



# SAFE4ALL Report on needs assessment for adaptation to climate change in the co-creation case studies

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## Table of contents

Executive Summary .....	1
1. Objectives and Goal .....	2
1.1 Goal.....	2
1.2 Objectives.....	2
2. Introduction.....	2
2.1 Demographic information of case studies .....	2
Ghana .....	2
Kenya .....	3
Zimbabwe.....	3
2.1.1 Survey Participants Overview: Gender and Age Distribution in the Case Studies 3	
2.1.2 Overview of Farming Experience in the Project Case Study Areas.....	4
2.1.3 Educational Background and Literacy Levels of Participants in the Survey.....	6
2.2 Need for Climate Services and migration patterns in the Case Study Countries 8	
Ghana .....	8
Kenya .....	8
Zimbabwe.....	8
3. Methodology .....	9
3.1 Survey Design.....	9
3.2 Target Population and Sampling .....	9
3.3 Data Collection .....	9
3.4 Data Analysis .....	10
3.5 Stakeholder Engagement .....	10
3.6 Ethical Considerations .....	10
3.7 Limitations .....	10
4 Results and Discussions .....	11
4.1 Governance of Climate Services .....	11
4.1.1 Prioritization of needs for climate services.....	11
4.1.2 Capacity Assessment of key stakeholders for the development and use of climate services .....	11
4.1.3 National Implementation Plans and Frameworks in place in the Case Study Countries.....	11
4.1.4 Relevant on-going or just completed projects on the development of climate services in the Case Study countries.....	12
4.2 Access to and use of Climate Services in the Case Study Countries.....	12
4.3 Delivery Channels for Climate Information Services (Existing & Preferred) .....	13
5 Weather, Climate and Farm Decision Making Needs and levels of literacy to use tools and technologies for Adaptation .....	14

6	Recommendations for Project Implementation and Service Delivery .....	15
7	References.....	16

### Table of Figures

Figure 1 :	Gender Distribution of Farmers in the Case Studies.....	3
Figure 2:	Age Distribution of Farmers in the Case Study Areas: Percentage of Farmers by Age Group. ....	4
Figure 3:	Percentage Distribution of Farmers in Zimbabwe by Years of Agricultural Practice. ....	4
Figure 4:	Percentage Distribution of Farmers in Kenya by Years of Agricultural Practice. ....	5
Figure 5:	Percentage Distribution of Farmers in Ghana by Years of Agricultural Practice. ....	5
Figure 6:	Educational Background of Lead Farmers in Zimbabwe, Kenya and Ghana .....	6
Figure 7:	Literacy Levels Among Lead Farmers in Zimbabwe .....	7
Figure 8:	Literacy Levels Among Lead Farmers in Kenya .....	7
Figure 9:	Literacy Levels Among Lead Farmers in Ghana.....	7
Figure 10	Currently used source of climate data in the case study countries.....	13
Figure 11	Most preferred sources of climate data in the case study countries .....	14

### List of Tables

Table 1	previous climate services in the case study countries [6] .....	12
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## Executive Summary

The SAFE4ALL project aims to enhance climate resilience and agricultural productivity among smallholder farmers in Sub-Saharan Africa by providing accessible and actionable weather information. Conducted in three key countries - Kenya, Ghana, and Zimbabwe, this project seeks to address the challenges posed by climate variability and change, which significantly impact farming decisions and productivity and drives migration from small cities to national capitals as well as from one country to another globally. The project emphasizes co-creation and collaboration with local stakeholders to ensure that the solutions are practical, culturally relevant, and sustainable.

To gather essential insights, a comprehensive questionnaire was administered to smallholder farmers across selected regions in Ghana, Kenya and Zimbabwe. The questionnaire focused on the demographic profiles of the farmers, their agronomic activities, current access and use of weather information, decision-making needs related to climate impacts, technology access, and levels of climate literacy. This was followed by interviews and workshops with relevant stakeholders including some of the farmers interviewed in the respective countries.

This report aims to provide a detailed analysis of the data collected, highlighting the critical needs and preferences of smallholder farmers representing citizens in general and other stakeholders regarding weather and climate information services.

From the survey results, farmers are in general very interested in learning about climate change, which is something that the project should take advantage of. The respondents, mainly farmers, would like to learn more about climate change, the effectiveness of tools and climate services and how they could adapt better using a combination of local and scientific knowledge. The SAFE4ALL project aside the use of tools and development of climate services, could help improve the capacities of the communities through the project activities in WP5 (Community Building and Local Embedding) in the LivingLabs in the case study countries which will result in improved food security and potentially less rural-to-urban migration, as opportunities in rural areas get better.

Another key finding from the needs assessment carried out showed that financial resources and capacity in all three countries are limited for the implementation of climate change policies, which is something to keep in mind in the development of tools and services and their business models.

The key findings from the needs assessment will inform the development of tailored climate services that meet the specific needs of users especially farmers, ultimately facilitating better decision-making, improving productivity, and enhancing resilience to climate-related challenges.

## 1. Objectives and Goal

### 1.1 Goal

The primary goal of the SAFE4ALL project is to enhance the climate resilience and agricultural productivity of smallholder farmers in Sub-Saharan Africa by providing them with accessible, reliable, and actionable weather and climate information and services. This goal aligns with broader objectives of promoting sustainable agriculture, food security, and adaptive capacity in the face of climate change.

### 1.2 Objectives

The main objective of WP1 is to better understand the needs of users with a special focus on smallholder farmers. This includes the following sub-objectives:

#### 1.2.1 Enhance Access to Weather and Climate Information

Develop and implement user-friendly weather and climate information services that deliver timely information to farmers, tailored to their specific needs and local contexts.

#### 1.2.2 Increase Climate Literacy

Foster understanding among smallholder farmers regarding climate change impacts on agriculture, enabling them to make informed decisions based on weather data.

#### 1.2.3 Facilitate Adaptive Decision-Making

Support farmers in adjusting their farming practices and strategies in response to changing weather patterns and climatic conditions.

#### 1.2.4 Promote Co-Creation of Solutions

Engage local stakeholders - including farmers, agricultural extension workers, water authorities, and community organizations in the co-creation of climate services to ensure relevance and efficacy.

#### 1.2.5 Strengthen Technological Access and Utilization

Assess and improve access to mobile technology and social media platforms, enabling farmers to receive and utilize weather information effectively.

#### 1.2.6 Gather and Analyze Data for Continuous Improvement

Conduct surveys and assessments to gather data on farmer needs, preferences, and challenges, guiding the ongoing refinement of climate services.

