies being tried out – they need to give immediate feedback as they test them on their farms. The observation was that the timing and device ownership was the major issue. The radio belongs to the man of the house.

Most of those who farm are women, who apart from not owning the radio, are busy with house chores when agricultural programs are aired.

These findings align with previous studies conducted by Mwaniki et al. (2017), who explored the potential of radio in influencing farmers' utilization of climate change information in Kilifi County, Kenya. Their research also revealed that a small percentage of farmers (33%) reported listening to radio programs. Their study revealed similar challenges - accessibility to the radio and timing, as well as the inability to record or store programs for later listening. The primary concern is the adoption of a top-down messaging approach in climate adaptation communication. Despite the current situation, there remains optimism that with strategic utilization, radio can effectively serve as a platform for climate information services.

To overcome the challenges in social learning, Mwaniki et al. (2017) suggest using group listening approaches like community listening clubs and community-based radio schools. Tenfalt (2006) emphasizes that radio can be a successful tool when it ensures listener participation and is sensitive to the participants' culture. He suggests that technical experts could organize call-in programs where farmers can interact with scientists.

Tenfalt proposes that for social learning to be effective on radio, women's listening clubs should be established, utilizing existing social groups such as merry-go-rounds where women regularly convene. These groups can engage with the program through collaborative listening and participation. To ensure wide accessibility and cultural resonance, the programs should include local languages and traditional folk media, reflecting and transferring cultural identity and pride (Tenfalt, 2006). Given that women often have limited time at home due to household chores, radio offers an ideal platform for interaction, one that Climate Service

Information providers can harness. Tenfalt (2006) highlights how radio, particularly in remote rural communities, can effectively increase participation and social mobilization. Success stories from across Africa, including Tanzania, Uganda, and Southern Mali, have shown that, when used skillfully, radio can offer smallholder farmers a platform for creative dialogue.

As a social learning tool, Bayedila (2010), says that radio also encourages and supports participation that results in the creation of local content suited to local reality. According to him, it can aid in enhancing local knowledge and raise awareness of how climate change is affecting local communities all around the world. According to Taiwo & Asmah (2012), research conducted in Ghana also lends credence to the idea that social learning via radio listening is positively correlated with the increase in noncocoa yield between 1991–1992 and 2005–2006. Further supporting the idea that if used strategically, rural radio serves as an effective social learning/participatory communication tool as it is still the most comprehensive, accessible, and flexible medium for rural communities, given the decreased number of extension workers in Africa.

In contrast to the findings of this study, when used effectively, the radio is an effective means of participatory communication and can facilitate discussions with communities on various issues such as weather, markets, crop and livestock production, and natural resources. It also allows for the generation of local content from remote listeners. Due to its low cost and high reach, radio is one of the most important mass media tools for conveying messages quickly to large audiences, regardless of their literacy level. It can also be used as a platform for inclusivity, even for women who have previously been left out of important conversations. That is why it has been found to be especially useful in rural development programs since it

also covers great distance and all kinds of natural barriers, for example radio communication can be received even where there is no electricity and can use local language.

The other major finding was that the most locally preferred channel by farmers was the face-to-face message dissemination forum, and for obvious reasons. This study found that the farmers did not only dialogue with the extension officer, but with each other, sharing experience on the new technologies they were trying on their farms. This platform provided a peer-to-peer learning opportunity among the farmers. Some of the advantages were the immediacy of feedback and the ability to speak in their mother tongue – Kikamba, until one understood. Several interviewees said this was critical when they were trying out new technologies in the face of so much uncertainty presented by climate change. This finding supports Torres (2010)'s claim that decisions regarding adaptation to risk-related phenomena, like climate change, which have community-wide effects, must take the whole community into account rather than just the context of the individual. In this regard, farmer field days and demonstrations are valuable because they foster discussion among farmers, which fosters collective learning.

The farmers in Machakos said they have too many uncertainties associated with climate change, and often they find themselves fumbling for solutions. But they can bring to the fore these uncertainties associated with the distribution of rain, the right inputs to use on their farm. They are also able to separate and choose from the many voices speaking to them about the solutions to the myriads of challenges affecting them. In other words, the dialogue amongst themselves in the presence of the expert helps them to clarify issues. This state is confirmed by Torres (2020), who says the process of learning by doing is deepened through

farmer field schools. This is accomplished in part by having farmers analyze the data on the spot and then incorporating these scientific findings to their realities, with the facilitator's assistance. As observed in the study, farmers become more proactive in this circumstance as opposed to being passive information consumers.

Another common view amongst some interviewees was that the demonstrations allowed them to observe what was working on farms, spurring those among them who were afraid of taking the risk associated with adaptation. Some said they have burnt their fingers, trying the various solutions offered by input marketers and other messengers - so they have adopted a wait-and-see attitude. They only adopt new technologies e.g., new seed varieties, if they work on their neighbors' farms! This finding confirms Bandura (1977) observation in the social learning theory that most human behavior is learned observationally through modelling. One forms an idea of how new behaviors are performed by observing others, and later, this coded information serves as a guide for action.

Furthermore, this study confirms that demonstrations greatly increase trust in the message, something so important in an area of uncertainty or an unfamiliar phenomenon such as climate change adaptation, an observation also made by (Harvey, 2012). This is so because even sluggards can learn from each other through modelling, imitation, and observation. People pick up knowledge by watching the actions, attitudes, and results of others, claims Bandura (1997), particularly in a field rife with uncertainties or unfamiliar phenomena like climate change.

Another recurring theme from this finding was that individual learning was leaving farmers confused, especially when they had to use the weather advisory on their own. These findings

support the comparison between learning in a social setting versus individual learning of complex and new technologies. The interviewees said that they get confused when trying new technology on their own versus when learning through the demonstration/face-to-face, thus ranking as the most useful forum of learning.

The results of this study support Röling's (2002, cited in Ingram 2021) assertion that demonstration activities promote dialogue and group interaction and are useful for supporting shared learning. He affirms that the development of these shared understandings of a problem, a feature of social learning, improves individual learning. He claims that social learning entails the convergence of various viewpoints into a common perspective on a given circumstance. The issue at hand is then addressed using this common viewpoint the adaptation in this instance. Additionally, it is confirmed by Leeuwis and Pyburn (2002, cited in Ingram 2021) that social learning promotes a collaborative approach to problem identification, with outside intervention taking the form of facilitation.

Despite the demonstrations fostering shared learning, interviewees expressed disappointment that their views on adaptation during such forums are not incorporated in the solutions proposed by the messengers. Yet, such face-to-face forums provide an ideal learning platform for merging local knowledge with scientific knowledge. FAO, which has wide experience with farmer demonstration recommends that in this demonstration plots or face-to-face learning forum, as the farmers meet with the extensionists, local knowledge can be merged with scientific knowledge because farmers can identify local adaptation options as the agricultural officer's monitor and facilitate the process. On the farms, for instance, the identified adaptation options could be piloted willingly and closely monitored. By keeping an

eye on crucial data, such as fertilizer, seed, water usage, etc., and sharing and evaluating it with the messengers, farmers can take part in the pilot project. Farmers can then see how the crops perform when this additional knowledge is applied by utilizing their data and observations to inform scientific guidelines and prescriptions.

