Sokoine University of Agriculture

MAPME Dissertation

The Influence of Agricultural Misinformation on Smallholder Farmers' Crop Production in Mvomero District, Morogoro Region, Tanzania

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THE INFLUENCE OF AGRICULTURAL MISINFORMATION ON SMALLHOLDER FARMERS' CROP PRODUCTION IN MVOMERO DISTRICT, MOROGORO REGION, TANZANIA

The Dissertation is Submitted to Sokoine University of Agriculture in Partial Fulfilment of the Requirements for Master of Arts Degree in Project Management and Evaluation

By

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EXTENDED ABSTRACT

In the context of agriculture development access to reliable agricultural information to farmers is highly vital. Research evidence has indicated that agricultural misinformation on crop production exists among smallholder farmers in Tanzania. This study was conducted in Mvomero District because it is one of the areas in Morogoro Region where smallholder farmers lack knowledge on how to access reliable agricultural information through proper sources. The study examined the effect of agricultural misinformation on crop production among smallholder farmers. Specifically, the study identified sources of agricultural information, the level of knowledge among smallholder farmers about agricultural misinformation, and the effects of agricultural misinformation on crop production for smallholder farmers. A cross-sectional research design was used. Data collection was done using both qualitative and quantitative research methods involving key informants' interviews and survey questionnaires. Descriptive statistical analysis was computed to establish measures of central tendencies. An index scale was constructed to establish the farmer's level of knowledge and a binary logistic regression model was developed to establish the predictors of farmers' level of knowledge and to estimate the effects of agricultural misinformation on crop production. Qualitative data were analyzed using content analysis with a constant comparison technique. The findings revealed that the majority of respondents (74%) had access to agricultural information through farmer-farmer information flow. The extension officers had no significant contribution (p-value of 0.1430) to providing agricultural information. The majority of respondents (96%) had a high level of knowledge of agricultural misinformation but still, could not access well reliable agricultural information. The Wilcoxon Signed Rank Test showed that misinformation had a significant negative effect on crop production ($p = 0.000$) and the seed varieties, fertilizer and pesticides misinformation coefficient was statistically significant ($P < 0.000$). It is concluded that farmers' access to reliable sources of

agricultural information, extension services, and local agricultural experts contributes to increase smallholder farmers' crop production. To mitigate the effects of agricultural misinformation farmers should be encouraged to consult agricultural experts to access and use reliable information. The local government and development actors should intensify farmers' training through capacity-building programs to improve smallholder farmers' knowledge to help increase the adoption of recommended agricultural practices. There is a need to establish farmers' resource centres for the effective dissemination of important information through community workshops, mobile apps, and radio programs to reach farmers in remote areas. Local government organizations and development partners should increase efforts to minimize the spread of misinformation to smallholder farmers.

IKISIRI KUU

Katika muktadha wa maendeleo ya kilimo upatikanaji wa taarifa za kilimo za kuaminika kwa wakulima ni muhimu sana. Ushahidi wa utafiti umeonyesha kuwa taarifa potofu za kilimo kuhusu uzalishaji wa mazao zipo miongoni mwa wakulima wadogo nchini Tanzania. Utafiti huu ulifanyika katika Wilaya ya Mvomero kwa sababu ni moja ya maeneo katika Mkoa wa Morogoro ambapo wakulima wadogo hawana elimu ya namna ya kupata taarifa za kilimo cha uhakika kupitia vyanzo sahihi. Utafiti huo ulichunguza athari za taarifa potofu za kilimo juu ya uzalishaji wa mazao miongoni mwa wakulima wadogo. Hasa, utafiti huo ulibainisha vyanzo vya habari za kilimo, kiwango cha maarifa kati ya wakulima wadogo kuhusu taarifa potofu za kilimo, na athari za taarifa potofu za kilimo juu ya uzalishaji wa mazao kwa wakulima wadogo. Ubunifu wa utafiti wa sehemu ya utafiti wa sehemu ya uchunguzi wa kuchanganua data ulitumiwa. Ukusanyaji wa data ulifanyika kwa kutumia njia zote za utafiti wa ubora na kiasi zinazohusisha mahojiano muhimu ya waarifu na maswali ya utafiti. Uchambuzi wa takwimu za maelezo ulihesabiwa ili kuanzisha hatua za tabia kuu. Kiwango cha index kilijengwa ili kuanzisha kiwango cha ujuzi wa mkulima na mfano wa regression ya vifaa vya binary ilitengenezwa ili kuanzisha watabiri wa kiwango cha ujuzi wa wakulima na kukadiria athari za habari za kilimo juu yauzalishaji wa mazao. Data ya usawa ilichambuliwa kwa kutumia uchambuzi wa maudhui na mbinu ya kulinganisha mara kwa mara. Matokeo ya utafiti huo yalibaini kuwa wengi wa waliohojiwa (74%) walipata taarifa za kilimo kupitia mtiririko wa taarifa za wakulima na wakulima. Maafisa ugani hawakuwa na mchango mkubwa (p-thamani ya 0.1430) kutoa taarifa za kilimo. Idadi kubwa ya waliohojiwa (96%) alikuwa na kiwango cha juu cha ujuzi wa taarifa za kupotosha kilimo, lakini bado hawakuweza kupata habari za kilimo za kuaminika. Mtihani wa Rank uliosainiwa wa Wilcoxon ulionyesha kuwa habari potofu zilikuwa na athari mbaya kwa uzalishaji wa mazao ($p = 0.000$) na aina za mbegu, mbolea na dawa za kuua wadudu zilikuwa muhimu sana ($P < 0.000$). Imehitimishwa

kuwa upatikanaji wa taarifa kwa wakulima kwa kupitia vyanzo vya uhakika vya taarifa za kilimo, huduma za ugani, na wataalamu wa kilimo nchini unachangia kuongeza uzalishaji wa mazao ya wakulima wadogo. Ili kupunguza athari za taarifa potofu za kilimo wakulima wanapaswa kuhimizwa kushauriana na wataalamu wa kilimo ili kupata na kutumia taarifa za kuaminika. Serikali za mitaa na watendaji wa maendeleo ya jamii wanapaswa kuongeza mafunzo ya wakulima kupitia mipango ya kuwajengea uwezo ili kuboresha ujuzi wa wakulima wadogo ili kusaidia kuongeza kupitishwa kwa mazoea ya kilimo yaliyopendekezwa. Kuna haja ya kuanzisha vituo vya rasilimali vya wakulima kwa usambazaji mzuri wa habari muhimu kupitia warsha za jamii, programu za simu, na vipindi vya redio ili kuwafikia wakulima walioko maeneo ya mbali. Mashirika ya serikali za mitaa na washirika wa maendeleo ya jamii wanapaswa kuongeza juhudi za kupunguza kuenea kwa taarifa potofu kwa wakulima wadogo.

DECLARATION

I, **Niwaely J. Sandy**, do hereby declare to the Senate of Sokoine University of Agriculture that this research is my original work, and has not been submitted for a master's degree award in any other institution.

……. …….
SANDY, Niwaely John Date
(Candidate)

The above declaration is confirmed by:

……. …….
Dr. Farida Salehe Date
(Principal supervisor)

……. …….
Dr. Magesa M. Mwita Date
(Co-supervisor)

LIST OF PUBLICATION PAPERS

Sources and knowledge of smallholder farmers in agricultural information in Mvomero district, Tanzania: where does misinformation originate?

Effects of agricultural misinformation on crop production among smallholder farmers in Mvomero district, Tanzania

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DEDICATION

The completion of this dissertation is dedicated to Deu's family in the USA, to my husband (Freddy Mwasalemba) & my children (Love, Meekness, Deborah, David and Derek), as well as my parents (John Sandy and Damari Noe Shanga). They have all walked alongside me in every way to make sure I reach the goal of accomplishing this work.

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
ICT	Information and Communication Technology
KII	Key Informant Interview
LGAs	Local Government Authorities
NGOs	Non-Government Organizations
SHF	Smallholder Farmers
STATA	Statistical Software for Science
URT	United Republic of Tanzania

CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 Background Information

Agriculture as a practice is a way in which crop plants and domestic animals sustain the global human population through the provision of food and other products. Its integral activities however are stretched and categorized into other key concepts such as domestication, cultivation, horticulture, vegeculture and arboriculture (Harris and Fuller, 2014). The practice with its integrated activities has been reputable for being a top driver of the economy for most developing and developed countries due to the presence of strong links between agriculture and economic growth (World Bank, 2021). This has been the case for most countries in sub-Saharan Africa that fill the list of most developing countries. The Agricultural sector not only drives the economy in these countries but also offers the best hope for food security (Bjornlund *et al.,* 2020) Tanzania just like other developing countries, relies on the agricultural sector as it plays a major role in the economy of the country (USAID, 2021).

According to the World Bank, the agricultural sector in the world is estimated to contribute about 28% of the total country's GDP while employing 66% of the total workforce (World Bank, 2021). It is understood that the agriculture sector is highly characterized by the concentration of smallholder farmers with small land sizes (less than two acres), poor financial capabilities and low knowledge of agricultural information (IFAD, 2013; Nyambo *et al.,* 2019), even though smallholder farmers contribute significantly in increasing the economic development of Tanzania (Tibesingwa *et al.,* 2019). The Regional Statistical Offices (2020) indicates that smallholder farmers in Tanzania make up 65.3% of the national population while 85% of that population is highly concentrated in the rural area and the remaining percentage is in the urban. Smallholder farmers are low income earners who are involved in farming, they are often disadvantaged from beneficial investments and trapped in a brutal

cycle of low-intensity farming, and low harvests due to the reliance on rainfall (Arce and Caballero, 2015), limited in accessing the market, and minimum or no profits (Meemken and Bellemare, 2020). Furthermore, smallholder farmers are characterized by being prone to lacking reliable sources of agricultural information on material and other important aspects of agriculture which is necessary for them to increase crop production (Misaki *et al.,* 2018).

In the context of agriculture development, access to reliable information for farmers is highly vital (Busungu *et al.,* 2019). Extension officers are regarded as change agents who are needed to intervene to bring about change through influencing innovation, technology transfer and decision-making processes to help improve the crop production of smallholder farmers. The production improvement process involves finding, accessing, evaluating, interpreting and using the acquired information that farmers need as a stimulus to support their decision-making in their agricultural production activities (Madden *et al.,* 2021). However, smallholder farmers often lack agricultural knowledge on how to access and acquire reliable information through proper sources hence they are always prone to (Vraga and Bode, 2020). The misinformation occurs as a result of accessing inappropriate and unreliable sources of agricultural information due to the low awareness of how to use the sources and acquire information. The sources of agricultural information include the channels of printing media (journals, magazines, bills, leaflets, books, etc.), electronic channels (internet, smartphones, mobile phones radio, boxes, etc.) and extension officers ((Mwalukasa, 2013); Ndimbwa *et al.,* 2019).