## 2. Introduction

### 2.1 Demographic information of case studies

#### *Ghana*

The study area in Ghana is located in the North part of the country, where migration is common and related to the climatic variability in the wider area. Like most of West Africa, the northern part of Ghana has only one rainy season, which lasts up to six months, while the rest is characterized as the dry season. This makes people in the rural areas move to the towns where more work opportunities exist, outside agriculture, or towards southern

and more urbanized locations in search of employment and livelihood opportunities, during the long hot dry season. Some irrigation dams provide opportunities to work but these are not sufficient to stem the flow of migration.

**Kenya**

The case-study in Kenya covers three counties: Kisumu county [1], Narok county [2] and Nairobi county [3]. Narok county is the largest of the three and has some arid and semi-arid areas that experience low rains, reaching up to the highest altitude of 3100m above mean sea level. Both Kisumu County and Nairobi County are significantly smaller in area compared to Narok county and are on an altitude between 1100m and 1800m above mean sea level. Whereas Narok county experiences one long rainy season, both Kisumu and Nairobi Counties experience both a long and a short rainy season every year. Nairobi county, being the smallest in land area, has the largest population, up to 5 million people, of which approximately half are female. Kisumu county and Narok county both have a population of around 1.1 to 1.2 million people, of which also approximately half is female.

**Zimbabwe**

The Zimbabwe case study is in the Secondary City of Marondera with the Primary City being Harare, the capital city of the country. Marondera is 70km from Harare along the Harare-Mutare highway. According the ZIMSTAT 2022 population census, the total population of Marondera District is 136,173 comprising 68,180 males and 67,993 females The Primary City Harare has a total population of 2,427,231 comprising 1,159,350 males and 1,267,881 females. 15 wards have been selected to participate in the SAFE4ALL Case Study.

**2.1.1 Survey Participants Overview: Gender and Age Distribution in the Case Studies**

Figure 1 presents the total number of participants in the SAFE4ALL needs assessment study from three key countries: Kenya (961 participants), Ghana (319 participants), and Zimbabwe (299 participants). It categorizes participants by gender. Additionally, Figure 2 shows the age distribution of the questionnaire respondents in these areas.

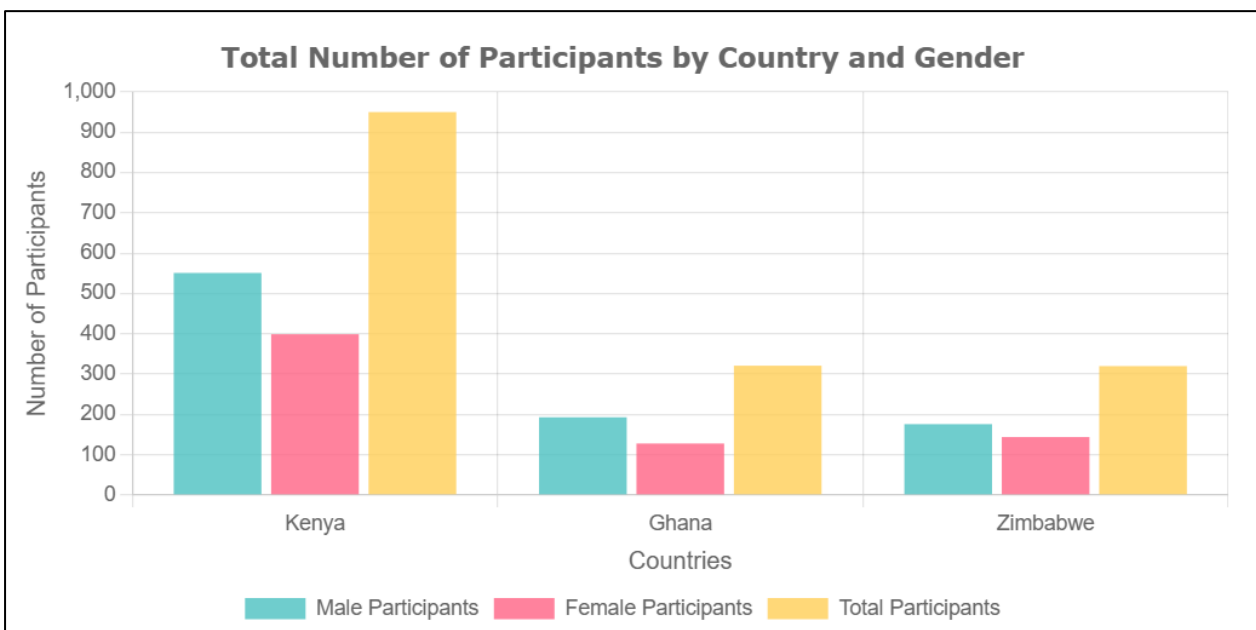


Figure 1 : Gender Distribution of Farmers in the Case Studies.