During a demonstration, it is ideal to have an overlap between local and scientific knowledge. This overlap can result in "enhanced local knowledge," as described by FAO (2010). The testing process of various adaptation options should be guided, and it should yield a list of feasible adaptation techniques. These techniques should be appropriate to local conditions, sustainable and environmentally friendly, economically viable, socio-culturally acceptable, and easily integrated into local community development.

The FAO (2009) also advocates for participatory approaches in social learning to dispel the belief that messages on new technologies belong to some outsiders. They emphasize that these approaches significantly enhance the benefits of climate information among smallholder farmers by fostering participation, ownership, and buy-in, which are essential for sustainability and farmer-driven action. The specific principle which FAO says guides this process is that rather than message developers starting the other way round - top-down approach – where they develop the strategies from the region or national level then to farmers, the project will work better if they start with where the people are, the farmers' local knowledge then build on that knowledge. Even when the rain does not come as expected, the farmers will not distrust the message and messengers since they are part of the process. When people own the process, they will also own the risk and not feel it the project belongs to some strangers. In fact, the study by Obeng et al. emphasized the significance of knowledge co-

generation and social learning between scholars and communities, stating that this lowers mistrust by giving farmers a sense of participation in the decision-making process (2013).

To summarize, the thesis underscores the significance of adopting a participatory approach in communicating about climate adaptation and new technologies to farmers. It stresses the importance of engaging farmers in the process of generating and disseminating information, while taking into consideration their local knowledge, customs, beliefs, and traditions. Equally crucial is the use of communication channels and systems that farmers are familiar with, such as face-to-face meetings, farmer field schools, and demonstration farms, to ensure effective communication. Ultimately, the thesis maintains that a participatory approach that incorporates farmers' ideas and local knowledge is essential to promoting climate adaptation messaging and realizing sustainable development.

### **7.2.2. Culture and Religion play a role in Adaptation**

Another important finding was that culture, and religion played a major role in determining whether farmers would accept the messages and adapt to climate change. The study showed that whereas farmers acknowledged the presence of climate change and the huge challenges it presented to their agricultural practices, their culture and religious beliefs influenced how they responded to these messages.

This is because they believe that climate change is a result of divine will. Indeed, some farmers believe that God is punishing the community for their sins by bringing climate change. This may be one other factor explaining the relatively poor adaptation since some farmers believe that the community just needs to appease God and the climate change will be

sorted. This finding is similar to Awiti et al. (2012), who discovered that communities routinely pray for rain, especially during a "prolonged" drought. In his research, local beliefs are based on the idea that a deity controls the weather and climate. He believes that perception had the greatest positive impact on the use of climate forecasts in decision-making, followed by norms.

While commenting on this issue of beliefs, other farmers stated that even though cassava does very well in their soil, their children do not accept it. He added that traditionally, goat milk is left for its young and is not for human consumption, yet these NGOs were asking them to use it for human consumption! (FG3:2). The farmers were appalled. Even though the idea of goat milk or cassava has sound scientific benefits, the messengers need to understand these perceptual barriers as they introduce new technologies since they reduce trust in the message and messengers.

As a result, Awiti et al. (2012) recommend focusing on changing farmers' and their societies' beliefs, values, and perceptions of weather and climate forecasts so that farmers find them useful and influence their use in farm activity planning. Jones (2010) made the same observations that the social sciences have long recognized: an individual's actions and behavior are shaped by deeply embedded cultural and societal norms and rules (Ostrom, 2005, cited by Jones 2010).

The current research aligns with other studies on natural resources management, which suggest that the main obstacles to individual or community action are not just a lack of understanding or information, but also cultural, social, and institutional factors (Tompkins and Adger, 2004:15, as cited by Jones 2010). The findings of this study are consistent with a

significant body of previous work in this field, which argues that rational responses to climate stress and shocks may not always result in the development of adaptive behaviors, even with adequate knowledge and awareness (Jones 2010: accessed June 2019).

The outcome is in line with Kihupi et al. (2015), who argue that farmers' perceptions of climate change and its effects are strongly correlated with their coping and adaptation strategies. According to D'Alessandro et al. (2017), a lot of farmers have rejected communications about climate change because of their worldviews. Therefore, he claims, it is essential to comprehend and segment farmer audiences from a homogenous group to target and customize communication strategies based on their values, attitudes, and habits. For D'Alessandro *et al.* therefore, the emphasis is on segmenting farmers and tailoring communication strategies to better engage with segments of concern, including which message to use, appropriate sources, as well as alternative communication techniques based on participatory approaches. On the other hand, back in Awiti et al (2012), proposed a solution to the disconnect between message developers and farmers. They suggested that developers consider the beliefs of farmers as opposed to disregarding them. When they ignore farmers' beliefs as is the case in Machakos, where this research was conducted, a notable gap communication gap between message developers and farmers develops.

These suggestions align with the SBCC theory, which prioritizes audiences' beliefs in message design. Social learning, which is covered in the literature reviews states that behavior is a complex phenomenon that is impacted by variables other than an individual. (Glanz & Rimer, 2005; Glanz & Bishop, 2010; cited by HC3, 2014), pointing out the importance of considering the four levels—individual, family and peer network, community, and

social/structural factors—that interact to affect change. The social/cultural factors include social beliefs and norms and knowledge and attitudes of community members towards the issue presented. The message designers then need to understand farmers’ beliefs about climate change and adaptation and aim to use communication to engage and break it, because these factors affect farmers’ choices and practices.

The significance of integrating local knowledge was confirmed by the findings of Nkoana et al. (2018) in their study aimed at identifying the best practices to involve rural communities in adapting to climate change by development practitioners. The study highlighted the importance of acknowledging the context, including cultural norms and beliefs, within which communities are situated. The researchers suggested that contextual issues should be the starting point for any discussion on climate adaptation.

Therefore, it should be about mobilizing whole communities for change. In this case, introducing new crop varieties, for example, will work when everyone in the community, including children, are targeted in the messaging. In Machakos, such a big audience as the children were ignored in the production of new crop varieties, the messaging process and even choice of dissemination tools. The children have rejected the new drought resistant crop varieties, like cassava, which they feel is not palatable and is associated with poverty. Probably if there was some attempt to involve them or persuade them to accept the new crop variety, they could have understood and adapted. As a result, their parents avoid cassava, even though it may be a useful crop to mitigate climate change. The children as well as the parents are consumers of the food, and a proper communication strategy considers the primary audience and writes messages that resonate with them.

In support of a similar viewpoint, Webler et al. (1995), cited in Muro and Jeffery (2008), suggest that when a group moves from individuals pursuing personal interests to a cohesive 'community' with a shared purpose and interests, that is when social learning takes place in a participatory context. As a result, message designers view themselves as essential members of the community who work toward the same goals as the farmers, rather than as outside forces.

The relevance of understanding audience beliefs, values and norms is clearly supported by the findings in this section. Especially the importance of taking farmers' cultural and religious perspectives into account while developing their adaptive capacity to help them become more resilient to the effects of climate change. Although conventional techniques presuppose that giving people more and better knowledge about climate change would result in better decision-making and behavior change, more is required. Because while good scientific data and technical information is great, people's values, beliefs, attitudes, preferences, habits costs and benefits assessments, social norms, policies, among others, interact to influence behaviour change. To create effective programs to help climate adaptation, message producers must conduct preliminary research to identify these enablers and barriers to social behavior change.