While agricultural misinformation has been a global problem facing smallholder farmers, notable efforts have been made to solve the problem. These efforts include the development of agricultural knowledge and information systems as well as creating means to track and foster information networks (Magesa *et al.,* 2020). In sub-Saharan Africa, where agricultural misinformation on issues such as

quality seed availabilities and how to see the important of acquiring and using the extension services have been among the possible reasons for lower crop yields (Waldman *et al*., 2017). In Tanzania, efforts have been dedicated to solve the prevalence of agricultural misinformation by the government. The government of Tanzania through public–private partnerships has encouraged the use of improved agricultural innovations and link farmers to markets, with the purpose of increasing agricultural production and income (Karanja *et al.,* 2020; Mgeni *et al.,* 2019). Also, Tanzania has made several efforts to improve agriculture among smallholder farmers sector such as through improved fertilizers and seed projects, for example by using agro-dealers (Kaliba *et al.,* 2021). This study assessed the effects of agricultural misinformation on crop production among smallholder farmers, in Mvomero District, Morogoro Region.

1.2 Statement of the Problem

Research evidence has indicated that agricultural misinformation exists among smallholder farmers in Tanzania (Ndimbwa *et al.,* 2019). The probable causes of agricultural misinformation reported include lack of reliable information sources, low level of knowledge among smallholder farmers, limited agricultural information access among smallholder farmers, poor technology, inadequate extension officers, and poor means of communication (Gwaka and Dubihlela, 2020; Kinuthia and Mabaya, 2017; Ndimbwa *et al.,* 2020; Ndimbwa *et al.,* 2019; Waldman *et al.,* 2017; Wineman *et al.,* 2020). As this challenge escalates, it leads to a decline in the adoption of technological innovations introduced to smallholder farmers that have the potential to help improve crop production (Kuntosch and König, 2018).

Efforts by the government to combat agricultural misinformation in Tanzania have included, establishment of the institutions which provide knowledge to extension officers who are later on employed to visit farmers as to provide agricultural advisory services. Through

this extension service, farmers are able to get the right agricultural information (Magesa *et al.,* 2020). Also, the agricultural policy emphasizes on farmers' access to agricultural information increase crop production profitability. on the policy among other things promote the strengthening of the effective linkages and dissemination of technologies and information between key stakeholders in agriculture sector. The successful intervention in the sector was anticipated to result in the improvement of the quality and standards of the information available for famers hence prevent misinformation (URT, 2013). Furthermore, the government of Tanzania through public–private partnerships has encouraged the use of agro dealers through whom smallholder farmers could access the information on modern technologies such as fertilizer, improved seed and pesticides (Mgeni *et al.,* 2019; Kaliba *et al.,* 2021). Despite the mentioned efforts, agricultural misinformation is still prevalent and affects agricultural production among smallholder farmers (Ndimbwa *et al.,* 2019). Smallholder farmers lag behind on using digital means of accessing information hence they are exposed to agricultural misinformation. Therefore, this study was carried out to examine the effects of agricultural misinformation on smallholder farmers' crop production in Mvomero District, Tanzania.

1.3 Justification for the Study

The study contributes to the dire need to address drivers for low production and productivity which are the topical issues in food security and livelihood improvement. The study provides empirical findings on the sources of agricultural information among smallholders, the causes of the spread of agricultural misinformation and its impact on farmer's production and productivity. The information provided by this research contributes to a better understanding of the policies and government strategies to improve production and productivity through access to relevant and useful information. The information provided by this study can be used by policymakers and practitioners engaged in the promotion of agricultural productivity. The findings of the study also provide useful

evidence on effective approaches for identifying and controlling access by smallholder farmers to agricultural misinformation. Also, the findings of the study contribute to a better understanding of the implementation and achievement of Sustainable Development Goal number 2 of ending hunger, achieving food security and improved nutrition and improved sustainable agriculture in Tanzania context.

1.4 Objectives of the Study

1.4.1 Main objective

To examine the influence of agricultural misinformation on crop production among smallholder farmers in Mvomero District, Morogoro Region Tanzania.

1.4.2 Specific objectives of the study

i) To identify sources of agricultural information among smallholder farmers in the study area
ii) To establish the level of smallholder farmers' awareness of agricultural misinformation
iii) To analyse crop production's effects due to agricultural misinformation among smallholder farmers

1.4.3 Research Questions

i) How does access to information by smallholder farmers differ in the research area?
ii) What is the level of access to agricultural misinformation among smallholder farmers?
iii) How does access to agricultural misinformation affect crop production of smallholder farmers?

1.5 Theoretical Framework

The study was guided by the diffusion of innovation theory and indigenous knowledge theory.

1.5.1 Diffusion of Innovation Theory

The Diffusion of innovation theory was developed by Rogers in 1962. He explores how new ideas, practices, or innovations spread through a social system. the theory emphasizes the process by which individuals and groups adopt innovations. the theory explains why, and how quickly new ideas and technologies spread. the theory proposes the trajectories of linkage to information flow from its source to the lowest level of the information flow. the flow of information involves groups of individuals such as innovators (these are the first individuals to adopt innovation. in the context of the study, it can help identify smallholder farmers who are early adopters of modern agricultural practices based on reliable information.), early adopters (these are the second category of adopters, often opinion leaders in a community. understanding their role in spreading accurate information and practices among smallholder farmers in crucial.), and early majority, laggards and later adopters (these categories represent individuals who are slow to change or more resistant to change. examining the reasons for their reluctance, such as the influence of misinformation, can provide valuable insights. the basic assumptions of the theory are innovation, communication, time and social system. the theory has emphasized the importance of communication channels in the diffusion of innovations. researchers can investigate which channels are most effective for disseminating accurate agricultural information to smallholder farmers and how misinformation spreads through certain channels. furthermore, the theory can analyse how social networks and community structures influence the adoption of agricultural practices and how they are affected by misinformation. additionally, in the context of the study, modern agricultural practices, including the use of specific seeds, fertilizers, and pesticides, can be considered innovations, smallholder farmers may receive information about these innovations, and the theory can help analyse their adoption or rejection.

1.5.2 Indigenous Knowledge Theory

Furthermore, the study was guided by the indigenous knowledge theory. the theory does not have a single founder but it draws from various scholars and indigenous leaders who have championed the importance of traditional knowledge (World Bank, 1998). The indigenous knowledge theory which is defined as spatially and/or culturally context specific, collective, holistic, and adaptive knowledge helps in understanding how farmers - farmer agricultural information can influence adoption of and access to reliable agricultural information.

1.6 Conceptual Framework

According to the diffusion of innovation theory sources of agricultural information such as farmer–farmer information can influence the access of agricultural information, but only if the information accessed is accurate then the information can be reliable to them. The constructs of the theory were used to create the hypothetical linkages of variables in the conceptual framework as demonstrated in Figure 1.1. Furthermore, the casual effect relationship between the independent variable and the dependent variable, was hypothesized to explain the influence of agricultural misinformation on crop production. for smallholder farmers' crop production to be high yield and quality yield accurate agricultural information is needed. The level of crop production reported as poor yield, was hypothesized to depend on how smallholder farmers access agricultural misinformation. It was also hypothesized that agricultural misinformation among smallholder farmers could be influenced by background factors such as age, sex, education level, marital status, farm size, income and household size. Therefore, the access and use of accurate agricultural information was anticipated to impact on production.

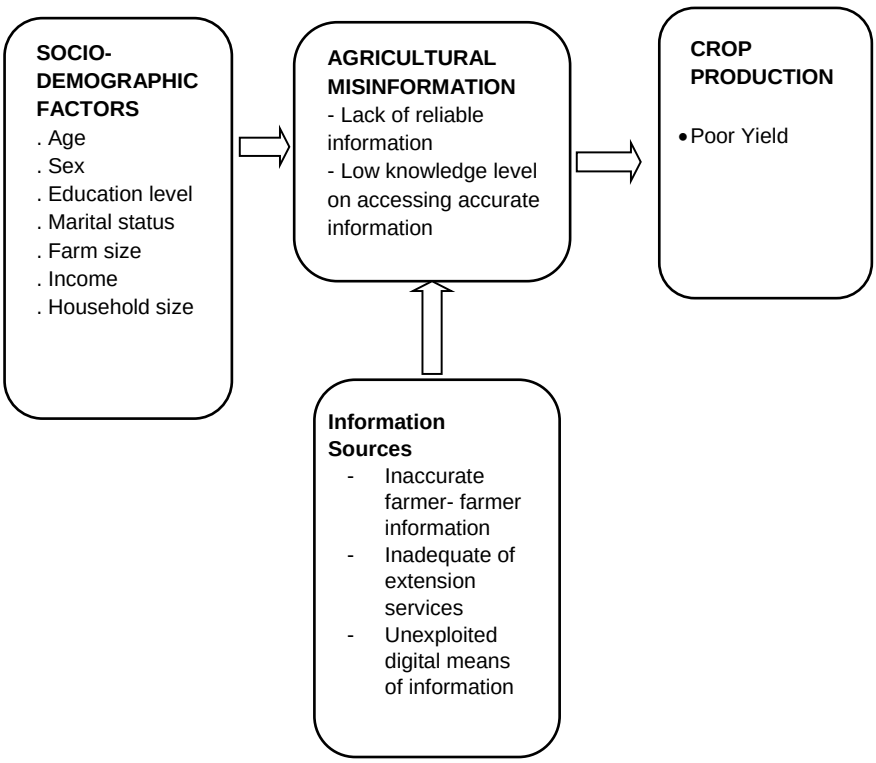

Figure 1.1: Conceptual framework illustrating the relationship between agricultural misinformation and crop production

Source: Researcher's Source (2022)

1.7 Methodology

1.7.1 Description of the study area

This study was carried out in Mvomero District, Morogoro Region. Mvomero District is among the six districts in the Region and is located at latitude 06^{o}C 26' south and longitude 37 ^{o}C 32' east. It borders Handeni district in the North, Bagamoyo district in the East, Kilosa district in the West, Morogoro Rural, and Morogoro Urban (Municipality) (Figure 2.1). Mvomero District is administratively divided into four (4) divisions, with a total of thirty (30) wards, and a hundred and thirty (130) registered villages (URT, 2016). The district

has been selected to intervene in the digital literacy and misinformation program undertaken by Sokoine University of Agriculture due to its agricultural diversity, rural setting and the potential for addressing local challenges and opportunities. Three wards (Mlali, Mzumbe and Dakawa) were selected because of the geographical location, whereby a large number of smallholder farmers who are involved in both food and cash crops farming as their main economic activities, live in the area. The food crops grown include maize, sorghum, paddy, bananas, horticultural and leguminous products. The cash crops grown include sugarcane, cocoa, simsim, sunflower, paddy, coffee and spices (URT, 2016).

1.7.2 Description of research design

The cross-sectional research design was used in this study since information was gathered once at Mvomero District. The design had been found proper for the study because it provided qualitative and numerical explanations. Also, it has given more knowledge on how smallholder farmers have been accessing agricultural misinformation and its effects. Thomas, (2023) justified that cross-sectional designs offer a quick overview of a situation, it is essential to acknowledge their limitations, such as the inability to establish causal relationships.

1.7.3 Sample size and sampling procedures

The sample size was estimated through the formula suggested by Yamane (1967) at a 99% confidence level, 1% precision level, and population size of 192 smallholder farmers:

$$n = \frac{N}{1+N}$$

Where n is the sample size, N is the population size, and e is the level of precision therefore, the sample size of 192 was determined. The respondents were willing to participate in the study and were selected through a simple random sampling for the survey and the 6 Key Informant Interviews who were 3 extension officers and 3 agricultural group leaders were selected purposively from the ward

executive offices. The methods of data collection were questionnaires and interviews.