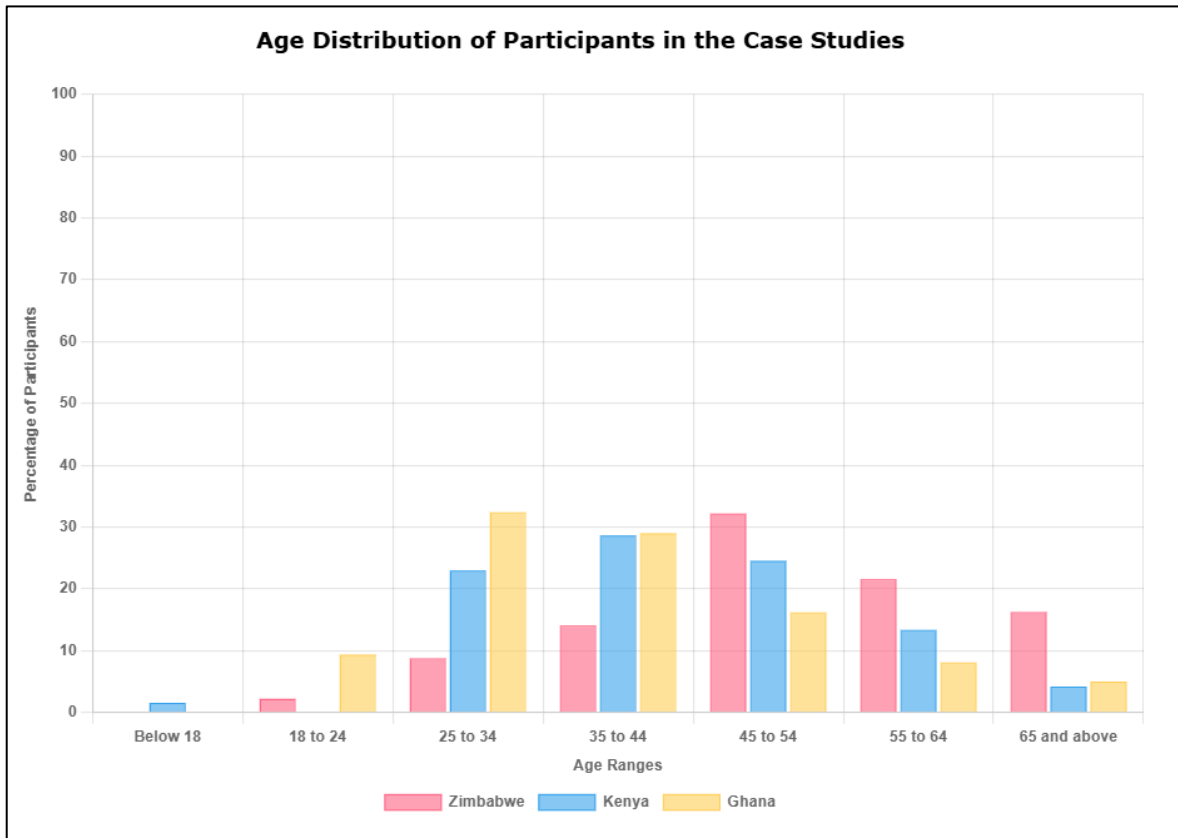


Figure 2: Age Distribution of Farmers in the Case Study Areas: Percentage of Farmers by Age Group.

**2.1.2 Overview of Farming Experience in the Project Case Study Areas**

Figures 3-5 illustrate the distribution of farming experience among farmers who participated in the survey in Zimbabwe, Kenya, and Ghana. Each chart represents the percentage of farmers in different experience categories, providing insights into the agricultural landscape of each region.

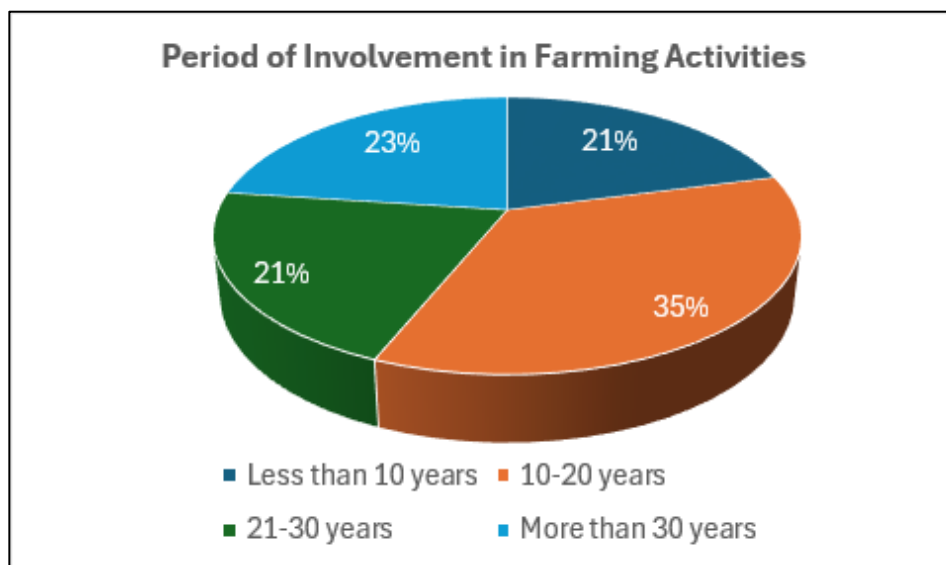


Figure 3: Percentage Distribution of Farmers in Zimbabwe by Years of Agricultural Practice.

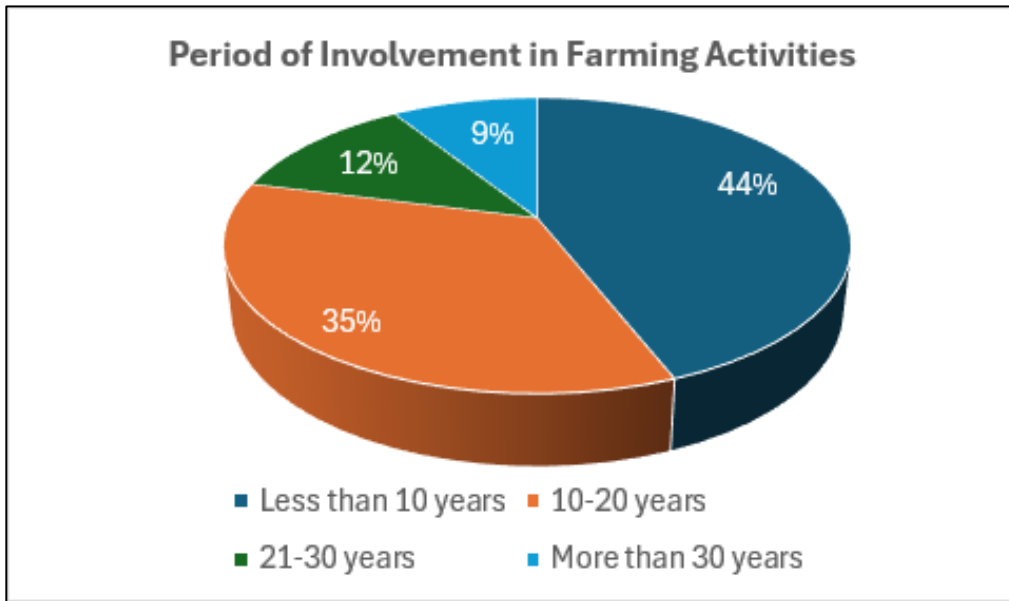


Figure 4: Percentage Distribution of Farmers in Kenya by Years of Agricultural Practice.