### **7.2.3. Role of Source and Message Credibility in Climate Change Adaptation Efforts**

Another important finding was that lack of source and message credibility is a major barrier or disabler of adaptation. Distrust of the seasonal weather advisories or the messages emanates from variabilities associated with climate change, with farmers claiming the predictions are not accurate. This was stated by FGD 4: 1 who noted:

“We do not trust the weather forecast because they are not accurate. Some seasons we harvested nothing, there was no rain, yet the seasonal forecast had indicated there would-be rain”.

According to this study, there is a clear connection between climate variability and a lack of trust among farmers. The study's participants expressed their skepticism towards seasonal weather forecasts, which is in line with the statement made by Ziervogel et al. (2005) that households' use of climate information depends on their trust in the forecast. These findings also support Onyango et al.'s (2012) research in Rarieda, Western Kenya, where farmers did not rely on weather and climate information due to unreliability, uncertainty, and mistrust of the Kenya Meteorological Department (KMD). The study assessed the capacity of agricultural and fishing communities to use existing weather and climate information tools designed to help farmers and fishers make better decisions that reduce risks to their lives and livelihoods. Just as in this study, there was therefore a dominant perception that making decisions based on forecasts was risky, based on past failure of forecast to materialize (Onyango et., al. 2012).

The finding is consistent with findings by Serra and Mckune (2016, cited in Mutune et al., 2018) that, despite the extensive distribution of climate information services, farmers continue to use this type of information sparingly to manage risks associated with climate change. Mudombi and Nhamo (2014), referenced by Mutune et al. (2018), stress the significance of reliability, trustworthy, and easy to understand climate information for effective utilization in adapting to climate change. In a similar vein, Diop et al. (2018) contend that crucial characteristics like delivery, legitimacy, salience, and credibility are necessary for climate information to be valuable. As I went through the social learning theory, I asked myself: Can social learning establish credibility? Renn and Levine (1991) propose that sharing values is

one of the essential elements required to effectively communicate risks, including those associated with climate change.

One of the other reasons trusts emerged as a significant factor was that messengers/ extension officers, are not from this locality, therefore, *they don't understand nor have experience with our soil and our environment*' (FGD 4:2). They claimed that because they have lived here and are more familiar with the soil in these areas, they occasionally question the advice of outsiders. Their worldviews constitute the lenses through which members of a society, collectively or individually, experience and interpret the world around them. Unless they come from the same culture, often, practitioners cannot fully understand these local worldviews as they are the lived experiences of rural people, but efforts should be made to solicit such knowledge from these communities. One farmer stated:

*'tunajua mchanga wetu - we have lived here all our lives; we know our environment, our soils.'* – we know our soils. Some of these officers come from different areas that have different soils, but *“Unajua unaweza kuchukua advise yote kutoka nje lakini upate hasara – you can take advice from a foreigner and be at risk* (FGD 4:2).

*“You take someone's advice from outside and at the end of it all, it is a total waste”* (FG5:1).

Farmers, therefore, said they take advice from extensionists with a pinch of salt and in small doses. Additionally, farmers have misgivings about the people who present other agricultural programs on adaptation TV and radio, saying they are out for financial gain. They think the shows are sponsored by private companies driven by commercial interest to market their products to gullible farmers. According to the farmers in the study, most of these individuals and companies sell seeds and pesticides and owners really do not care about what happens to farmers even when those products do not work. And they say that these people recommend

certain crop varieties for the dry weather conditions, which often do not work, yet they have nowhere to go and complain.

This finding regarding the credibility of the message and the messenger supports the relationship between trust and adaptation. It also aligns with the findings of Turyahikayo & Edson (2016), who found that trust is likely the foundation for understanding farmers' attitudes toward successful agricultural government programs based on their research conducted in Uganda. According to his findings, "staying close to them and showing strong concern for their interests is a plus to the effectiveness of the extension system." Farmers' interests should be at the center of any outreach.

Once more, this result confirms the relationship between shared values to increased trust, that resonates with the social learning theory that lays emphasis on participation of all, including message developers. Bharwani & Vulturius (2016) say that social learning theory calls them knowledge mediators, change agents, facilitators, and champions, who play an important role in SBCC and social learning strategies. Their assignment will not be to pass down information, rather, they act as primary messengers, secondary interpreters of knowledge, and "champions" of change. Bharwani & Vulturius (2016) say such a relationship calls for listening to the farmers for example, understanding the cultural or other environmental factors that influence farmers beliefs. This takes time but so does building trust and changing behavior. Message designers build trust by building relationships during the 'co-exploration' sessions.

Selin et al. (2007) cites Lee, Wondolleck, and Yaffee (1993 and 2000) for their emphasis on the social learning theory's application to collaborative initiatives aimed at addressing uncertainty and complexity related to natural resource management. Participants are said to start discussing planning strategies like collaborative information search, shared problem identification activities, and joint monitoring of ecological and social indicators when they acknowledge they do not have all the answers.

These results are consistent with those of other studies that suggest that social learning and lay model theories can effectively help to build trust, as the 'experts' come into the community as facilitators rather than outsiders. In the literature review, Bharwani & Vulturius (2016) says message designers can build trust by creating relationships during the 'co-exploration' sessions. This art calls for relationship building based on listening to the farmers. They listen and understand the cultural or other environmental factors influencing farmers' beliefs. This takes time but so does building trust and changing behavior.

The study findings revealed a correlation between trust levels and the use of technical jargon. Moreover, complex language contributed to the erosion of trust in weather advisories. This finding corresponds with Renn & Levine (1991), who also insist that communicators refrain from using this technical language and impersonal style (1991). They claim verbal and physical cues can help the audience identify with the message or messengers.

Ignoring farmers' cultural, religious, and belief systems while developing adaptive solutions has led to distrust among them. This distrust has become a major obstacle to adaptation. For instance, in Machakos, farmers hold the belief that maize is the only authentic food, and they resist planting crops that are considered "alien" to their region and culture. For instance, a

farmer stated that while they were being asked to grow sorghum, their children were not familiar with its taste and considered it a "poor man's meal."

Another farmer stated that maize was the only crop considered as "real food" in their community, while other food crops were seen as inferior. As mentioned earlier, ignoring farmers' culture, religion, beliefs and values while designing adaptive solutions has become source distrust. This distrust emerged as a big barrier to adaptation. For example, farmers in Machakos believe that maize is the only 'real' food and have a problem with the crops that the message designers asked them to plant claiming the crops are alien to their region and culture. For example, one farmer stated that while they were being advised to practice sorghum farming, their children were not used to the taste. He further claimed that sorghum was "a poor man's meal," and that it was not palatable to the people in the county. Another farmer said maize was the only crop considered as food *-liu* in this Kamba community. The other food crops were called *kivulani* and not seen as real food.

Maize is the only food considered as food here. It is called "liu" in Kamba. Other food crops are called "*kivulani*" this *kivulani* is not seen as real food. You see, maize can be turned into ugali or *githeri* or cooked on its own. That is why we plant maize only.