The Formula of Sample Size of Smallholder Farmers of 3 Wards in Mvomero District:

Proportional sample size = $StratumN * n$

Stratum size = Population Size of each ward

N = Total population of three wards

n = Sample size of farmers of Mvomero ward

NO.	Ward	Stratum size	Proportional size	Sample Size
1	Mlali	22 197	(22 197/60884)*192	70
2	Mzumbe	17 124	(17 124 /60884)*192	54
3	Wami Dakawa	21 563	(21 563 /60884)*192	68
	Total	**60884**	**60884**	**192**

1.8 Study Limitations

The study had some limitations such as some of the respondents were reluctant to provide accurate information as requested and some of the extension officers were unable to introduce the researcher to some houses during the survey because of the inadequate means of transportation. These obstacles were overcome by rapport building between the researcher and the respondents. Furthermore, the problem of transportation by extension officers where solved by them introducing the researcher to the chairpersons of the neighbourhood who could introduce the researcher to his/her neighbourhood. These chairpersons of the neighbourhood were able to introduce the researcher to the respondents and data were collected as intended.

1.9 Description of the Organization of the Dissertation

The work of this dissertation is arranged and organized in the form of chapters. The first chapter is about a general introduction, the second chapter and the third chapter are about papers submitted t in the Tanzania Journal of Agricultural Sciences and the fourth and fifth chapters are about general discussion, general conclusion and recommendation.

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CHAPTER TWO

2.0 SOURCES AND KNOWLEDGE OF SMALLHOLDER FARMERS IN AGRICULTURAL INFORMATION IN MVOMERO DISTRICT, TANZANIA: WHERE DOES MISINFORMATION ORIGINATE?[1]

ABSTRACT

Smallholder farmers play a crucial role in food security and rural development, making access to accurate and reliable agricultural information essential for their lives. Therefore, this study identified the sources of agricultural information and established the level of smallholder farmers' knowledge of agricultural misinformation. The study was carried out in Mvomero District, Morogoro region and selected 192 respondents randomly from three wards of Mlali (n=70), Mzumbe (n=54), and Dakawa (n=68). The study adopted a cross-sectional research design involving both qualitative and quantitative research methods through key informant interviews and questionnaires respectively. Frequency, mean, and standard deviation were used to establish farmers' sources of agricultural information. Knowledge index scale was developed to measure farmers' level of knowledge. Descriptive statistics results indicated that more than half of the respondents (70%) were poorly accessing the reliable agricultural information. Furthermore, more than three quarters of the respondents (96%) had high level of knowledge on agricultural misinformation but still, they could not well access reliable agricultural information. Likewise, more than half of respondents (74.5%) accessed agricultural information through farmers – farmers while half of respondents (50%) accessed agricultural information through other sources such as radio, television, mobile phone, smartphone and extension officers and this

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may be a problem in accessing the reliable agricultural information. The findings of this study underscore the vital importance of enhancing information access for smallholder farmers in Mvomero District. Access to diverse and reliable sources of agricultural information is essential for empowering Mvomero smallholder farmers and improving their agricultural practices. Furthermore, the study highlights that misinformation often originates from various sources, including traditional knowledge transfer, social networks and unreliable sources. Addressing misinformation and promoting accurate agricultural information is imperative for the sustainable development to smallholder farmers in Mvomero District. Additionally, strengthen partnerships such as fostering collaboration between governmental organizations, NGOs and private sector are entities to develop and maintain databases of trustworthy agricultural information tailored to local needs.

Keywords: Information Sources, Smallholder Farmers, Knowledge, Agricultural Misinformation

2.1 Background Information

Most developing countries depend on the Agricultural sector for various purposes in order to reduce poverty through raising income and improving food security as the 80% of the world's poor live in rural areas are mainly depending on farming (Mulhall and Garforth, 2000; World Bank, 2021). In addition, in many developing countries agriculture is the backbone of economy as about 80% GDP of the extreme poor who live in rural areas depends on agriculture (Lwoga *et al.,* 2011; World Bank, 2019). In order for agriculture to yield well extension service is required, Wambura (2015) defined the extension as a system which assists farmers through educational procedures in improving farming methods and techniques in order to increase production efficiency and income for better standard of living to the farmers. The extension system is largely important catalyst for agricultural growth (Mulhall and Garforth, 2000; Cervantes-Godoy and Dewbre, 2010), this service enhances the

production capacity of the agricultural sector and help promote sustainable livelihoods for farmers (Swanson and Rajalahti, 2010).

In Tanzania, agriculture is mostly done by smallholder farmers who make up to 83% of the national population and contribute to 75% of the nation's agricultural output. The average plot size of these smallholder farmers is less than two hectares and typically consists of crop production (ALGIN, 2022). These smallholder farmers are characterized by being prone to unreliable sources for agricultural information on material and other important aspects of agriculture which may in one way or another create agricultural misinformation (Misaki *et al.,* 2018). In general, sources of agricultural information used by smallholder farmers play a great role in the knowledge dimension of smallholder farmers. There are sources of agricultural information similar to channels of printing media (journals, magazines, bills, leaflets, books, etc.), electronic channels (internet, smartphones, mobile phones radio, boxes, etc.) and extension officers (Ndimbwa *et al.,* 2019). Even though there are such sources, smallholder farmers still calculate on traditional means such as face to face as sources of agricultural information which create agricultural misinformation due to fact that the professionalism is neglected. Furthermore, smallholder farmers mostly depend on their farmers – farmers in penetrating agricultural information and agricultural services which in one way or another create agricultural misinformation to them. They are only laterally advantaged from the new digital devices similar as smartphones and boxes (Daum *et al.,* 2021).

The World Bank report showed that for countries in the frontline of world economy, the balance between knowledge and coffers has shifted and knowledge has come to be the most important factor determining the standard of living further than land, digital devices, and labour (World Bank, 1998). Similar developments if effectively employed can have a major donation for agricultural knowledge sharing to enhance the development of the agricultural sector. One

of the critical problems undermining smallholder farmers' effort to increase their product is the delivery of and access to timely and applicable agricultural information and knowledge (Muyobozi *et al.,* 2021). Still, due to the characteristics of smallholder farmers that involve a lack of knowledge on how to pierce and acquire dependable information through proper sources, misinformation has been a result among farmers in sub-Saharan countries including Tanzania (Vraga and Bode, 2020). This study examined the sources of agricultural information and how the smallholder farmers are knowledgeable about agricultural misinformation.

2.2 Theoretical Framework

This study was guided by the indigenous knowledge theory. The theory does not have a single founder but it draws from various scholars and indigenous leaders who have championed the importance of traditional knowledge (World Bank, 1998). The theory provides the concrete situations of communities in relation to the environment and provides practical solutions to the problems of information to farmers.

This study borrows insight and contribution from the Indigenous knowledge theory which is defined as spatially and/or culturally context specific, collective, holistic, and adaptive knowledge. The theory helps in understanding how farmers - farmer agricultural information can influence adoption of and access to reliable agricultural information. For example, many farmers have developed traditional calendars to control the scheduling of agricultural activities according to the rain and dry seasons and planting and harvest season and these calendars can be adapted from one generation to another in their agricultural information. Moreover, in this study, the indigenous knowledge theory gives a theoretical understanding on how smallholder farmers pass knowledge from one another in accessing agricultural information as the aim of the theory is to observe oral and written knowledge. Furthermore, the basic assumptions of the theory are innovations of the practices, and

beliefs that promote sustainability and the responsible stewardship of cultural and natural resources through relationships between humans and their landscapes (Zhang & Nakagawa, 2018).

The indigenous knowledge theory has its limitations when applied to smallholder farmers as followed; lack of formal documentation as its often passed down orally or through tradition, which can make it difficult to access and share among smallholder farmers. Also, the theory is highly context-specific, and what works for one group of farmers may not work be applicable to another group. Smallholder farmers often face diverse challenges, so relying solely on indigenous knowledge may not provide adequate solutions (World Bank, 1998; Kitchin, 2009). The limitation mentioned can be compared with farmer – farmer agricultural information, if the agricultural information to farmers is addressed only through farmer – farmer and there is no room for the professionalism then it is easy for agricultural misinformation to be created. The study has used this theory because the indigenous knowledge theory helps in understanding on how farmer – farmer agricultural information can instigate the adoption of agricultural information. The theory shows that if the farmers are given room to adopt reliable agricultural information, they can easily transmit the information adapted to their farmers – farmers.

2.3 Methodology

2.3.1 Description of the study area

This study was carried out in Mvomero District, Morogoro Region. Mvomero District is among the six districts in the Region and is located at latitude 06^{o}C 26’ south and longitude 37^{o}C 32’ east. It borders Handeni district in the North, Bagamoyo district in the East, Kilosa district in the West, Morogoro Rural, and Morogoro Urban (Municipality) (Figure 2.1). Mvomero District is administratively divided into four (4) divisions, with a total of thirty (30) wards, and a hundred and thirty (130) registered villages (URT, 2016). The district has been selected to intervene in the digital literacy and

misinformation program from the Sokoine University of Agriculture due to its agricultural diversity, rural setting and the potential for addressing local challenges and opportunities. This grant donated by Facebook Inc. has been conducting conduct research on agricultural misinformation among smallholder farmers in Tanzania. Furthermore, the wards (Mlali, Mzumbe and Dakawa) were selected because of their geographical location, whereby a large number of smallholder farmers are involved in both food and cash crop farming as their main economic activities. The food crops grown are maize, sorghum, paddy, bananas, horticultural and leguminous products. The cash crops grown include sugarcane, cocoa, simsim, sunflower, paddy, coffee and spices (URT, 2016).

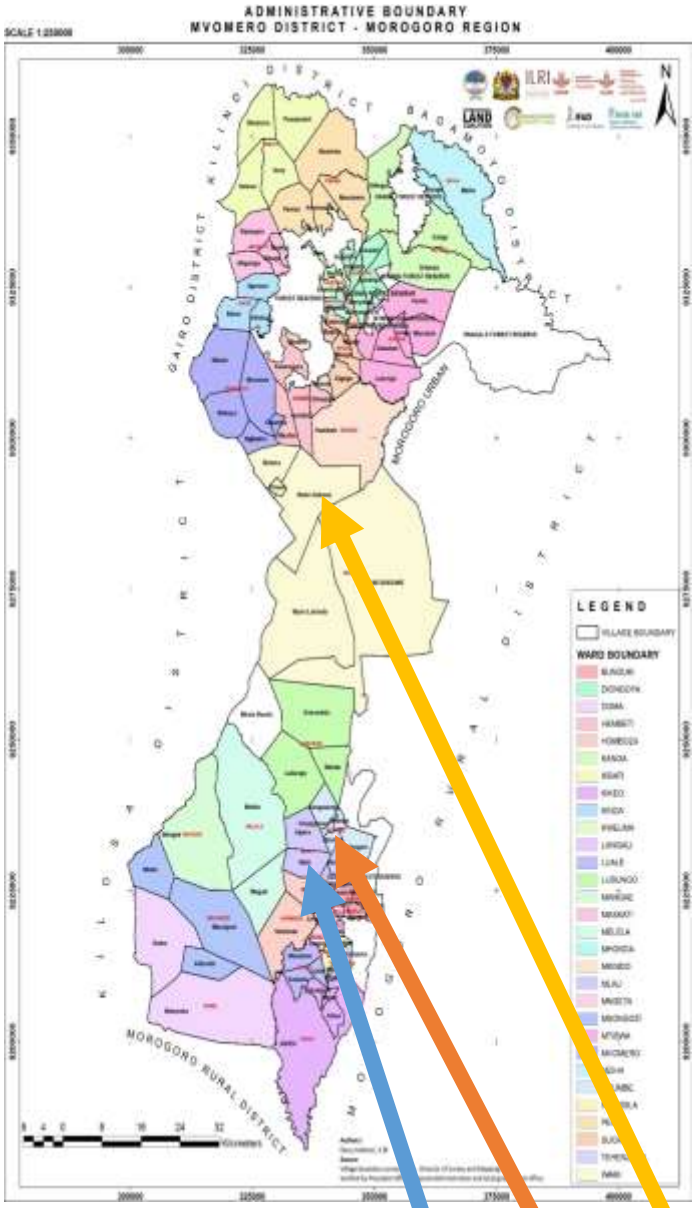

Figure 2.1: A map of Mvomero District showing the administrative boundary in the Morogoro region including wards of Mlali, Mzumbe & Dakawa

Source: Kalenzi (2018).