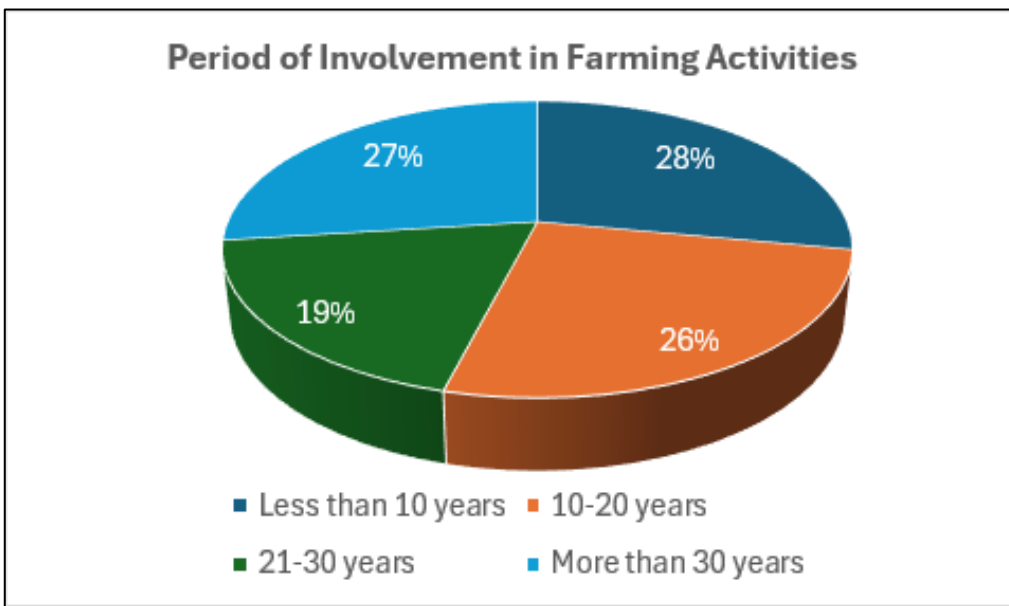


Figure 5: Percentage Distribution of Farmers in Ghana by Years of Agricultural Practice.

**2.1.3 Educational Background and Literacy Levels of Participants in the Survey**

Figure 6 depicts the educational background as well as the literacy levels of the SAFE4ALL survey participants:

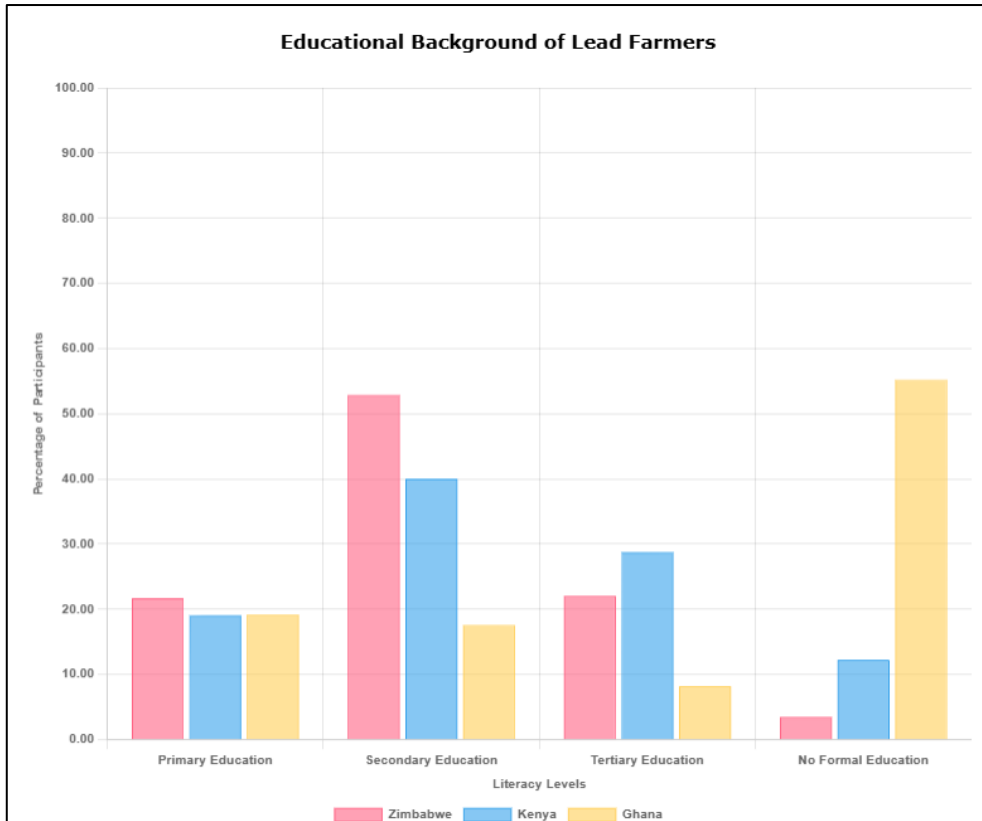


Figure 6: Educational Background of Lead Farmers in Zimbabwe, Kenya and Ghana

Across the case studies, literacy levels among farmers exhibit significant variation as shown in Figure 7 – 9.