Someone can sleep hungry if they plant only cassava, and they will say, I did not have maize... (FGD5:4)

In the literature, social behavior changes communication attempts to change a population's behavior by influencing its knowledge, attitudes, and social norms. Communicators need to understand the enablers and the disablers of behavior change as they create messages. By studying messaging and the variety of communication techniques used in Machakos, I conclude that trust building is important to increase the probability of individuals taking personal actions aimed at adapting to climate change. Message recipients need to trust the

messenger and the messages. This can be done by the messengers creating a 'bond', with farmers, and acknowledging existing attitudes, beliefs, values, and perceptions when designing messages.

As knowledge mediators, potential change agents and champions play an important role in SBCC and social learning strategies. These change agents act as primary messengers, secondary interpreters of knowledge, and "champions" of change. They may also be the first to adopt technology or behavior and serve as role models for others. Message designers can also build trust by building relationships during the 'co-exploration' sessions discussed in this section. Bharwani & Vulturius (2016) say such a relationship calls for listening to the farmers for example, understanding the cultural or other environmental factors that influence farmers beliefs. This takes time but so does building trust and changing behavior.

#### **7.2.4. Women's exclusion from Climate Change Messaging**

Interviewees' perception that women are most impacted by climate change was a recurring theme in the interviews. This finding supports Onyango et al. (2012)'s findings that the population segment that is already vulnerable due to gender, age, and minority status is more severely affected by the effects of climate change. This study found that women's ability to adapt to climate change is weakened by structural and communication factors, making them more susceptible to its effects. This finding supports the claim made by Onyango et al. (2012) that women continue to face social discrimination and suffer more because of their limited access to climate change information. Abraham and Purkayastha (2012), cited in Shaw and Kristjanson (2013), also state that socially disadvantaged groups—such as those who are

poor, women, youth, and the elderly—tend to be the most vulnerable to environmental risks, natural hazards, and variability.

These results are consistent with those of scholars, such as Eggerts et al. (2011), who assert that since the poor and the disadvantaged are the groups most at risk from climate change, and since women make up most of this group, then the repercussions of climate change are gendered. This is because women account for at least 50%, if not more, of those actively engaged in farming. This finding also corroborates an FAO statement: “In much of the world, the face of farming is female!” This finding also corroborates what Paris 2006, Kakota et al. 2011; and Brody et al. (2008, cited by Shaw 2013) say that rural women are responsible for half of the world’s food production and produce between 60-80% of the food in most developing countries.

How does communication discrimination happen in this study? The findings revealed that women lack proper representation in forums meant to map new technologies and approaches, leaving them behind on vital decision-making communication platforms where they would give input. As most of the female farmers noted, they have never been invited to contribute their knowledge on climate change, adaptation options or the most relevant communication channels.

Scholars such as Skinner (2011, p. 3, cited by McOmber et al., 2013) have confirmed this situation by arguing that "climate adaptation policies too often treat women only as vulnerable beneficiaries rather than as rights-holding citizens who need to be recognized for the agency, skills and experience they can contribute." According to FAO (2011), beliefs that belittle women (e.g., they are uninterested, they will not comprehend) and favor men (e.g.,

they are better educated, they are going to pass on what they learn, etc.) are the foundation of this social order. Furthermore, women farmers are overlooked because, rather than being valued as productive contributors to the economy, they are perceived in the public mind as family laborers with no decision-making authority.

Besides women do not have access to critical information needed to help them succeed. This study also observed that training and capacity building forums where farmers are exposed to messages on new technologies are not sensitive to the realities of farming communities in the study area. While most farmer outreach meetings like demonstrations are attended by either one of the spouses, men attend most of the group meetings while the women are left at home tending the farm. Interviewees explained that women are unable to attend the capacity building meetings because the men think they will not understand the technical issues—leaving such meetings to men who are better educated and will understand the content of the meetings. In other words, women are the ones working on the farms while the men attend the agricultural meetings.

This becomes even a bigger challenge when the men attend a demonstration meeting where sight, smell and touch are used to build the capacity for using new technologies, yet the women who practice the farming are not present at these platforms. It is not even possible to go back home and give the same training to the woman – since she won't have the experiential learning opportunity of interacting with the facilitator. In addition, men do not share the information or lessons they learn at the agricultural meetings with the women.

The AO 2 noted that in cases where the women attend the training without their husbands, they may share the information with their husbands to receive financial support to try out new

technologies. However, this is still a hurdle since the men are the resource controllers and decision makers and will most times be unwilling to support an idea they do not understand. Hence, the female farmer is not able to implement the new technologies. According to FAO (2011), this results in women being excluded from opportunities to acquire knowledge, expand their skills, access resources, enhance their social status and obtain power. Yet in female headed homes, women control the resources and decisions and so more change is realized.

Another finding was that women's lack of education influences the rate of adaptation. The low rate of adaptation to climate change can be attributed to the fact that most of the people who work on the land are women, many of whom are over 50 and have very little formal education. As a result, these women may not understand the weather advisory flyers or other messages related to adaptation. Those interviewed said that younger people must translate the information for them because of the English (and technical) language used in the weather advisory. They still cannot use it on their own, even though it is intended to provide information and guidance on new agricultural techniques to combat challenges emanating from weather variabilities. For example, it is meant to guide on drought-resistant varieties and control of pests, among other climate adaptation messages.

This finding confirms that even when utilized in development endeavors, communication techniques are frequently selected or constructed with a literate audience in mind—one that has easy access to information. Further corroborating McOmber, et al., (2013) statement that women are overwhelmingly less educated than men in developing countries and that they tend to have less knowledge of emerging technologies and are thus less likely to incorporate

adaptive livelihood strategies in the context of climate change. Weighing in on this argument, Schwager et al., (2018), also say that even with access, gaps in schooling and literacy (both technical and otherwise) can result in less proficient use, just confirmed from this study.

Similar studies also revealed a strong correlation between the education level of the farmer and the decision-making process for daily management operations. Kyazze et al. (2012) confirm this observation, stating that technical and probabilistic information, along with the formats commonly used for presentation, can pose challenges in terms of comprehension and accessibility. As a result, men may be better equipped to interpret seasonal forecasting, while women may encounter difficulties.

Another interesting and an unexpected finding from the female interviewees was that in most households, the radio and TV remote control are controlled by the man of the home, he determines what will be watched or listened to. Yet women have no control over what to watch or listen to. Additionally, the seasonal weather advisory is disseminated via radio in addition to the not women friendly flier. Women, who are the farm producers, said that the timing of agricultural programs is not friendly because during the day they are busy on their farms while in the evening, they come home tired, and they still must take care of household chores. These results support the findings of Schwager et al. (2018) that although radio programming is used more frequently in climate services to address these limitations, women's access to radio programming may be hampered by childcare and household responsibilities, according to several studies.

These general results of communication marginalization for many women support the claims made by Shaw and Kristjanson (2013) that women face barriers to resources, rights, mobility, and authority in the home and community—problems that will probably get worse because of climate change. Most relevant to these findings is her view that existing asymmetries of power and access to knowledge and technology lead to exclusion and/or disadvantages in development outcomes if not given appropriately.