2.3.2 Description of research design

The study adopted a cross-sectional research design whereby data were collected at a single point in time with mixed methods involving both qualitative (using KII to a ward agricultural officer and smallholder farmers' group leader) and quantitative (face-to-face interview with the farmers) research methods.

2.3.3 Sample size and sampling procedures

The sample size was estimated through the formula suggested by Yamane (1967) at a 99% confidence level, 1% precision level, and population size of 192 smallholder farmers:

$$n = \frac{N}{1+N}$$

Where n is the sample size, N is the population size, and e is the level of precision therefore, the sample size of 192 was determined. The respondents were willing to participate in the study and were selected from the ward executive offices through a simple random sampling for the survey and the 6 Key Informant Interviews who were 3 extension officers and 3 agricultural group leaders were selected purposively from the ward executive offices. The data collection tools were questionnaires and interviews.

The Formula of Sample Size of Smallholder Farmers of 3 Wards in Mvomero District:

Proportional sample size = $StratumN * n$

Stratum size = Population Size of each ward

N = Total population of three wards

n = Sample size of farmers of Mvomero ward

Table 2.1: Proportionate of Smallholder farmers' sample (n=192)

NO.	Ward	Stratum size	Proportional size	Sample Size
1	Mlali	22 197	(22 197/60884)*192	70
2	Mzumbe	17 124	(17 124 /60884)*192	54
3	Wami Dakawa	21 563	(21 563 /60884)*192	68
	Total	**60884**	**60884**	**192**

Source: (URT, 2021)

2.3.4 Data processing and analysis

The primary quantitative data collected through the questionnaire were coded and entered into the STATA ver13 (Statistical Software for Science version 13) software for data cleaning and analysis. During data analysis, descriptive statistics were used to obtain frequency, mean and standard deviation in summarizing statistics on farmers' sources of agricultural information and production. Knowledge index scale calculation was developed to measure the farmer's level of knowledge as a score was given as '1' very poor '2' poor '3' fair '4' very good '5' excellent in understanding agricultural information as indicated in Table 1. Furthermore, the ordinal logistic regression analysis was used to evaluate factors influencing farmers' access to agricultural information. The equation of the model is specified as;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \cdots \ldots \ldots \ldots \ldots \ldots (1)$$

$$logit(p) = ln\left(\frac{p}{1-p}\right) = \frac{e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_k X_k}}{1+e^{\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_k X_k}} \cdots (2)$$

Whereby;

$logit(p)$ = Logit link function

p = Probability that farmers have high access reliable agricultural information

β_0 = Intercept

$\beta_1 - \beta_k$ = Slope coefficients for selected independent variables

$X_1 - X_k$ = Independent variables

ε_i = Residuals

(Table 1 of the list and definition of variables is shown in Apappendix 1)

The content analysis was used to analyze the qualitative data collected from key informants interview via check-list of questions.

2.4 Results and Discussion

2.4.1 Socio-economic and demographic characteristics of smallholder farmers

Table 2.2 presents the summary of respondents' socio-economic characteristics. The total number of interviewed respondents (n=192) were from three wards which are Mlali (n=70), Mzumbe (n=54), and Dakawa (n=68).

Table 2.2: Socio-economic characteristics of the sample household respondents (n = 192)

Variable	Description	Frequency	Percent (%)
District	Dakawa	68	35.42
	Mlali	70	36.46
	Mzumbe	54	28.12
Sex	Male	67	34.9
	Female	125	65.1
Age (years)	18 – 35	72	37.5
	36 – 45	42	21.88
	46 – 65	61	31.77
	Above 65	17	8.85
Education level	No formal education	29	15.1
	Primary education	140	72.92
	Secondary education	18	9.38
	Certificate	2	1.04
	Diploma	2	1.04
	Degree	1	0.52
Marital status	Single	11	5.73
	Married	123	64.06
	Divorced	45	23.44
	Widow/Widower	13	6.77
Family size (members)	Below or equal to 3	60	31.25
	4 to 6	98	51.04
	7 to 10	33	17.19
	Above 10	1	0.52

2.4.1.1 Age of respondents

The Table 2.2 results show that the majority of respondents (37.50%), were at the age between 18 and 35 years, followed by those at the age of 46 and 65 years (31.77%). These results imply that in farming activities there were relatively more youths who were engaged in farming activities compared to older people. This is

ascribed mainly to the fact that not most youth, after accomplishing school, migrate to urban areas looking for salaried employment or engaging in self-employment. These youths may have access to family-owned land, making it easier for them to start farming without the need for significant capital. This study is inconsistence with the findings reported by Modibo *et al*. (2010), who explored that the farming population in most developing countries is aging.

2.4.1.2 Education of respondents

The results on the education of respondents show that more than half of the respondents (72.92%) had completed primary education and 15.10% had no formal education (Table 2.2), while the rest had secondary and college education. It means that smallholder farmers can write and read which enables them to understand the information on agricultural misinformation compared to a non-educated person. The study by Oyeyinka *et al.* (2014) revealed that a person with formal education has a positive significance to knowledge. Also, similar results were reported by Mlozi *et al.* (2015), who clarified that formal education affects the way of understanding instructions, therefore, formal education has been done by the majority of farmers in the study area as in many other areas thus, they could read and comprehend information about agricultural production.

2.4.1.3 Sex of respondents

The results in Table 2.2 reveal that the majority of respondents (65%) were females while males were less than half (34.9). This difference is likely because the present study focused on smallholder farmers who were largely women who owned less than two acres. This study is contrary to the findings by Mwamakimbula (2014), which indicated that the males who participated in the interview in the same district were 60%. Furthermore, this is also reflected in the proportion of men who get more free time to attend extension education training where the number of women who had ever attended extension training outweighed that of men regardless of their less access to external inputs and credit due to the division

of labour directed by socio-cultural values (Lopes and Kovács, 2010).

2.4.1.4 Sources utilized by smallholder farmers

In this study, the sources of agricultural information among respondents were identified and the results showed that regardless of the several sources used by the respondents to access agricultural information, farmer-farmer information flow was 74% for all means of information sources (at 1% level of significance) (Table 2.3). However, extension officers were observed not to have a significant contribution (p-value of 0.1430) to providing agricultural information. Due to the results on agricultural information sources mentioned in this study whereby the respondents tend to rely on their farmers – farmers as the main source in accessing agricultural information, that could indicate that if the information acquired is not accurate, they end up getting agricultural misinformation. The study by Zhang & and Nakagawa (2018), indicates that farmers – farmers' agricultural information can influence the adoption of and access to reliable agricultural information if these farmers are provided with accurate agricultural information. Likewise, the information from the agricultural extension officers was not significant which can increase the chances of getting agricultural misinformation to the respondents. Also, Key Informant Interviews from all three groups indicated that,

> *"extension officers do not visit them individually"* and, only one group mentioned that *"they were visited as a group by extension officers once per year and rarely twice per year."* (Key Informant, Mlali, Mzumbe and Dakawa August 2022).

This implies that there is a limitation of extension officers whereby this could be caused by inadequate facilities, equipment and means of transportation at the disposal of extension officers. According to Waldman *et al.* (2016), the limitation of the agricultural extension to support farmers has been one of the possible reasons for crop yields

for smallholder farmers in sub-Saharan Africa to be dramatically lower than yields in more developed countries.

Table 2.3: Access sources of agricultural information among smallholder farmers (n = 192)

Source	Ward			chi-square	p-value
	Dakawa	Mlali	Mzumbe		
Radio	1	26	10	28.2409	0.0000
Television	2	13	3	11.2084	0.0040
Mobile phone	1	28	5	38.8186	0.0000
Smartphone	1	11	0	16.9519	0.0000
Extension officers	8	12	3	3.8863	0.1430
Farmers – Farmers	65	31	47	53.9945	0.0000
Other sources	0	20	5	25.8007	0.0000

2.4.1.5 Frequency uses of sources of agricultural information

Figure 2.2 shows that frequency of use of digital devices to access agricultural information, whereby 60% of the respondents never used their digital devices to access agricultural information, 21% of respondents were using the devices they owned occasionally (during the growing season), 16% of the respondents were sometimes using the digital devices they owned (monthly) and 2% of the total respondents were often (weekly) using their digital devices. These results indicate that different factors can affect the usability of digital devices in acquiring agricultural information respondents such as low level of education and training on how and the importance of using digital devices in accessing agricultural information, hence, their farmers – farmers became a main source of agricultural information. These results are in line with Mgendi *et al.* (2021), who explored that learning and adopting new agricultural techniques may be challenging for smallholder farmers with limited education as they may find it harder to grasp complex methods or innovations. Also, the low income of the respondents to buy batteries for their radio was one of the hindrances of acknowledging if there is agricultural information from this digital device. During the KII one of three group leaders said that,

> *"Some of the members of my group have radios and as there is a channel called 'farmer' which has a lot of agricultural information which they could listen to but due to the low income of these members they unable to afford to buy batteries for their radios, hence, they do not listen to agricultural information channels". (*Key Informant, Dakawa, August, 2022)

Furthermore, the results from KII, all group leaders confirmed that,

> *"They usually get and share agricultural information with their farmers – farmers"* (Key Informant, Mlali, Mzumbe and Dakawa August 2022).

Likewise, two of the group leaders pointed out the same thing as the first group leader said:

> *"We rarely get agricultural information from extension officers the most agricultural information we are obtaining is from other NGOs and institutions such as agricultural institutions."* (Key Informant, Mlali and Dakawa August 2022).

Moreover, the second group leader explained that,

> *"We have demonstration plots whereby most of the information on how to make them comes from agricultural institutions." (*Key Informant, Mzumbe, July 2022).

Furthermore, the third group leader made some explanation concerning the uses of the source used to get agricultural information and said*,*

> *"I rely on my smartphone as my occasional source of agricultural information, even though most agricultural*

*information from other countries is in English but still I can learn many things concerning agricultural information in my country and even learn from other nations through photographs and demonstrations." (*Key Informant, Mlali, July 2022).