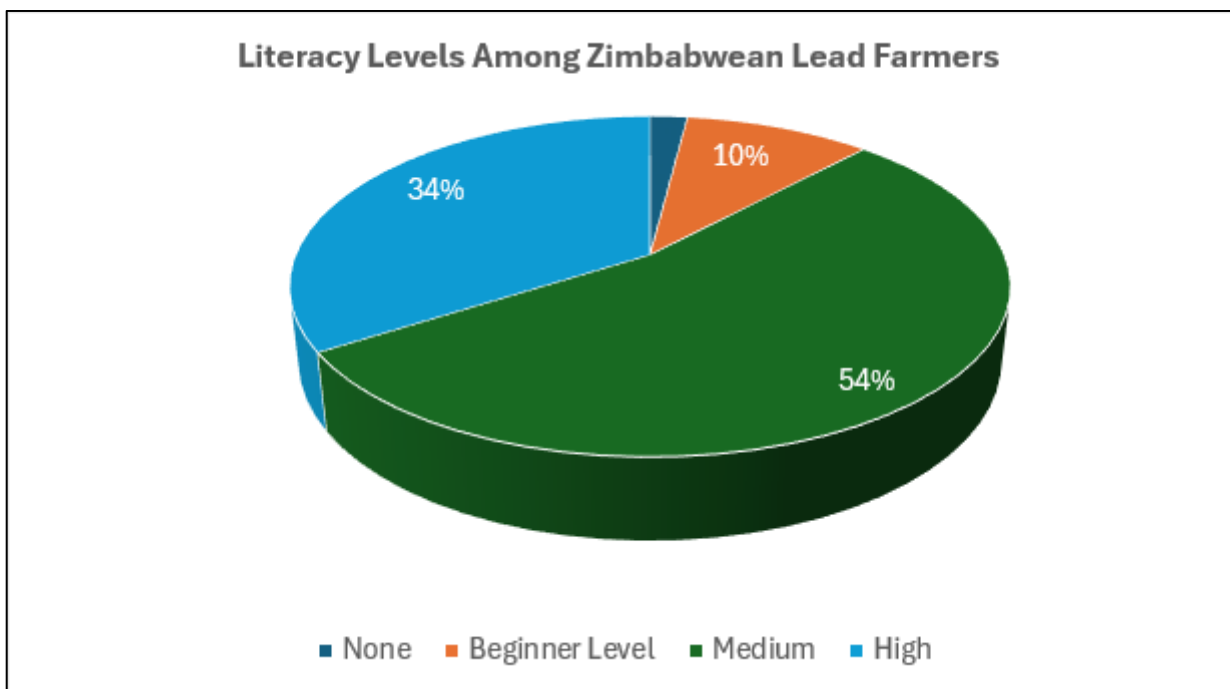


Figure 7: Literacy Levels Among Lead Farmers in Zimbabwe

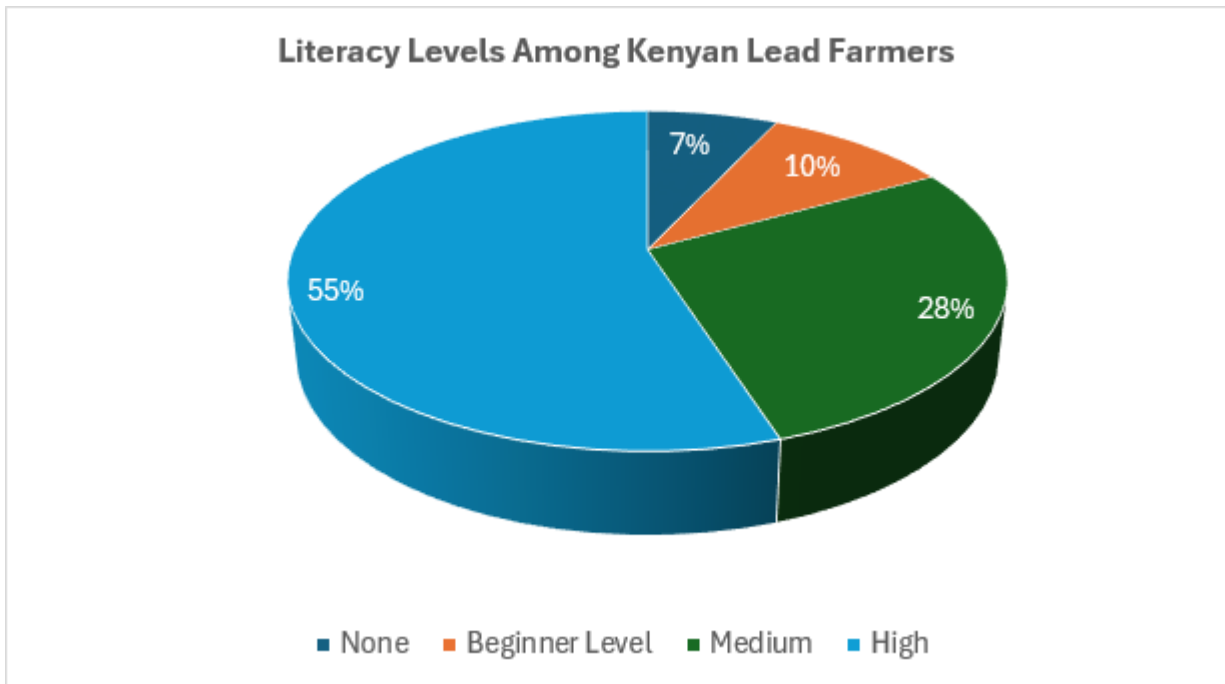


Figure 8: Literacy Levels Among Lead Farmers in Kenya

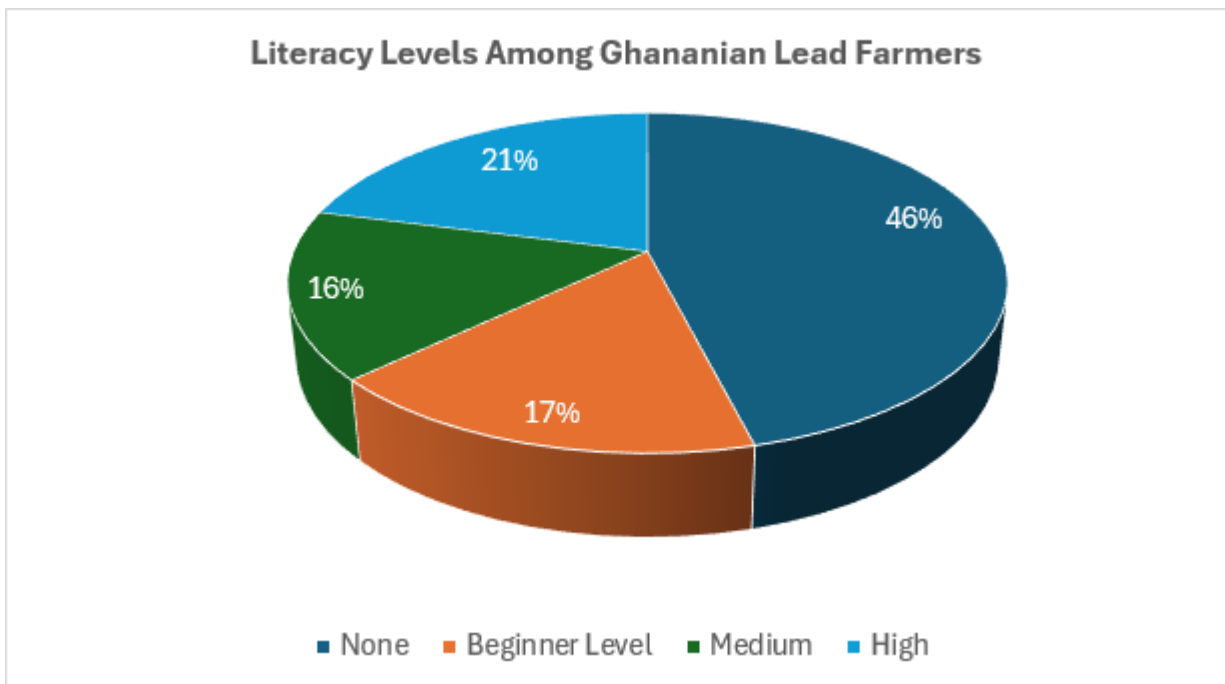


Figure 9: Literacy Levels Among Lead Farmers in Ghana

The educational background of the lead farmers plays a crucial role in their agricultural practices and community engagement. Many possess varying degrees of formal education, with a significant proportion having completed primary and secondary education. This foundational knowledge enhances their ability to understand climate information services, adopt innovative farming techniques and sustainable practices. However, a notable percentage still face challenges, as some lack formal education entirely. This disparity highlights the need for targeted educational initiatives to empower

all farmers, ensuring they have the skills and knowledge necessary to thrive in a competitive agricultural landscape in the face of climate change.