According to Kyazze et al. (2012), the problem is summarized as follows: most female farmers are illiterate, they are not included in resource management, they do not hold leadership positions within farmers' organizations, and capacity-building initiatives overlook them. According to Lumosi and Mcgahey (2016), there are several factors that affect vulnerable communities' access to climate information, including power dynamics, gender roles, gender equality, and resource availability. This finding on the isolation of women from the messaging and communication platforms leads to the question FAO (2011) asks: How, then, can we expect transformational change or adaptation and improvement of food security when half of the population, who make an essential contribution, are excluded from these processes?

The social learning theory address and guarantees participation of women in development says Christmann et al. (2015, cited by Phuong et al., 2017) since it facilitates and builds community capacity, where this capacity will include those of women. As reviewed in the literature, social learning is about collective learning, joint learning, or group learning, and refers to similar mechanisms for helping multiple stakeholders understand and utilize one another's viewpoints, values, resources, and ideals regarding collective actions. It is therefore

important because it guarantees addressing the participation of women in decision-making, increasing their adaptive capacity to climate change.

Similarly, the lay expertise model, which was also used in this study, highlights the importance of collaborating with farmers and valuing their local knowledge. Both models reject top-down, linear approaches to message design, advocating instead for communication activities that acknowledge the expertise that communities already possess (Lewenstein, 2003). This model allows communities to express their perspectives, identify shared concerns, and collaboratively seek solutions. Both approaches are particularly relevant for smallholder farmers, more so women, who have historically been marginalized in development processes, as is evidence from this study. Recognizing and incorporating their knowledge ensures greater ownership of adaptation strategies and more effective outcomes.

A more positive outlook is emerging from gender strategies and programs that are inclusive and targeted. This is according to case studies conducted by CGIAR on social learning and social differentiation (Kakota et al. 2011, cited by Shaw 2013). For example, a study in Bangladesh demonstrated that involving women in participatory varietal selection led to their empowerment. In certain cases, increased communication and transparency have resulted from including more women in decision-making processes. Men in the community can now see that women have important knowledge to share thanks to this. The results of the study show that involving socially diverse groups in the process of producing knowledge and making decisions can result in important capacity and information that would not otherwise be available to researchers and stakeholders. According to the CGIAR study, allowing

socially diverse groups to voice their needs and knowledge gives them the power to affect change. Shaw (2013) cited Kakota et al. (2011).

FAO (2009) also recommends using the development communication or SBCC approach to address the challenges faced by women in receiving and acting upon adaptation messaging. The approach is effective in messaging as it requires a deep understanding of the audience's key drivers, beliefs, and values before developing any intervention, as stated by Sherard et al. (2017). An analysis of these issues is important and should be conducted during the project's strategy design, implementation, monitoring, and evaluation phases to understand the social and cultural norms that influence learning for both men and women.

What are the practical steps to including the women through an SBCC approach? Firstly, is the communication analysis which will bring a greater understanding of divisions of power, roles, and responsibilities, as well as a better understanding of both women's and men's attitudes about perceived roles (e.g., who makes the decision about information tools like radio? Or who attends agricultural communication forum?). Understanding how decisions are made at a household level will identify barriers and key enabling factors that will inform design of project strategies and messages.

Secondly, because of the unequal access of communication channels unearthed in the study, there is need to explore communication channels that favor women, especially social platforms where they feel comfortable – these could be community-based and female-dominated groups and networks. Such alternative channels where they can interact with women e.g., prayer meetings, water boreholes or 'merry-go-round', can be used to interact with women on issues of weather and climate information (Schwager et al 2018). Training

schedules might be designed to consider women's mobility, family obligations, and farm commitments — schedules that virtually guarantee their attendance and involvement. The idea is to offer a comfortable environment that is not predominately male, and many community-based organizations that are run by locals can also offer these.

Even though it is not popular in this community, Participatory Radio is still a channel recommended by FAO, an organization that has worked extensively in rural development. If strategically thought through, this tool can be utilized to enhance the voice of the female farmer, and it has been in other nations. Since women frequently attend merry-go-rounds, the FAO also suggests that radio programs be broadcast during women's meetings. This will allow communicators to reach the women where they are and enable them to share their experiences, anxieties, and stories (FAO, 2011).

The idea is to identify effective communication channels that provide women with a platform to express themselves and interact in a comfortable environment. These channels may comprise of female-dominated groups and networks, community-based setups, and even unconventional options such as prayer meetings, water boreholes, or "merry-go-rounds." In such platforms, the women will collaborate and interact with experts and peers around weather and climate messages, a technique previously implemented in the Schwager et al. (2018) study. Participatory theaters and video cameras have also been utilized in similar communities to great effect.

Thirdly, to address the finding of women feeling left out, climate change adaptation programs need to adequately incorporate their perspectives. Their voices need to be amplified, and this can be done through communication tools that are relevant in their communities and that will

allow them to articulate issues. Alam et al. (2015) emphasize that although women bear particular and sometimes disproportionate burdens because of climate change, they are not merely victims.

To the contrary, women are also agents with important perspectives and indigenous knowledge, which can inform and influence solutions to address climate change. This study, therefore, supports the assertion made by former Finnish President Tarja Halonen that women are strong agents who contribute to efforts to combat climate change with their knowledge, abilities, and creative ideas. They are more than just onlookers or help recipients. The international community needs to learn more about the ways that men and women experience the effects of climate change to ensure that women's voices are heard at the international, national, and subnational levels (Alam et al., 2015).

### **7.3 Conclusions**

In this study, I investigated how climate change adaptation technologies were communicated to smallholder farmers in Machakos County, Kenya. The investigation covered a wide range of topics, including the nature of communicated messages, the message design process, message dissemination methods, and farmers' perceptions of these messages. The overarching goal was to determine how these factors influence farmers' adoption of adaptation practices in Katumani, Machakos County.

Upon analyzing the communication activities aimed at promoting adaptation practices among smallholder farmers, the study unveiled significant conclusions. The conventional top-down and linear messaging approach has proven to be a hindrance to effective climate change

adaptation. Additionally, farmers believe and have experienced climate change, however ignoring their cultural and religious beliefs about the source being divine and beyond their control is a hindrance adaptation. Farmers claim that that the new drought resistant crops are not acceptable to their families. Additionally, due to cultural norms, gender disparities have emerged as a significant issue, with women—a significant farming demographic—frequently excluded from the messaging process due to cultural norms. Further, the top-down approach has resulted in a lack of trust in both the messages and the messengers, which has been exacerbated by use of technical jargon that farmers do not understand. Furthermore, inadequately designed dissemination tools have failed to cater to the needs of farmers, resulting in overall resistance and sluggish adoption of climate change adaptation practices.

The findings, in essence, highlight the need for a paradigm shift in communication strategies to better facilitate climate change adaptation among smallholder farmers. The study concludes that the key to crafting messages that truly resonate with people lies in understanding human behavior. Designers must take the time to study and analyze individuals, identifying obstacles, challenges, and what motivates change. SBCC principles and especially the SLT, are powerful tools in messaging for climate change adaptation since messages are tailored to align with people's values and beliefs. This approach involves actively involving community members in the co-creation process, recognizing the value of their local knowledge, and fostering trust and motivation for the adoption of adaptive behaviors. Ultimately, this approach leads to more sustainable and effective adaptation outcomes that can mitigate the impacts of climate change.