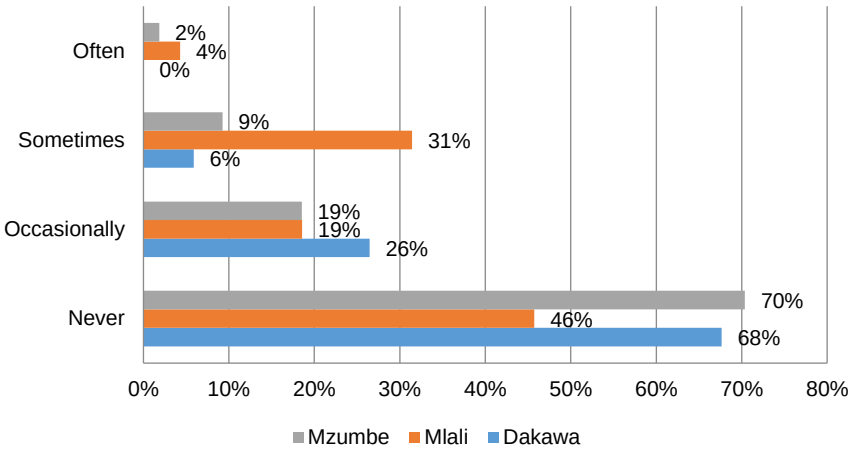

Figure 2.2: Frequency of using the digital devices to access agricultural information

2.4.1.6 Awareness of agricultural misinformation

The respondents were asked to rate their awareness of understanding misinformation on agriculture and in rating the awareness of the respondents on understanding agricultural misinformation, the response was ranked on three scales (low, moderate, and High), Figure 2.3 indicates that 76% of respondents at Mlali scored the low level of awareness on understanding misinformation while 41% the respondents at Dakawa scored the highest level of awareness on understanding misinformation and 5% of the respondents at Mzumbe scored moderate level of awareness on understanding misinformation. This shows that the respondents at Dakawa and Mzumbe were more aware of agricultural misinformation while the respondents at Mlali were not aware of

agricultural misinformation, the realizations were especially during crop harvesting as when whether seed, pesticide, fertilizer or weather-related agricultural misinformation was utilized. These results were reported by Misaki *et al.* (2018) who specified that the low level of education and training among smallholder farmers in Tanzania on how to access agricultural information is one of the weaknesses facing them. This is because the respondents depended mostly on their fellow farmers to access agricultural information whereas the evidence-based knowledge of agriculture which could be found from extension services and digital devices was not utilized.

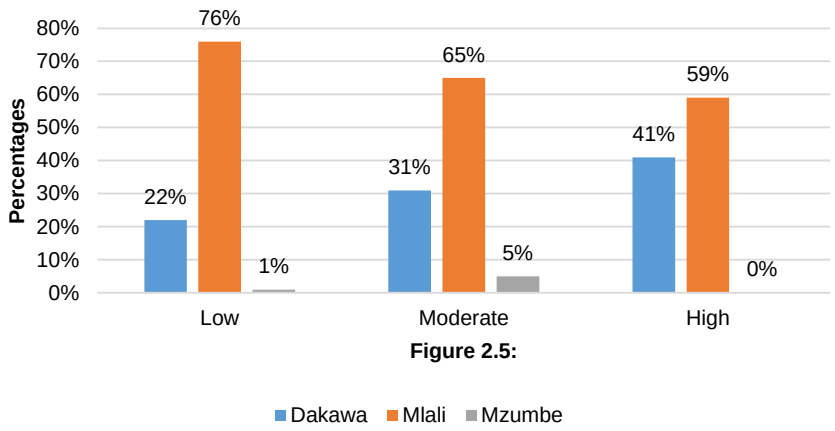

Figure 2.5:

Figure 2.3: Knowledge level on understanding misinformation

2.4.1.7 Awareness of information through farmers' courses/seminars/workshops

Regarding attending courses/seminars/workshops to access agricultural information, the frequent chances of the respondents who attended training related to agriculture were observed and grouped into three classes (occasionally, sometimes, and often). From the results, it shows that 51% of respondents attended training training sometimes (once – 5 years) related to agriculture, followed by occasional (after 2 – 4 years) attendance of agricultural training to

the respondents which were 34%, and 15% of the proportionate of respondents attended training on agriculture often (after 3 months – Annually) as shown in Figure 2.5. This indicates that only a few respondents were in the position to be quickly updated with agricultural information more frequently compared to others which could easily create agricultural misinformation for them.

The extension officers are unable to plan and do their work effectively as during Key Informant Interview (KII) the extension officers from all three wards acknowledged that it was hard for them to plan well. One of the extension officers said that

> *"One of our daily activities is to ensure that the respondents are aware on agricultural information through employing the trainings as if they have accurate agricultural information, they will minimize agricultural misinformation in their daily farmer activities, but still we have failed in that area".* (Extension officers, Mlali, July 2022).

Furthermore, another extension officer revealed that,

> *"due to inadequate means of transportation to us as you may see that the ward is wide it is hard for me to reach the farmers and give them agricultural information unless they form groups and call me or come to the officer for the agricultural information needed"*. (Extension officer, Mlali, August 2022).

Even though they knew that they were responsible on ensuring that the respondents are supposed to get awareness on agricultural information but still this statement mentioned was not practically applicable. There is an inconsistency by the study done by Mkiki and Msuya (2020), which revealed that the agricultural extension officers are overloaded with non-extension tasks such as tax collection that hinder them to perform their technical roles which one of them is to ensure farmers are getting accurate agricultural information.

Furthermore, during KII all three groups leaders asserted that, the extension officers do not conduct training nor do they follow up on agricultural issues. Additionally, one of the group leaders said that,

> *"Often in our group if we want training on a certain thing, we do not expect to get the training needed from extension officer but instead we gather and talk about it and see if there is any way of getting training in the relevant area."* (Key Informant, Mlali, July 2022).

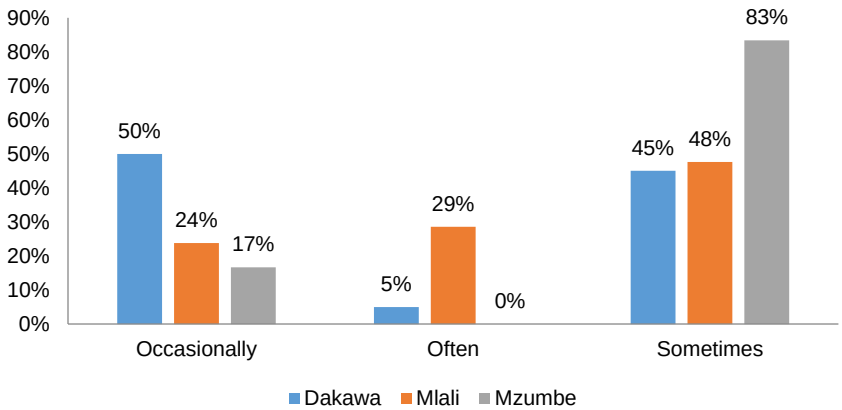

Figure 2.4: Frequency of attending courses/seminars/ workshops

2.4.1.8 Knowledge index on agricultural misinformation

The knowledge level measured from the study area using a knowledge index associating a summation of scores for correct replies over all the items of a particular respondent indicated his/her level of knowledge about the practices related to Agriculture information mentioned above, results show that the average score obtained from all the three wards was 84.3% with a highest mean score of 87.1% from Dakawa and the lowest score of 81.2% from Mlali in districtwide (Table 2.4). The results indicate that respondents were aware of agricultural misinformation resulting from information spread due to strong farmer-farmer linkages as farmers often rely on

each other for information and support, fostering a strong network whereby if there is accurate information can spread more efficiently. Also, smallholder farmers often have a tradition of sharing knowledge and experiences which helps in combating misinformation as information through each other are disseminated quickly. For example, Smith *et al.* (2018), emphasized that the role of interpersonal communication among farmers in sharing agricultural knowledge and combating misinformation. Similarly, study was done by Jones and brown (2019), demonstrated the significant impact of farmer networks on information exchange and adoption of the best practices in agriculture, further reinforcing the notion of strong farmer-farmer linkages as determinant of accurate information dissemination in agricultural communities.

Table 2.4: Knowledge index on measuring agricultural misinformation (n=?)

Ward	n	Mean	SD	Min	Max
Dakawa	68	0.871324	0.050256	0.75	1
Mlali	70	0.8125	0.110979	0.541667	1
Mzumbe	54	0.846451	0.058828	0.625	0.958333
Total	**192**	**0.842882**	**0.08322**	**0.541667**	**1**

2.4.2 Determinants of farmers' access to reliable agricultural information

Table 2.5 provides the results of an ordinal logistic regression analysis, which is used to understand the relationship between multiple independent variables and an ordinal dependent variable. In this case, the dependent variable is "accessing reliable agricultural information," which is measured on an ordinal scale (poor, fair, etc.). The independent variables include "knowledge of agricultural misinformation," "frequency of use of sources of agricultural information," "age group," and "education." The most significant factor affecting access to reliable agricultural information in this model is the level of knowledge about agricultural misinformation. Farmers with higher knowledge in this regard are more likely to have better access to reliable information. The frequency of using sources

of agricultural information, age group, and education level do not seem to have a significant impact on access to reliable information, at least based on the variables included in this model.

The "knowledge on agriculture misinformation" variable has two categories: "low" and "moderate." The coefficient for "low" (-7.816) is statistically significant ($p < 0.001$). Being in the "low" category significantly decreases the odds of accessing reliable agricultural information compared to the reference category. The coefficient for "moderate" (-1.656) is also statistically significant ($p = 0.006$). Being in the "moderate" category significantly decreases the odds of accessing reliable agricultural information compared to the reference category. Implication: Lower levels of knowledge about agricultural misinformation (both "low" and "moderate") are associated with decreased access to reliable agricultural information. This indicates that as knowledge about agricultural misinformation increases from "low" to "moderate," the odds of having better access to reliable agricultural information increase significantly. A related study that supports this finding is the research by Aker *et al.* (2022) in Uganda. They found that farmers with higher knowledge of pest management and crop diseases were more likely to access and use reliable agricultural information. This finding suggests that efforts to improve access to reliable agricultural information should also focus on increasing awareness and knowledge about agricultural misinformation. Educating individuals about the presence of misinformation in agriculture and how to discern accurate information from false information can help them make better-informed decisions and improve their agricultural practices.

On the frequency of use of sources of agricultural information variable, the results in Table 2.5 show that the coefficients for different levels of frequency indicate the impact of how often individuals use sources of agricultural information. However, none of these coefficients appear statistically significant (all have p-values > 0.05). This suggests that the frequency of using sources of agricultural information does not significantly affect access to reliable

information in this context. In this study, the frequency of using agricultural information sources does not seem to have a significant impact on access to reliable agricultural information. A study by Kiptot *et al.* (2017) in Kenya found that the frequency of mobile phone use for accessing agricultural information did not necessarily correlate with improved farming practices. This aligns with this study's finding that frequency of use may not be a significant factor. The implication here suggests that, according to the study's results, the frequency with which people access agricultural information sources (whether rarely or frequently) does not seem to be a major factor affecting their access to reliable agricultural information. In other words, regardless of how often individuals seek out agricultural information, their access to trustworthy information appears to be relatively consistent.