## **2.2 Need for Climate Services and migration patterns in the Case Study Countries**

### ***Ghana***

The patterns of migration that have evolved over the years, both within the country and between Ghana and other countries in the West African subregion, could be explained by the 'push-pull' model. The push-pull model consists of some negative or push factors in the place of origin, that causes people to move away, in combination with positive or pull factors that attract migrants to a receiving location. Some of these push factors may include economic, social, and political hardships in poorer or deprived areas, while the pull factors may include the comparative advantages in richer or better endowed areas.

Urbanization in Ghana is driven by inter-regional migration flows, where the more economically resource-endowed regions attract more migration inflows compared to others that are less socio-economically endowed. The most common migration flow in Ghana from the year 2000 up to 2017 was rural to urban migration. The expectation, therefore, is that Ghana will continue to experience increased urbanization of varying degrees across the regions, driven largely by migrant inflows from smaller to larger urban settlements (ISSER, 2023).

### ***Kenya***

The major need for climate services and information is with farmers. There is low access to supportive climate and weather information by majority of farmers. Farmers are highly exposed to climatic variability, especially those that grow staple crops such as maize and wheat [4]. Agro weather information is crucial in enhancing adoption of climate smart practices and resilience to climate change risks, but right now there is low access (23.4%), knowledge and use of agro-weather information [5]. In general, the establishment of industries in urban areas encourages rural-to-urban migration [2]. Nairobi county is highly affected by such migration, due to the opportunities in the capital city. This is viewed as a threat to the county development agenda and environmental conservation efforts. Narok county has reported high external migration into the county from the neighboring counties such as Bomet, Kisii, Nyamira and Nairobi [2].

### ***Zimbabwe***

The need for climate services can be categorized according to customer segments. The aviation industry needs climate services for air traffic control and advisories. The academic and research institutions also demand climate services including weather forecasts and seismological data, meteorological guides and standards, calibration references and work-related learning experience for their students.

Agriculture, forestry and farmers need climate services including agro-climatological information and weather forecasts, timely, accurate and accessible severe weather warnings, weather instruments, training and advisories.

Industry and commerce including the mining industry, construction, insurance, water, tourism, energy, sport and recreation and transport need climate services for operational and risk management purposes. This includes climate data and information, seismological data and information, meteorological guides and standards, climate impact assessments,

seismological impact assessment, severe weather warnings and confirmations, instruments, installation and calibration and weather information.

Other service providers that need climate data, tools and services include the health sector, the general public and such organizations as the World Meteorological Organization (WMO) and other National Hydro-Meteorological Services (NHMS).

In Zimbabwe Rural-to-Urban migration is fueled by the difference in economic opportunities and income between the primary towns and rural communal areas, urban-based economic development, as well as the surge in public sector employment [8]. In 2020, about 33% of Zimbabwe's total population lived in urban areas [9]. Migration can also be a result of internal displacement mainly as a result natural disasters, e.g., the tropical cyclones Eline (2000) and Idai (2019) that resulted in the relocation of many people.

### **3. Methodology**

The project employed a multi-faceted methodology to gather and analyze data on the needs and preferences of smallholder farmers regarding weather and climate information services. This approach ensured comprehensive insights into the challenges faced by farmers in the SAFE4ALL co-creation case studies. The methodology consisted of the following key components:

#### **3.1 Survey Design**

A structured questionnaire was developed to collect quantitative and qualitative data from smallholder farmers and other key stakeholders. The survey included sections on:

- Demographic Information: Age, gender, education level, and farming experience.
- Agronomic Practices: Types of crops cultivated, farming methods, and reliance on seasonal forecasts.
- Access to Weather Information: Sources of weather information, frequency of use, and preferred formats (e.g., SMS, mobile apps, radio).
- Decision-Making Needs: Specific weather-related information required for effective planning and risk management.
- Technology Access: Availability of mobile devices and internet connectivity.
- Climate Literacy: Understanding of climate change and its impacts on agriculture.

#### **3.2 Target Population and Sampling**

The target population consisted of smallholder farmers and citizens in Kenya, Ghana and Zimbabwe. A purposive sampling method was employed to ensure representation from diverse agricultural communities, considering factors such as:

- Geographic location (rural vs. peri urban)
- Crop type (cereals, vegetables, cash crops)
- Farm size (small, medium, large)

In total, approximately 1,600 farmers were surveyed in the three countries (Ghana, Kenya and Zimbabwe).

#### **3.3 Data Collection**

Data collection was conducted through questionnaires over a period of three months.

Trained enumerators facilitated the process, ensuring that respondents understood the questions and felt comfortable providing accurate information. Community meetings were organized to raise awareness about the survey and encourage participation.

### ***3.4 Data Analysis***

The data collected were analyzed using both quantitative and qualitative methods. Statistical software was employed to perform descriptive analyses, including frequency distributions and cross-tabulations. Qualitative responses were coded and categorized to identify common themes and insights related to farmers' needs and challenges.

### ***3.5 Stakeholder Engagement***

To validate findings and ensure that the project aligns with local needs, stakeholder engagement sessions were conducted. These included workshops with farmers, agricultural extension workers, and local organizations to discuss preliminary findings and gather feedback. This participatory approach helped refine the climate services to be developed under the project.

### ***3.6 Ethical Considerations***

Ethical guidelines were adhered to throughout the research process including the General Data Protection Regulation (GDPR) and national regulations. The questionnaire was first drafted by Wageningen University & Research (WU) in the Netherlands and went through ethical clearance from the University of Development Studies (UDS) in Ghana before being administered. Informed consent was obtained from all participants, ensuring they understood the purpose of the study and their right to withdraw at any time. Confidentiality was maintained, and data was anonymized to protect participants' identities.

### ***3.7 Limitations***

While the methodology aimed to capture a comprehensive view of smallholder farmers' and other user needs, certain limitations were acknowledged, including potential biases in self-reported data and challenges in reaching remote communities' user groups with the focus mostly on smallholder farmers. Future research may seek to address these limitations through longitudinal studies and expanded outreach efforts to other users in the food (agriculture), environment/health and water sectors.