#### **7.4 Thesis**

Transformational climate adaptation demands a shift in messaging that emphasizes farmer-centered approaches. An approach that incorporates farmer knowledge is rooted in their social and cultural context. Such an approach will promote trust and comprehension leading to effective adoption of adaptive practices crucial for building resilience against climate challenges.

#### **7.5 Contributions**

The contribution of this study is significant in multiple areas. Overall, the study's findings strengthen the communication of climate change adaptation to small-scale farmers, which will lead to an increase in the number of farmers implementing improved farming approaches in the face of climate change. First, the study adds to the body of knowledge the theoretical foundations relevant for messaging of climate adaptation, by utilizing the social learning and lay knowledge theories to understand the interplay between climate change adaptation and the messaging process. From the literature review, this is a novel approach, especially in the Kenyan context, where no study was found, that applied such creative theories to explore climate adaptation messaging.

Importantly, for Communication for Development (C4D) scholars, the research contributes to the adoption of Social Learning theory, which incorporates the socioeconomic and cultural backgrounds of message recipients for climate adaptation. Scholars will incorporate SBCC theories, which extend beyond the delivery of messages, so that it becomes a systematic application of theory-based, research-driven communication strategies to address not only

the individual but also change within the broader environment and structural levels, as has been the case with health communication.

Second, the study adds to the body of knowledge regarding the application of social learning theory to messaging related to climate change adaptation in Kenya and Africa. Although social learning is the subject of applied and increasingly interdisciplinary scholarship in the developed countries concerning environmental education, adaptation to climate change, governance of natural resources, and ecosystem management, this debate is still in its infancy, if not non-existent, in the region, with very little literature available for the African continent, let alone Kenya. From the reviewed literature there is limited or no evidence of use of social behavior change communication on adaptation of climate change technologies. This study examined the messaging of adaptation – based on an SBCC approach, using social learning and lay model theory.

Thirdly, the study sheds light on smallholder farmers' responses to climate adaptation messaging. Specifically, it provides information on the communication barriers hindering adaptation. For instance, the top-down messaging, as revealed in this study, has led to a sense of isolation from the adaptation issue, lack of trust, dissemination tools that are not farmer centered, technical language and jargon, while women, who are the real farmers, have been isolated from adaptation messaging. Evidently, the current system of messaging devised from above and given to farmers is ineffective at effecting change.

Fourthly, the findings of this study offer important insights for scholars and practitioners working in the field of agricultural communication and climate change communication in Kenya, which is currently underdeveloped both in research and practice. Specifically, the

study highlights the potential of participatory approaches, such as SBCC and social learning specifically, to drive transformative change among smallholder farmers. This is a significant contribution, as participatory theories have already been successfully applied in health communication, and it is argued that the same models can be applied to promote climate adaptation and development in agriculture. By providing this background literature and strategic communication guidance, this study aims to support the advancement of agricultural communication in Kenya and contribute to the development of effective communication strategies for smallholder farmers.

Fifthly, this research is an important contribution towards finding effective ways of analyzing climate change messaging. Even though communication strategies have been undertaken in recent years, further examinations of these campaigns, is, analyses that go beyond media sensationalism and generalizations—remain elusive, making it challenging to pinpoint the advantages and disadvantages of these initiatives (Steg & Vlek, 2009; Moser, 2010 cited by Van Linden 2014). These findings will close this gap and will hopefully contribute towards helping to create effective ways of analyzing climate adaptation messages and strategies.

Methodologically, the study contributes to the use of the qualitative approach, a unique way to dig deeper and interact intimately with the farmers to understand the complexity of messaging for adaptation. Most studies in Machakos county and other farming communities in Kenya, use the quantitative approach, to gather and report data. While this approach is great at objective data that can be clearly communicated through statistics and numbers, it lacks the rigor necessary to analyze the reasons behind the subjects' actions. Facilitated by this form of inquiry, the qualitative technique helps to delve deeply into the difficult and

little understood topic of climate change adaptation messaging. The study also contributes to providing information about using observational methods to collect data. It provided great insight in the enquiry as I ‘saw’ and ‘heard’, even with the sixth sense, the farmers’ interaction with peers, messengers, and the experiential learning. The insights gathered here helped to make sense of the farmers’ actions.

In summary, the findings of this study provide strong support for the call by scholars and practitioners to move away from traditional top-down information distribution methods towards communication procedures that promote learning and participation, such as social learning processes, to address the urgent need for climate change adaptation. The study highlights the critical importance of facilitating knowledge sharing among stakeholders and farmers to stimulate social behavior change to achieve transformative adaptation. Given the rapidly advancing challenges of climate change, it is crucial to help farmers adapt quickly. By contributing to the understanding of the effectiveness of participatory communication processes in promoting climate change adaptation, this study provides a significant contribution to the field of agricultural communication and can inform the development of effective communication strategies for climate change adaptation in Kenya and beyond.

## **7.6 Implications for Practice and Policy**

The results of this research support the idea that participatory approaches, specifically the Social Learning theory and the Lay Model theory, offer a ready set of concepts and approaches that can be used to explain receptivity to climate adaptation messages and practices by farmers. Social learning principles can also be operationalized to accelerate the rate of adoption and broaden the reach of climate change technology innovations.

### **7.5.1. Farmer Focused Communication Approaches**

The findings underscore the crucial need of engaging farmers in the co-creation of messages and dissemination process centered on them to enhance their sense of ownership, active involvement, and trust, ultimately leading to more effective adaptation practices. It emphasizes the necessity to transition from the top-down messaging approach, which has been identified as a primary obstacle in adaptation, to a bottom-up, participatory approach. The study advocates for the integration of theoretical frameworks such as social learning and lay knowledge into communication strategies. To implement this approach successfully, message designers must conduct thorough situational analyses, acknowledging the socio-cultural context, communication channels, and must involve the farmers in writing the messages and pre-testing messages. Overall, the study's implications suggest a shift towards co-creation and participatory messaging, centered on the farmer's perspective and community mobilization, to drive effective climate communication strategies.

The findings also provide the message designers with a basis to improve and invest in more farmer focused messaging, including farmer focused dissemination tools. Farmers should take part in selecting the appropriate channels for conveying climate change messages. The language and overall design should be friendly to farmers and use language and visuals that will draw them to learn. Face-face channels, especially the demo plots, need strengthening since they allow for experiential learning, which is important when discussing climate change adaptation, which is a complex topic.

Even though farmers dismiss the radio as tool for choice in communicating adaptation messages, this research found that it was the formatting and the timing of the agricultural

program that may have hindered its use. Literature reviewed showed that radio had worked in other rural communities with success. As a social learning tool, Bayedila (2010), says that radio also encourages and supports participation that results in the creation of local content suited to local reality. According to him, it can aid in enhancing local knowledge and raise awareness of how climate change is affecting local communities all around the world. Practitioners need to use rural radio strategically because it serves as an effective social learning/participatory communication tool as it is still the most comprehensive, accessible, and flexible medium for rural communities, given the decreased number of extension workers in Africa.

Utilizing farmers' current communication systems and channels makes sense, as one of the guiding principles of ComDev and participatory approaches is the need to expand on and strengthen current communication capacities and resources to achieve long-term sustainability. The scientists would seek those channels that work best in this community as a priority rather than use radio/TV or fliers that may not really connect them with the locals.