In Table 2.5, the results show that none of the coefficients for age groups or education levels are statistically significant (all have p-values > 0.05). This indicates that age group and education level do not significantly affect access to reliable agricultural information. A study by Mshenga *et al.* (2016) in Tanzania explored the relationship between education level and access to agricultural information. They found that education had a limited impact on accessing extension services and information. This supports the current study's finding that education may not be a significant factor. The implication here suggests that, according to the study's results, neither the age group to which participants belong nor their level of education appear to strongly influence their access to reliable agricultural information. It means that individuals from different age groups and educational backgrounds seem to have relatively similar access to accurate agricultural information.

Table 2.5: Ordinal logistic regression results: factors influencing farmers' access to reliable agriculture information

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Threshold	[Accessing reliable agricultural information=Poor]	-0.427	2.330	0.034	1	0.855	-4.994	4.140
	[Accessing reliable agricultural information=Fair]	2.950	2.360	1.564	1	0.211	-1.674	7.575
Location	[knowledge on Agri. misinformation=Low]	-7.816	1.215	41.405	1	0.000***	-10.196	-5.435
	[knowledge on Agri. misinformation=Moderate]	-1.656	0.601	7.580	1	0.006***	-2.834	-0.477
	[knowledge on Agri. misinformation=High]	0[a]			0			
	[Frequency of use of sources of agricultural information=Never]	1.067	2.368	0.203	1	0.652	-3.574	5.709
	[Frequency of use of sources of agricultural information= Occasional]	2.219	2.432	0.833	1	0.362	-2.548	6.986
	[Frequency of use sources of agricultural information =sometimes]	0.655	2.421	0.073	1	0.787	-4.089	5.399
	[Frequency of use of sources of agricultural information =Often]	0[a]			0			
	[Age group=18-35]	0.652	1.063	0.376	1	0.540	-1.431	2.735
	[Age group=36-45]	-1.857	1.154	2.588	1	0.108	-4.119	0.405
	[Age group=46-65]	-0.483	1.020	0.224	1	0.636	-2.481	1.516
	[Age group=65+]	0[a]			0			
	[Education=certificate]	3.829	2.259	2.874	1	0.090	-0.598	8.257
	[Education=degree]	0.610	3.284	0.034	1	0.853	-5.827	7.047
	[Education=diploma]	-20.731	0.000		1		-20.731	-20.731
	[Education=no formal education]	1.388	1.233	1.267	1	0.260	-1.028	3.804
	[EDUCATION=primary]	1.257	0.979	1.646	1	0.199	-0.663	3.176
	[EDUCATION=secondary]	0[a]			0			

2.4.3 Conclusion and Recommendations

2.4.3.1 Conclusion

Access to sources of agricultural information and knowledge level of smallholder farmers is essential for crop production improvement. These empower them with the information needed to make informed decisions on agricultural practices. However, misinformation can originate from various sources such as unreliable online platforms, word of mouth, and well-intentioned but incorrect advice, which can hinder farmers' success and well-being. To combat this, reliable and localized information, channels should be promoted to ensure smallholder farmers have access to accurate agricultural knowledge in order to minimize the effects of agricultural misinformation to smallholder farmers.

2.4.3.2 Recommendations

This study is recommending to promote accessible and localized agricultural information channels such as community-based agricultural extension service, mobile apps and radio broadcasts to ensure smallholder farmers have easy access to reliable and relevant agricultural knowledge. Also, capacity building for smallholder farmers like training programs and workshops for smallholder farmers should be there to enhance their digital literacy and critical thinking skills helping them discern accurate information from misinformation. Furthermore, strengthen partnerships such as fostering collaboration between governmental organizations, NGOs and private sector are entities to develop and maintain databases of trustworthy agricultural information tailored to local needs. Trainings and workshop should be there to enhance farmer-farmer knowledge, as it is important to share networks among smallholder farmers to exchange experiences, best practices and validated information, reducing reliance on potential unreliable sources. Additionally, it is important for extension services to establish feedback mechanisms where farmers can report misinformation, allowing for prompt corrections and addressing the spread of false information. These can improve smallholder farmers' access to reliable agricultural

knowledge while mitigating the sources of agricultural misinformation, ultimately enhancing their crop production and livelihoods.

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CHAPTER THREE

3.0 EFFECTS OF AGRICULTURAL MISINFORMATION ON CROP PRODUCTION AMONG SMALLHOLDER FARMERS IN MVOMERO DISTRICT, TANZANIA[2]

ABSTRACT

Access to accurate agricultural information is critical for farmers to make informed decisions and improve crop production. This study was conducted to examine the effects of agricultural misinformation among smallholder farmers' crop production. Due to the effects of agricultural misinformation being emerge in Mvomero District, specifically, the study intended to analysed the effects of agricultural misinformation on crop production for smallholder farmers in Mvomero District, Tanzania. The cross-sectional research design was used to gather data from the wards of Mlali, Mzumbe and Dakawa, using a survey (n=192) and key informants' interview (n=6). Using the Wilcoxon Signed Rank Test, the results show that misinformation had significant negative effect on crop production ($p = 0.000$). Also, by using binary regression model, seed varieties, fertilizer and pesticides misinformation coefficient was statistically significant at 5% level of significance ($P = 0.000$). The findings suggest that the respondents have limited access to accurate agricultural information, and their inability to use accurate agricultural information prevailed the misinformation and contributed to low crop production. Thus, improving access to accurate agricultural information from all agricultural agents, including extension officers, and emphasizing the importance of using right channels for agricultural information could be a way forward to increase crop production and diminish agricultural misinformation among smallholder farmers.

Keywords: Agriculture, Agricultural Information, Access to Agricultural Information, Agricultural Misinformation, Crop Production

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3.1 Introduction

Background Information

Agriculture is a practice which is explained to be a way in which crop plants and domestic animals sustain the global human population through food provision and other products which play a major role in developing countries' economies (Harris and Fuller, 2014). Tanzania just like other developing countries, relies on the agricultural sector due to the presence of strong links between agriculture and economic growth (Jayne *et al.*, 2021). Furthermore, in Tanzania, agriculture is mostly done by smallholder farmers who make up 75% of the national population while 85% of that population is highly concentrated in rural areas and the remaining percentage is in the urban (Carlos and Jorge, 2015). These smallholder farmers have been categorised as people who lack reliable sources of agricultural information on material and other important aspects of agriculture to increase crop production (Misaki *et al.,* 2018). Due to the lack of reliable sources of agricultural information for smallholder farmers', agricultural misinformation still exists which minimize awareness of how to improve agricultural production (Levi *et al.,* 2015; Mihály, 2010).

Misinformation in agriculture refers to false or misleading information that is spread about agricultural practices, technologies, or products. This can include rumors, myths, and misconceptions that can mislead farmers, policymakers, or the general public about the benefits, risks, and impacts of various agricultural practices (Gray and Haines, 2016; Van Huis, 2019). Some examples of misinformation in agriculture include false claims about the safety or effectiveness of certain pesticides, incorrect information about the nutritional value of various crops, and myths about the benefits or risks of genetically modified organisms (GMOs). Misinformation in agriculture can have serious consequences, including the crop yields low, environmental degradation, and food safety risks. It can also lead to inappropriate policy decisions that negatively impact the

agricultural sector and the broader economy (Gray and Haines, 2016; Van Huis, 2019; Barret and Moser, 2019; FAO, 2020).

Misinformation can have negative effects on crop production in various ways. Misinformation could lead to the adoption of inappropriate technologies or practices that could reduce yields (Gray and Haines, 2016; Löfgren and Weitzman, 2016). A study by Gibson *et al*. (2020) argued that misinformation can limit the adoption of new technologies that could increase yields and improve food security, and that accurate and targeted information campaigns are needed to address this. Also, a report by the International Food Policy Research Institute (IFPRI) published in 2019 has discussed the negative impacts of misinformation on agricultural crop production in Africa. The report notes that misinformation can lead to suboptimal use of inputs (e.g., underuse of fertilizers or overuse of pesticides), which can reduce crop yields. The report also notes that misinformation can lead to the adoption of inappropriate technologies or practices, which can further reduce yields (Tadesse *et al.,* 2019). Furthermore, due to agricultural misinformation formed by inadequate of the right information on seed performance, local unavailable of the right information on the seed, and the limitation of the agricultural extension to support farmers, there are possibilities of low crop production to smallholder farmers (Matheny, 2020; Waldman *et al.,* 2016).

The effects of agricultural misinformation are highly surging and prevalent due to most farmers failing to get accurate and reliable agricultural information (Isaya *et al.,* 2018). Due to the agricultural misinformation on the importance of the use of agricultural technologies such as modern seeds and equipment on crop production by smallholder farmers, there is lower crop yields and the decrease of crop production (Muzari *et al.,* 2012; Kinuthia and Mabaya, 2017). Moreover, low production has been created due to the effects of agricultural misinformation on identification of the disease, proper management practice of crops and the uses of

fertilizer (Hashim, 2018). The availability of accurate information on crop management practices is crucial for farmers to achieve high yields and food security. Therefore, improving access to accurate information through extension services, farmer training, and other means could help Tanzanian farmers improve their crop yields and economic well-being.

Tanzania has made efforts to address misinformation and improve agricultural crop production. The government has invested in agricultural extension services and other programs aimed at providing accurate information to farmers (Landmann *et al.,* 2021). For example, the National Agricultural Extension Services Program (NAES) provides training and information on good agricultural practices to farmers. Additionally, the government has promoted the use of mobile phones and other technologies to improve access to agricultural information. However, challenges remain in improving access to accurate information in Tanzania, particularly in remote and rural areas where access to extension services and other information sources may be limited. Among other sources, the use of digital devices in accessing agricultural information is important for improving smallholder farmers' crop production and profitability.

Therefore, this study aimed to analyze the effects of agricultural misinformation on crop production to smallholder farmers. The specific objectives of this study were to determine the uses of digital devices utilization by smallholder farmers in accessing agricultural information, identify the potential reasons for the low usage of digital devices in accessing agricultural information among smallholder farmers, and explore the relationship between the use of digital devices and agricultural misinformation and its impact on crop production.

3.2 Problem Statement

Several studies have investigated the effects of misinformation on crop production. For instance, a study conducted by Liu *et al.* (2019)

in China found that misinformation had a negative effect on farmers' decisions regarding pesticide use, leading to lower crop yields. Similarly, a study by Munyua *et al.* (2018) in Kenya found that misinformation on the use of herbicides resulted in poor weed management practices and reduced crop yields. Furthermore, a study by Nderitu *et al.* (2020) in Kenya found that misinformation on the use of fertilizers led to incorrect application rates, resulting in lower crop yields. Additionally, a study by Oluoch *et al.* (2019) in Kenya found that misinformation on crop storage methods led to post-harvest losses, reducing crop production. A study by Harvey *et al.* (2014) and Mussa (2020) identified that misinformation regarding weather and climate change has a significant impact on smallholder farmers, as it affects crop production. The availability of water and rainfall largely determines the decision-making process of crop selection and the overall output of agricultural production. As a result, weather and climate change misinformation can lead to lower crop yields and reduced crop production among smallholder farmers.