## 4 Results and Discussion

### 4.1 Governance of Climate Services

#### 4.1.1 *Prioritization of needs for climate services*

The National Climate Change Policy (NCCP) in Ghana is a framework that identifies five key pillars, in which climate-resilient agriculture is one. In Kenya a similar policy is in place, the National Climate Change Action Plan (NCCAP), which has climate-smart agriculture as one of the key areas of focus. Adaptation policies in Zimbabwe are anchored in the National Climate Policy (2017) and the National Adaptation Plan (NAP) under development. These policies aim to enhance resilience in key sectors, including agriculture, water, and health. This clearly shows that all three case-study countries have specific policies for (climate) resilient and smart agriculture.

#### 4.1.2 *Capacity Assessment of key stakeholders for the development and use of climate services*

As the majority of tools and climate services developed make use of either mobile phones or internet to get information to the users, it is vital for the user to have access to a mobile phone or the internet. Currently only 8 to 12 percent of the farmers in Ghana, Kenya and Zimbabwe make use of the internet to receive climate data and 1 to 9 percent makes use of a mobile phone to receive climate information. However, from the survey, 93% of the respondents in Kenya had mobile phones with 73% of the phones being smartphones and for Zimbabwe 89% of the respondents had mobile phones with 75% of them being smartphones. These results are promising as they show the high potential for the use of mobile (smart)phones for the dissemination of the climate services and tools being developed within the project despite the current low patronage of such services with mobile phones. We believe that coupling that aspect with tailored education and mobilization of digital literacy among societal actors, the situation with the use and trust in information from mobile phones will keep improving in the future.

#### 4.1.3 *National Implementation Plans and Frameworks in place in the Case Study Countries*

As stated in the SAFE4ALL deliverable D1.1 *'Report on inventorying Tools, Services and Policy context for co-creation case studies: Needs Assessment and Gap Analysis for Adaptation to Climate Change'*, Ghana has a well-defined policy framework to address climate change adaptation, spearheaded by the National Climate Change Policy (NCCP). The policy identifies five key pillars: climate-resilient agriculture and food security, sustainable forest management, disaster risk reduction, resilience for vulnerable populations, and energy efficiency. The Nationally Determined Contributions (NDCs) focus on sustainable land management, afforestation, and renewable energy integration. Additionally, the Ghana Strategic Investment Framework for Sustainable Land Management and Ghana Plan of Action for Disaster Risk Reduction and Climate Change Adaptation enhance institutional coordination.

Similarly from D1.1, Kenya is recognized for its progressive climate change adaptation governance, with the Climate Change Act (2016) as a key policy. The act establishes a framework for mainstreaming climate resilience into national development plans, guided by the National Climate Change Action Plan (NCCAP). Key areas of focus include water resource management, climate-smart agriculture, and disaster preparedness. Institutions such as the Climate Change Directorate oversee implementation, while the Kenya National Adaptation Plan (NAP) 2015-2030 provides specific adaptation actions at the national and county levels.

Zimbabwe's adaptation policies are anchored in the National Climate Policy (2017) and the National Adaptation Plan (NAP) under development. These policies aim to enhance resilience in key sectors, including agriculture, water, and health. The Climate Change Management Department coordinates efforts at the national level, with support from international donors and development partners. Initiatives like the National Contingency Plan for Droughts and the Renewable Energy Policy are also integral to adaptation. In all three countries limited financial resources and capacity cause challenges in the implementation of the climate change policies.

#### 4.1.4 **Relevant on-going or just completed projects on the development of climate services in the Case Study countries**

Four relevant tools and services are identified that have been developed and implemented in the case study countries but are not active anymore. These are all from the G4AW report [6]. Two of the services were in use in Ghana and two in Kenya. The services have all been developed by international consortia and used different devices for data communication.

*Table 1: previous climate services in the case study countries [6]*

Name	Implementation	Device	Applied in Ghana (G), Kenya (K), Zimbabwe (Z)
Sat4Business	2019-2022	Radio, mobile	G
FarmGrow	2018-2021	Extension officers	G
CROPMON	2015-2019	SMS	K
GEODATIC	2015-2018		K

## 4.2 Access to and use of Climate Services in the Case Study Countries

The vast majority of the interviewed farmers in Ghana, Kenya and Zimbabwe have access to climate services. Some of the farmers in the countries use weather information on a daily basis, but the majority do this every few days up to every week. Some farmers only use the weather information only during the rainy season of each year and very few never use weather information for their farm management.

The farmers in Kenya and Zimbabwe were asked how reliable their current weather information was. 31% of the respondents in Kenya and 75% in Zimbabwe answered always, 47% and 18% in Zimbabwe answered somewhat, and only a few farmers said rarely (17% in Kenya and 4% in Zimbabwe) or never (2.5% in Kenya and 2% in Zimbabwe).

Figure 10 shows that local knowledge and personal experience are the most commonly used sources of climate data over the three countries, whereas technology-based services, such as internet or mobile, are only used by a very small number of farmers.