### **7.5.2 Infusing Local Knowledge into Climate Change Messages**

The study emphasizes the need to infuse local knowledge into messaging. This approach not only involves incorporating farmers' local knowledge and experiences into climate change adaptation strategies but also aligns with the principles of SLT. By combining local insights with scientific information through participatory processes, the study underscores how this approach can enhance the effectiveness, relevance, and contextual appropriateness of these strategies. Creating platforms for sharing and integrating indigenous knowledge with scientific information is a key aspect of this participatory approach, ensuring collaborative

utilization of both sources of knowledge. This in turn resonates with the principles of SLT and Lay Knowledge theories, which emphasize engaging communities and fostering ownership of behavior change processes for more sustainable outcomes in adaptation efforts.

Practitioners and Scholars need policy support. A key policy priority should therefore be to plan for a constitutional framework to mainstream participatory communication in all adaptation programs. Moreso, taking this practical step will ensure a learner-centered approach to climate change adaptation program design and management, while formalizing social learning and lay learning into program monitoring and evaluation framework. The participatory approach will allow considerable time and resources for negotiation of shared meaning among all players – including farmers who are the primary audience.

### **7.5.3. Capacity Strengthening**

The above learner-centered policies will serve as the foundation for development or revision of extension training programs to include social learning and lay knowledge theories and approaches, while revising messaging to ensure adaptive actions. If transformation is to happen, these policy level adjustments must incorporate communication training on messaging to enhance scientists' and other message designers' comprehension of participatory ways that promote social behavior change. An interactive, hands-on communication and messaging course that helps participants to unpack the barriers to building public will for action on climate change adaptation, while exploring best practices to participatory messaging and engagement approaches. If possible, such training needs to be standardized for all extension workers or messengers interacting with farmers on climate adaptation.

Additionally, institutions need to engage communication experts in climate change adaptation programs. The communications experts will need messaging toolkits designed to support social behavior change or outreach efforts among smallholder farmers. Such messaging kits will be customized for organizations working around climate adaptation among smallholder farmers.

#### **7.5.4. Women-Sensitive Messaging in Climate Adaptation**

The study points out potential disparities in how men and women access, understand and utilize climate information. This suggests the need for communication strategies that address the specific needs of both male and female farmers, ensuring equitable access to information. This study also provides information to advise policy that is sensitive to women, which is essential for behavioral change. To accelerate adaptation, policies must consider women. They must be included in the mapping of climate risks, their perceptions as well as those of men must be considered, and both men and women must have access to communication tools so they may explain and share their own experiences and contribute to the solutions. As evidenced by the research, women too, have recommendations of what can be done to improve adaptation to climate change. Their voices must be amplified, and this can be accomplished with the use of communication tools that are relevant to their community. According to Alam et al. (2015), it is imperative to make sure that women's issues are firmly at the top of the list of concerns and that women from a range of backgrounds can lead in negotiations and take part in the creation and execution of programs, including communication initiatives.

## **7.8 Suggestions for Further Research**

This researcher suggests further study of the following research areas in communication for adaptation:

1. Investigate the interplay between climate change adaptation and messaging, leveraging SBCC approaches, specifically social learning and lay knowledge theories to comprehensively understand their combined effects.
2. Examine the integration of local knowledge into messaging approaches, incorporating both indigenous knowledge and scientific knowledge within the framework of SBCC and social learning for enhanced relevance and ownership.
3. How to engage farmers in the co-creation and participatory messaging process, from the project design phase, to ensure that messaging strategies are farmer centered.
4. The role of social norms and gender roles in shaping the reception and uptake of messaging for climate change adaptation.

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## **APPENDIX I: INTERVIEW GUIDES**

### **INTERVIEW SCHEDULE ONE – MESSAGE DESIGNERS**

#### **LOCATION**

This guide was used for pre-testing with Agricultural Officers and Extension Officers and was convened for the purpose of understanding the farmers, their farming practices and to further clarify and sharpen the research questions.

1. What informs the decision on the messages constructed for farmers? Explain
2. Who is/are the main message developer/s? what criteria is used to select them?
3. What informs the inclusion of content on this informational material (radio, brochures, weather advisory, field day/demonstration) for the farmers?
4. Explain the process you undertake from inception to making the materials/messages ready for farmers use.
5. How are farmers involved in the process of developing the materials/messages?
6. What communication training have you attended?
7. Explain the process of transferring the adaptation messages to farmers to train them on new technologies– what channels do you use?
8. Explain how you receive feedback from farmers (probe how useful is that feedback as you message?)
9. What are your perceptions about the rate of transformation taking place to adapt to climate change among these farmers exposed to the messages?
10. How do communication campaigns address contextual issues hindering adaptation of innovations?

**INDEPTH INTERVIEW SCHEDULE ONE**  
**FINAL INTERVIEW GUIDE FOR EXTENSION/AGRICULTURAL OFFICERS AND**  
**MESSAGE DESIGNERS**

LOCATION/VILLAGE

1. What type of farming practice takes place in this location?
2. What is/are your key role?
3. How would you describe your most successful farmer(s)?
4. Descriptive these farmers' – location, age, commodity or crop that they grow, level of family involvement in farming, and others.
5. How do farmers in this area understand climate change?
6. How do they make sense of climate change?
7. How is this perception/understanding formed?
8. Are there innovative approaches farmers have been introduced to?
9. How are the new innovations communicated to farmers?
10. What are their attitudes towards using new approaches or innovations to reduce the negative effects of climate change?
11. Identify and describe farmers' successes/unsuccessful transformation after interacting with the messages on innovations.
  - a. (probe for success stories)
12. What sense do farmers make of this information material?
  - a) Weather advisory
  - b) The extension/agricultural officers' visits
13. What challenges do you face when presenting these messages on new technologies to help in the face of climate change to farmers?
14. What was the meaning to farmers of what happened when they used the information you provide to them?

15. What was the meaning to farmers of what happened when the guidelines provided by information is not used?
16. What are your feelings about these experiences?
17. Describe the experiences at the point of sharing these messages
18. Why do you think farmers respond in this way?

**INTERVIEW SCHEDULE THREE (where is schedule two?)**

**GUIDES FOR IN-DEPTH INTERVIEWS WITH FARMERS**

**AGE:- Is this attribute necessary?**

**LOCATION/VILLAGE:**

**Number OF MEMBERS IN HOUSEHOLD? What do you want?**

1. When did you start farming?
2. What do you understand by “climate change?”
3. What changes have you noticed in rain patterns in this region?
4. In what ways have these changes influenced the choices you make your farming practices?
5. Why do you think these changes in weather pattern are taking place?  
(beliefs about climate change causes)
6. How do you feel about these changes?
7. What do you think is the source of these changes?
8. What type of crop do you grow?
9. Who helps you in your farming practice?
10. Explain any changes in the messages they are presenting to change your farming practice as you face climate change.
11. What do these messages mean to you as you face the challenge of climate change?
12. What are the communication tools used to communicate about climate change and the new ways to cope with the climate change?
13. Probe: how do the messages on these items answer the challenges you have been experiencing in the face of climate change?
  - a) weather advisory.
  - b) brochure
  - c) poster
  - d) radio
  - e) extension officers/agricultural officers

- f) the demonstrations/field days – how helpful are they in addressing your farming needs and why?