Access to accurate agricultural information is critical for farmers to make informed decisions and improve crop production. Studies have shown that farmers who have access to accurate agricultural information are more likely to adopt best practices, leading to increased crop yields and improved economic outcomes. For instance, a study by Maredia *et al*. (2016) in Malawi found that farmers who used mobile phones to access agricultural information were more likely to adopt new technologies and practices that led to improved crop yields and increased incomes. Similarly, a study by Labarta *et al.* (2017) in Nicaragua found that farmers who used mobile phones to access agricultural information were more likely to adopt best practices for soil conservation and sustainable agriculture. These studies suggest that access to accurate agricultural information is critical for farmers to make informed decisions that can improve crop production. Although various studies (Kaliba *et al.,* 2021; Labarta *et al.* 2017; Magesa *et al.,* 2020;

Maredia *et al.,* 2016; Mgeni *et al.,* 2019; Ndimbwa *et al.,* 2019) have been conducted to investigate the agricultural misinformation on crop production among smallholder farmers.

The existing literature has extensively examined the impact of agricultural misinformation on smallholder farmers' crop production, focusing on various aspects such as pesticide use, herbicide management, fertilizer application, crop storage, and weather forecasting. However, despite these efforts, there remains a significant research gap in understanding the comprehensive effects of agricultural misinformation on crop production outcomes. Therefore, this study aims to address this gap by conducting a thorough investigation into the multifaceted impacts of misinformation on smallholder farmers' crop production, considering diverse geographical and socio-economic contexts.

3.3 Methodology

Description of the Study Area

This study was conducted in Mvomero District, Morogoro Region. The district has been selected as to intervene in the digital literacy and misinformation program from Sokoine University of Agriculture with the grants given by Facebook In. These grants have been given purposively for conducting researches in agricultural misinformation among smallholder farmers in Tanzania. Also, because of agricultural misinformation on crop production which has emerged in Mvomero District, it has been among of selected areas. Furthermore, due to its agricultural diversity, rural setting and the potential for addressing local opportunities Mvomero District has been selected for this study.

3.4 Research Design

3.4.1 Description of research design

The cross-sectional research design was adopted in this study, since information was gathered once in Mvomero District to allow

the investigation of multiple causes and multiple results in one single study (Kesmodel, 2018).

3.4.2 Method and data collection

The methods of data collection were qualitative and quantitative. In qualitative, key informants Interview (KII) (the wards extension officers and smallholder farmers' group leaders) were used as method of data collection. The questionnaires were created and face to face interview with the farmers in quantitative research method was used in order to understand a research problem more completely.

3.4.3 Sampling procedure and sample size

The sample size was estimated through the formula suggested by Yamane (1967) at a 99% confidence level, 1% precision level, and population size of 192 smallholder farmers:

$$n = \frac{N}{1+N}$$

Where n is the sample size, N is the population size, and e is the level of precision therefore, the sample size of 192 from three wards of Mlali (n=70), Mzumbe (n=54), and Dakawa (n=68) was determined. The selection criteria for the Key Informant Interview were that the respondents were to be the ward or village extension officer and village or ward agricultural group leader. These were willing to participate in the study and were selected through a simple random sampling for the survey. The 6 Key Informant Interviews who were 3 extension officers and 3 agricultural group leaders were selected purposively from the ward executive offices. The methods of data collection were questionnaires and interviews.

3.4.4 Data processing and analysis

The data which was collected through the questionnaire were entered into the STATA Fver13 software for data cleaning and analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the data. To compare crop production levels of farmers with accurate information

versus misinformation, the Wilcoxon Signed Rank Test was used. Additionally, a binary logistic regression model was used to estimate the effects of agricultural misinformation related to modern technologies (e.g., seed varieties, pesticides, and fertilizer) on crop production. Equation 1 presents the binary logistic regression model;

$$ln\left[\frac{P}{1-P}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \quad \text{.....Equation 2}$$

X_1, X_2, and X_k are the independent variables included in the model as shown in Table 3.1

Table 3.1: List and Definition of Variables included in the model

Variable	Description of Variables Used in Index Scale
Dependent variable	
Crops production: Binary outcome (1/0)	Identified as 0 if a farmer experiences the decrease in crop production when acquire the agricultural misinformation and 1 if a farmer experiences the increase in crop production when acquire agricultural misinformation.
Independent variables	
Seed varieties misinformation	Identified as 1 if yes and as 0 if no
Fertilizers misinformation	Identified as 1 if yes and as 0 if no
Pesticides misinformation	Identified as 1 if yes and as 0 if no
Weather misinformation	Identified as 1 if yes and as 0 if no

The qualitative data collected from key informants via checklist questions, on the other hand, were analyzed using content analysis. To capture the relevant information, the useful information and insights were prepared, organized and reported in content analysis. According to Luo (2019), in content analysis, there is a systematic analysis of the content. Content analysis is a flexible and widely used research technique that can be applied in various fields.

3.5 Results and Discussions

3.5.1 Socio-demographic characteristics of the respondents

Table 3.2 presents a summary of respondents' socio-economic characteristics, whereby the total number of interviewed respondents (n=192) came from three wards which are Mlali (n=70),

Mzumbe (n=54), and Dakawa (n=68). The majority of the respondents were female (65.1%) implying that women are actively involved in agriculture in the study area. The higher number of female respondents is consistent with the findings of a study conducted by Agunga *et al.* (2018) in Tanzania, which reported that women are responsible for up to 80% of household food production. In this study, female respondents were found to be more engaged in income-generating activities to meet their basic needs and often sold food crops to meet their primary needs when their income was insufficient. Moreover, the sex distribution of respondents could be advantageous in terms of agricultural information dissemination, as it allows for joint planning, decision-making, and action within the household.

Table 3.2: Socio-economic characteristics of respondents (n =192)

Variable	Description	Frequency (n)	Percent (%)
District	Dakawa	68	35.4
	Mlali	70	36.5
	Mzumbe	54	28.1
Sex	Male	67	34.9
	Female	125	65.1
Age (years)	18 – 35	72	37.5
	36 – 45	42	21.9
	46 – 65	61	31.8
	Above 65	17	8.8
Education level	No formal education	29	15.1
	Primary education	140	72.9
	Secondary education	18	9.4
	Certificate	2	1.0
	Diploma	2	1.0
	Degree	1	0.5
Marital status	Single	11	5.7
	Married	123	64.1
	Divorced	45	23.4
	Widow/Widower	13	6.8
Family size (members)	Below or equal to 3	60	31.3
	4 to 6	98	51.0
	7 to 10	33	17.2
	Above 10	1	0.5

Regarding the age distribution, the highest number of respondents fell within the age group of 18–35 years (37.5%), followed by the age group of 46–65 years (31.8%). The result implies that the sample population has a relatively balanced age distribution, with a significant number of respondents falling within the younger age group of 18–35 years, followed by the middle-aged group of 46–65 years. These age groups were found to be active and energetic, indicating that these respondents are still physically capable of cultivating crops and making decisions based on agricultural information they receive. This finding is consistent with previous studies by Andersen and Gautam (2016) and Mbwambo *et al.* (2022) that highlight the importance of this age group in farming activities and decision-making processes.

In Table 3.2 the results show that the education level of the respondents was predominantly primary education (72.9%), followed by no formal education (15.1%), then certificate and diploma (1.0%) and finally the degree (0.5%). The implication of this is that the majority of the respondents had low levels of formal education. This may have implications for their ability to access and utilize certain types of information and resources, particularly those that are technical or require a certain level of literacy. It may also have implications for their ability to engage in certain types of livelihood activities that require specialized knowledge or skills. For example, a study by Oduol *et al.* (2018) in Kenya found that farmers with higher levels of education were more likely to adopt improved agricultural practices and technologies than those with lower levels of education. Similarly, a study by Osemeobo *et al.* (2019) in Nigeria found that farmers with higher levels of education were more likely to access and utilize extension services and other sources of agricultural information.

In terms of marital status, the majority of respondents were married (64.1%), implying that households headed by married individuals might be more stable and therefore more likely to accept agricultural

information provided by extension services and agents focused on agricultural issues, as suggested by a study conducted by Atube *et al.* (2021) from Northern Uganda. In Table 3.1 results indicate that the family size of respondents ranged from 1 to 10 members, with the majority of households having 4 to 6 members (51.0%). This implies that the majority of households in the sample have a moderate family size, which can have implications for household food security and resource allocation. With a family size of 4 to 6 members, households may need to produce or purchase a larger quantity of food and other household items compared to smaller households. As a result, they will need to acquire more information related to agriculture.

3.5.2 Reason for using the sources of agricultural misinformation

The results mentioned in Table 3.3 showed that the most common reason for agricultural misinformation is the lack of reliable information, accounting for 49.48% of the cases, while lack of knowledge is the second most frequent reason at 39.58%. The results imply that smallholder farmers often rely on the information available to them. When there is a lack of reliable sources or access to accurate information smallholder farmers may resort to less trustworthy sources. Also, in the absence of verified and accurate information, there is a higher likelihood of misinterpretation and the development of misconceptions farmers might make decisions based on incomplete or outdated information, which can lead to misinformation. Furthermore, in many agricultural communities, information is traditionally passed down through generations. If this information is not backed by scientific research or is outdated, it can lead to the perpetuation of misinformation. Likewise, smallholder farmers often take cues from farmer-farmer, if one farmer relies on unreliable information, it may influence others to do the same, creating a cycle of misinformation within the community. Additionally, access to reliable information can also be influenced by economic factors. If smallholder farmers lack the financial resources to access

advanced agricultural training or technology, they may be more susceptible to misinformation. The results are also in line with Isaya *et al.* (2018), who defined that agricultural misinformation is highly surging and widespread due to most farmers failing to catch up with the expansions in information and technology development. Also, during KII the groups leaders affirmed that, even though the majority have digital devices such as mobile phones and radios but still they cannot use them to access agricultural information due to the lack of knowledge on how to use them on agricultural information. Two of the group leaders pointed out the same thing and said:

> *"The majority of us have mobile phones and radios but we do not have knowledge on how to get agricultural information through these digital devices we have."* (Key Informant, Mlali and Dakawa August 2022).

Table 3.3: Reason for using the sources of agricultural misinformation

Reason	Freq.	Per cent	Cum.
Lack of knowledge	76	39.58	39.58
Lack of reliable information	95	49.48	89.06
Inadequate means and extension services	10	5.21	94.27
Prefer normal and traditions	11	5.73	100
Total	**192**	**100**	

3.6 Effects of Agricultural Misinformation on Crop Production

Misinformation about agriculture can have negative impacts on crop production, particularly through the adoption of inappropriate technologies or practices and the failure to adopt new technologies that could increase yields. The respondents were asked to compare their crop yields when they had access to accurate agricultural information from various sources to when they had little or no information or misinformation to determine the impact of misinformation on agriculture. Maize and paddy were the primary

crops cultivated in the research location. A detailed description focusing on these crops is given in this section.

3.6.1 Effects of agricultural misinformation on maize yields

Table 3.4 presents the result of the Wilcoxon Signed Rank Test assessing the effect of misinformation on maize yields. It presents the mean and standard deviation of maize yields when farmers had accurate information and when they had misinformation on agricultural practices. According to the results, farmers achieved a significantly higher maize yield (mean =4.45) when they had access to accurate information, as opposed to when they relied on misinformation (mean = 1.24). The difference between these means is statistically significant (sig = 0.000), with a standardized test statistic (Z) of 9.441, implying that misinformation on agriculture had a large effect on maize yields.