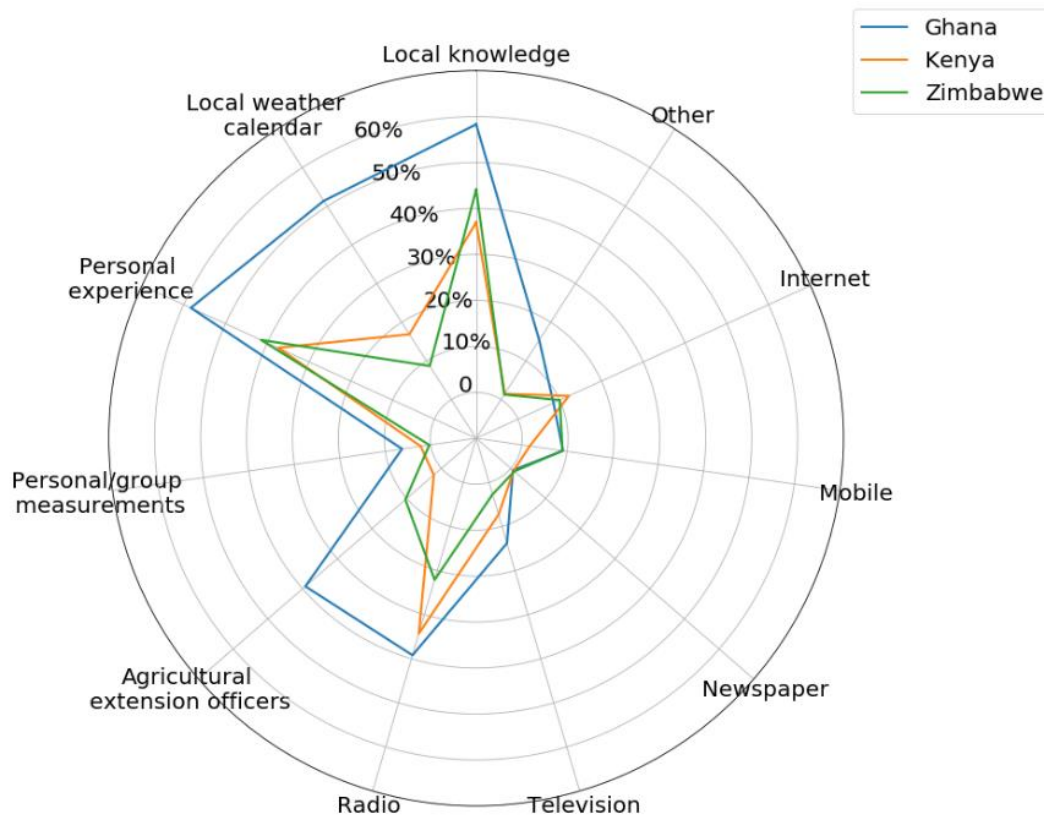


Figure 10: Currently used source of climate data in the case study countries

### 4.3 Delivery Channels for Climate Information Services (Existing & Preferred)

A distinction can be made between two types of channels for climate information services. First there are the more personal, local channels, which are local knowledge on weather forecasting, local weather calendar, personal experience, personal or group measurements and agricultural extension officers. The second group is the more technology-based sources, which are internet, mobile, television and radio. From Figure 10 and

Figure 11 it is clear that in general the more personal, local channels are used and preferred a lot more amongst farmers in Ghana, Kenya and Zimbabwe, compared to the technology based channels and sources.

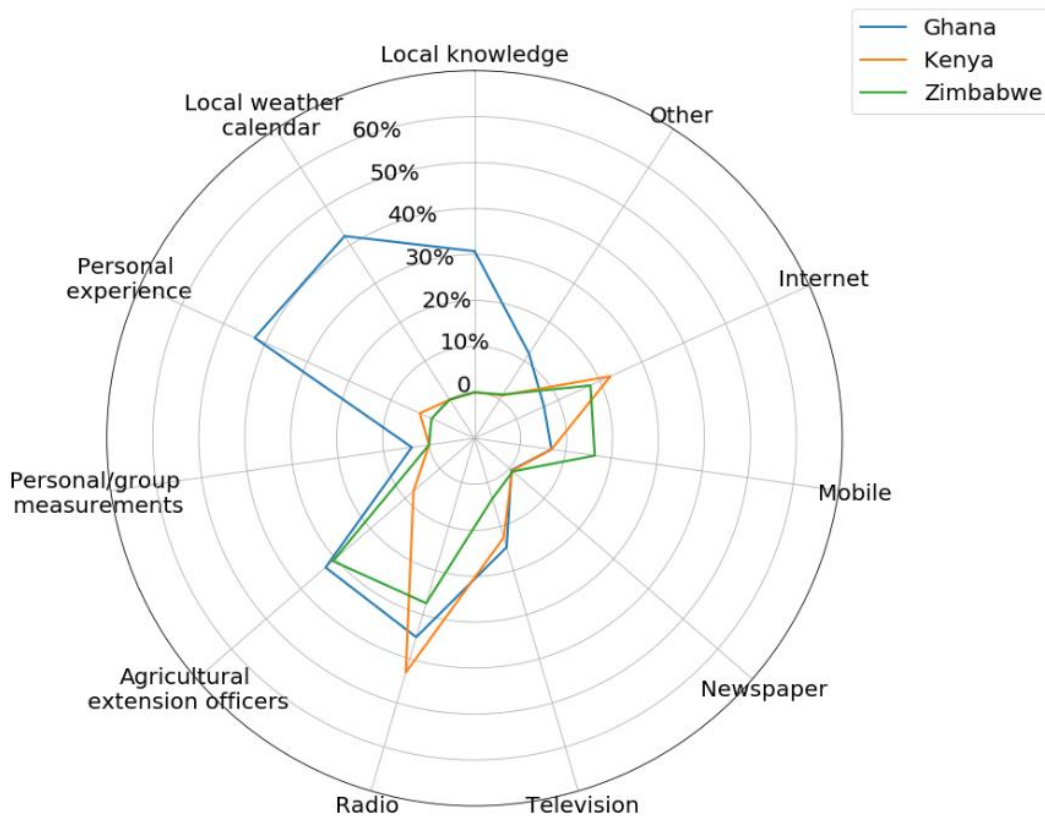


Figure 11: Most preferred sources of climate data in the case study countries

## 5 Weather, Climate and Farm Decision Making Needs and levels of literacy to use tools and technologies for Adaptation

From Figure 6, more than 50% of Zimbabwean farmers have secondary level education, whereas this is 40% in Kenya and less than 20% in Ghana. This shows that farmers in Zimbabwe are generally highly educated with at least secondary school education.

Out of the farmers interviewed, 51% indicated that they would be willing to dedicate one to two hours per week to learning more about climate change and its impact. Over 30% of the farmers indicated to be willing to spend even more time every week on learning. 45% of the farmers replied that they are interested in learning about farm practices (sowing/harvest, fertilizer application, improved yields, irrigation, animal farming) and 11% expressed interest in learning about the climate (weather events, forecast).

## **6 Recommendations for Project Implementation and Service Delivery**

It will be important to understand more why majority of farmers (more than 75% of farmers in all countries) have mobile phones but hardly use this (less than 10%) to access weather and climate information. This is particularly relevant because the majority of tools and climate services in SAFE4ALL related to farmers is being developed to be used on a mobile phone.

Farmers are in general very interested in learning about climate change, which is something that the project should take advantage of and build upon. By building and mobilizing the capacity of farmers about climate change, as well as their digital literacy, the effectiveness of tools and climate services can be enhanced. This could add to the capacity building in communities and result in better food security and possibly less rural-to-urban migration, as opportunities in rural areas get better.

Financial resources and capacity in all three countries are limited, concerning the implementation of climate change policies, which is something to keep in mind in the development of tools and services and their business cases.

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# **SAFE4ALL**

**A F R I C A**

Safeguarding **African Foodsheds** and **Ecosystems** **for** all **Actors** across **Local**, regional and international **Levels** to manage migration.

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