Probe: How do you interpret the message on this weather advisory?

14. Have you ever seen this promotional material (show the weather advisory flier)? - Have you ever seen this flier, and do you have access to it every season?
15. How have you used the information on the flier
16. What messages are on it?
17. Explain how you decided to change your farm practice based on the information on any of these communication platforms?
18. What motivates you to read or listen to message on new technologies on any platform?
19. What discourages/prevents you from reading or listening to messages on climate adaptation?
20. How does it relate to your farming enterprise?
21. Have you ever made the choice to change your farming practice based on listening or reading these materials? Please explain.
22. Probe – were you successful after making the choice? how much more successful were you that season as compared to others? What was the difference?
23. Is there anything you would like changed or improve about this information material?
  - a) Font
  - b) Color
  - c) Where some information appears
  - d) Other

Probe: What options would you suggest making it useful for your use?

24. What is your perception of the various forms used to communicate about new approaches of farming?
  - a) The weather advisory
  - b) Extension officers
  - c) Demonstration farms/field days
25. From your perspective, what would you say are some risks farmers face due to climate change and what information do they need to transform their agricultural practice?

**FOCUS GROUP DISCUSSIONS WITH FARMERS****NAME OF GROUP:****LOCATION/VILLAGE:****NO. OF MEMBERS:****PURPOSE OF GROUP – GOAL**

Ask the same questions as above

## APPENDIX II - WEATHER ADVISORY FLIER

**Additional Information**

- Farmers are encouraged to take advantage of subsidized farm inputs provided by the Government through the National Cereals & Produce Board (NCPB) to improve productivity.
- Farmers are also advised to take advantage of credit provided by Universal Traders Sacco to buy the necessary inputs and increase productivity.
- Farmers are advised to dry their grain to the recommended moisture content before storing it to avoid infestation by aflatoxin-producing fungi.
- Farmers are advised to treat their grains against storage pests.
- Due to prevailing poor prices and expected low rainfall, farmers are advised to conserve their current grain stocks.

**Important Note**

The information provided here is general information based on the March-May 2016 seasonal forecast issued by Kenya Meteorological Service (KMS). The information should be used in conjunction with the forecast updates issued by KMS and technical advice provided by the nearest agricultural extension office.

**This advisory is a collaborative effort of the following institutions**



Kenya Agricultural & Livestock Research Organization



Kenya Meteorological Service



Ministry of Agriculture



State Department of Water



Agricultural Technology & Information Project (ATIP)



Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)

**With financial support from**



Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)



**WEATHER BASED AGRO-ADVISORY FOR MWANJA WATERSHED**

**MARCH-MAY 2016**

**About this advisory**

This advisory was developed on 2<sup>nd</sup> March 2016 by a team of scientists from Kenya Meteorological Service (KMS), Kenya Agricultural & Livestock Research Organization (KALRO), officers from the Ministry of Agriculture, Agricultural Technology & Information Project (ATIP) and farmer representatives, with financial support from the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) through the project "Agricultural Water Productivity Project".

The advisory is mainly aimed at supporting the farm level decision making in Mwanja watershed in planning agricultural activities for the March-May 2016 Rain Season. Application of this advisory to other areas will depend on similarities in soil and climatic conditions of such places with those of Mwanja watershed.

**Performance of the October-December 2015 Rain Season**

- The long-term average for Mwanja watershed and the rest of Machakos County during the OND season is 350 mm
- The County was predicted to receive enhanced rainfall
- The area received over 500 mm of well distributed rainfall (as recorded at Katuman station)
- The season was very good and most farmers realized bumper harvest

**Outlook for March- May 2016 Rain Season**

- This time Mwanja watershed is expected to receive normal to below normal (depressed) rainfall, about 220-280 mm
- Like the rest of Machakos County, Mwanja watershed is expected to realize the onset between the fourth week of March and the first week of April
- Rains are expected to cease between the second and third week of May
- The March-May 2016 rainfall is predicted to be poorly distributed over most parts of the watershed and Machakos County in general

**Implications of the forecast on agriculture**

Based on the outlook:

**CROPS**

- Farmers are advised to plant crops of their choice at the earliest opportunity by dry planting after preparing the farm in the 3<sup>rd</sup> week of March.
- They are advised to conserve moisture by harvesting run-off from roads and other uncultivated areas; repairing their terraces; rehabilitating dams and water pans; constructing tied ridges or contour furrows; double-digging; carrying out timely weeding, and by mulching where possible.
- Farmers are encouraged to plant early maturing/drought-tolerant crop varieties such as:

Crop	Variety
Sweet potato	KEMB20 & KEMB23
Green grams	N26 & K520
Beans	KATX 56, KAT B1 & Mwitemani
Pigeonpea	Mbaazi I
Cowpea	M66 & K80
Dolichos	DL1002 & DL1009
Sorghum	Gadam, Sakedo & Serena
Pearl & Finger millet	KAT/PM 1,2 & 3; KAT/PM 1

- Farmers are encouraged to use manure instead of chemical fertilizers due to the expected low rains
- For pigeonpea, farmers are encouraged to weed and spray the existing crop on the farms, besides planting Mbaazi 1

- Plant cowpea at 60 cm x 20 cm, beans at 45 cm x 20 cm, sorghum at 60 cm x 20 cm for sole crop and 120 cm x 15 cm when intercropped with a row of legume, pearl millet at 60 cm x 15 cm for sole crop and 120 cm x 15 cm when intercropped with a row of legume, dolichos at 50 cm x 50 cm, green grams at 45 cm x 15 cm, finger millet at 30 cm x 10 cm, pigeonpea at 90 cm x 60 cm and sweet potato at 75 cm x 50 cm
- For those with fruit (mango and orange) orchards or bananas, we advise that they prune, cut & burn fruit stalks, manure and construct pegging around them to harvest water, before the start of the season
- Farmers are advised to watch out for aphids especially in cowpea and fruit trees; army worms; stem borers and termites; shoot fly and stalk borers in sorghum and report such outbreaks to agricultural extension officers

**LIVESTOCK**

- Livestock farmers are encouraged to plant boma Rhodes, re-seed their pastures and plant more Napier grass using "mbukiza method", for their livestock
- Beekeepers are encouraged to harvest their honey and dean up the hives before the onset
- Fish farmers are encouraged to harvest their fish and conserve water
- Poultry farmers should look out for viral diseases, especially the Newcastle Disease (NCD), and vaccinate their birds in time

## APPENDIX III – RESEARCH AUTHORIZATION



### NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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Website: www.nacosti.go.ke  
when replying please quote

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Uhuru Highway  
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NAIROBI-KENYA

Ref. No.

Date:

**NACOSTI/P/16/32657/11159**

**11<sup>th</sup> May, 2016**

Stella Mwhaki Kihara  
Moi University  
P.O. Box 3900-00100  
**ELDORET.**

#### **RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on *“Communicating climate change adaptation strategies in rural Kenya: A study of smallholder farmers in Machakos County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Machakos County** for the period ending **10<sup>th</sup> May, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Machakos County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

**DR. STEPHEN K. KIBIRU, PhD.**  
**FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner  
Machakos County.

The County Director of Education  
Machakos County.