Table 3.4: Maize yields: A comparison of accurate information vs. misinformation

Maize yields	N	Mean	Std. Deviation	Std. Error Mean	Sig	95% Confidence Interval	
						Lower	Upper
Maize yields with misinformation	192	1.24	2.193	0.143	0.000	0.98	2.42
Maize yields with accurate information	192	4.45	4.969	0.359		3.74	5.11

Standardized Test Statistic (Z) = 9.441

These results imply that accurate information is crucial for achieving high maize yields. Farmers who have access to accurate information about the best practices for maize cultivation are more likely to adopt these practices and achieve higher yields. Conversely, farmers who are misinformed about maize cultivation may adopt inappropriate practices that reduce their yields. Similar studies have also found that access to accurate information is important for achieving high crop yields. For example, a study by Gray and Haines (2016) found that farmers who received accurate information from extension services had significantly higher crop yields than those who did not.

Another study discovered by Löfgren & and Weitzman (2016), found that misinformation can lead to the adoption of inappropriate technologies or practices, which can reduce yields and increase the risk of environmental damage. In summary, the results in Table 3.3 highlight the importance of accurate information for achieving high maize yields, and suggest that efforts to improve access to accurate information could help to improve agricultural crop production and food security.

3.6.2 Effects of agricultural misinformation on paddy yields

In Table 3.5 the results suggest that there is a significant difference between paddy yields with accurate information and paddy yields with misinformation. The mean paddy yield with accurate information (8.76) is much higher than the mean paddy yield with misinformation (2.69), and the difference is statistically significant ($p < 0.000$). These findings suggest that misinformation can have a significant negative impact on paddy yields. The results of the Wilcoxon signed-rank test indicate that misinformation can have a significant negative impact on paddy yields, emphasizing the importance of accurate and reliable information for sustainable agricultural crop production and food security.

Table 3.5: Paddy yields: A comparison of accurate information vs. misinformation

Paddy yields	N	Mean	Std. Deviation	Std. Error Mean	Sig	95% Confidence Interval	
						Lower	Upper
Paddy yields with misinformation	192	2.69	5.018	0.362	0.000	1.99	3.49
Paddy yields accurate information	192	8.76	10.011	0.722		7.32	10.19

Standardized Test Statistic (Z) = 9.553

The implication of these findings on the effects of agricultural misinformation is that accurate and reliable information is essential for improving crop yields and ensuring food security. Misinformation can lead to poor decision-making and suboptimal use of resources,

which can have a detrimental effect on crop yields. Therefore, it is important to provide farmers with access to accurate and reliable information about crop management practices, weather patterns, and market prices, among other things. A study by Osemeobo *et al.* (2019) in Nigeria found that farmers who received accurate and timely information about improved farming practices had significantly higher yields than those who relied on traditional practices or had limited access to information. The study highlighted the importance of extension services and other channels for disseminating accurate information to farmer farmers.

3.6.3 Effects of misinformation of seed varieties, fertilizer and pesticides on crop production

Smallholder farmers (SHFs) seem to get misinformation more on seed seeds, fertilizer, pesticides and whether which affect their crop production. The results from the binary logistic regression showed that the seed varieties, fertilizer and pesticides misinformation coefficient in Table 3.6 is statistically significant at a 5% level of significance (P-value<0.000). Exp(B) for seed varieties is 4.220 which means that farmers who have misinformation on seed varieties are 4.220 times more likely to decrease crop production compared to those who have no misinformation on seed varieties. Also, Exp (B) for pesticide misinformation is 2.973 which means that farmers who find misinformation on pesticides are 2.973 times more likely to decrease crop production compared to the ones who are not misinformed on pesticides. Also, Exp(B) for fertilizers misinformation is 3.649 which means that farmers who have misinformation on fertilizers are 3.649 times more likely to decrease crop production compared to ones who have no misinformation on fertilizers. Furthermore, Exp (B) for weather misinformation is 1.570 which in common sense and experience shows that misinformation on weather on crop production. These results may indicate that smallholder farmers do not always recognize the effects of agricultural misinformation on the weather because of factors like limited access to accurate and timely weather information. They may

not be aware of the misinformation or have access to alternative sources of accurate weather forecasts. Also, many smallholder farmers rely on traditional knowledge and local practices for weather prediction. They may not realize that the misinformation they encounter is inaccurate, especially if it aligns with their existing beliefs. This study is consistence with a study prepared by Kahimba *et al.* 2015, who acknowledged that the misinformation on weather may have short, medium and long-term effects on crop production even though not always farmers recognize these effects.

Table 3.6: Binary regression results: Effects of Agricultural Misinformation on Crop Production to SHF.

Parameters	β	S.E.	Wald	df	Sig.	Exp(β)	95% C.I.for EXP(B) Lower	Upper
Fertilizer Misinformation	1.293	0.373	12.044	1	0.001***	3.645	1.756	7.568
Seed varieties Misinformation	1.440	0.381	14.259	1	0.000***	4.220	1.999	8.911
Pesticides Misinformation	1.090	0.385	8.006	1	0.005***	2.973	1.398	6.325
Weather Misinformation	0.451	0.366	1.517	1	0.218	1.570	0.766	3.217
Constant	-1.798	0.352	26.119	1	0.000***	0.166		

Note for the model:
1. Model fitting information: Omnibus test (Chi-square=76.479, df=4 and P-value=0.000)
2. Goodness of fit: Hosmer and Lemeshow test (Chi-square=8.002, df=7 and P-value=0.332)
3. Coefficient of variation: -2 log likelihood=185.022, Cox&Snell R2=0.330 and Negelkerke R2=0.442
4. Model classification: Overall 80.6% Correct specified

3.7 Conclusion and Recommendations

3.7.1 Conclusion

The lack of reliable information is a significant source of agricultural misinformation as when smallholder farmers lack access to accurate information, they become vulnerable to adopting erroneous practices, which can undermine crop production. The absence of reliable information can lead to resistance to adopting modern seeds, equipment and innovative farming techniques, hindering

progress in crop production. Furthermore, smallholder farmers may miss out on economic opportunities due to agricultural misinformation, resulting in reduced income and financial instability.

The effects of agricultural misinformation on seed varieties, fertilizers, and pesticides can significantly impact crop production in several was such crop yield reduction. Misinformation can lead smallholder farmers to choose inappropriate seed varieties, fertilizers, or pesticides, resulting in reduced crop yields and economic losses. Also, there will be poor decision making based on misinformation which can increase input costs and decrease return, affecting the financial wellbeing of smallholder farmers. Furthermore, misuse or overuse of fertilizers and pesticides due to misinformation can harm the environment, causing soil degradation, water contamination and damage to non-target species. Likewise, inaccurate information on pesticide use can lead to health risks for smallholder farmers when unsafe practices are adopted. These can influence agricultural misinformation on crop production among smallholder farmers.

3.7.2 Recommendations

To address these challenges, it is imperative to invest in agricultural extension services and education to ensure that smallholder farmers have access to accurate and up-to-date information. Also, science-based agricultural practices should be promoted through partnerships with research institutions and government agencies. There should be the encouragement of the use of reliable sources of agricultural information, such as agricultural experts, reputable publications and agricultural extension programs. Moreover, it is important to utilize technology and digital platforms to disseminate accurate information to a wider audience of smallholder farmers. By addressing the lack of reliable agricultural information, the mitigation of the spread of agricultural misinformation could be minimized and support sustainable and environmentally responsible farming practices. Furthermore, to mitigate these effects of agricultural

misinformation smallholder farmers should be encouraged to consult with agricultural experts and use reliable information sources such as extension officers. By addressing agricultural misinformation and providing smallholder farmers with the knowledge they need, there will be enhancement of crop production, safeguarding food security and the protection of the environment. In addition, the information on seed varieties, fertilizers and pesticides should be available and the price should be uniform in agro dealers' shops. On the price aspect, the government may find the possibility of having government grant prices whereby smallholder farmers can afford to pay after harvesting their crops. If these concerns will be taken in to consideration they can bring the solutions to smallholder farmers on how to minimize agricultural misinformation and improve crop production.

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CHAPTER FOUR

4.0 GENERAL DISCUSSION

This study aimed to examine the influence of agricultural misinformation on crop production among smallholder farmers in Mvomero District. The study identified sources of agricultural information and the level of smallholder farmers' knowledge of agricultural misinformation. Also, the study analysed the effects of agricultural misinformation on crop production among these smallholder farmers.

Smallholder farmers rely on a variety of sources for agricultural information such as farmer-farmer knowledge, extension officers and digital devices. Peer learning plays a vital role in rural communities. Smallholder farmers often learn from their fellow farmers who have experience in similar crop production and practices. This informal knowledge sharing can be highly effective if the information given is accurate, as it is context-specific and based on local conditions and challenges. Furthermore, extension officers are crucial in providing farmers with scientific knowledge and best practices. Extension officers who are trained experts offer guidance on crop management, pest control, soil health and more. They bridge the gap between research institutions and farmers, helping disseminate relevant information. Likewise, digital devices and technology such as mobile phones, and smartphones have become valuable tools for smallholder farmers, mobile apps and websites offer access to weather forecasts, market prices and agricultural tips. Text messages and social media can be used for communication and knowledge sharing.

The knowledge gap among smallholder farmers can make them vulnerable to agricultural misinformation. Due to the level of knowledge of smallholder farmers, there are often challenges in accessing accurate information, leading to susceptibility to agricultural misinformation. This creates a fertile ground for the

spread of agricultural misinformation. Furthermore, smallholder farmers may face challenges in accessing accurate and timely information due to limited resources and connectivity. This can lead to reliance on local rumors or outdated practices and contribute to the spread of agricultural misinformation within their communities.

Agricultural misinformation can be detrimental to smallholder farmers, leading to poor crop production management. Misinformation can lead smallholder farmers to choose inappropriate seed varieties, fertilizers, or pesticides, resulting in reduced crop yields and economic losses. Misinformation in agriculture can result in suboptimal farming practices, affecting crop yields and quality for smallholder farmers. Furthermore, false guidance on irrigation, the use of seed varieties, fertilizers or pesticides can lead to financial losses and decreased crop production. It underscores the importance of reliable agricultural extension services and access to accurate agricultural information for sustainable farming.

CHAPTER FIVE

5.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Agricultural information is vital for the prosperity of the farming community and the global food supply chain. However, the abundance of information available, combined with the proliferation of misinformation, presents challenges to smallholder farmers. The sources of agricultural information are diverse, but the challenge lies in ensuring their accuracy and accessibility. The low level of knowledge of smallholder farmers leads them to agricultural misinformation. Inadequacy in access to the right agricultural information for farmers including modern technologies (seed varieties, fertilizers and pesticides) and limited agricultural extension to support farmers could lead to low production. Addressing agricultural misinformation requires collective efforts from various stakeholders, including governments, educational institutions, and the agricultural industry. These are substantial impacts of agricultural misinformation on the livelihoods of farmers, food security and sustainability of agricultural production.

5.2 Recommendations

to avoid agricultural misinformation this study recommends that smallholder farmers should be educated about trusted sources of agricultural information, such as government agricultural extension services, reputable agricultural websites and local agricultural experts. There should be enough initiatives by LGA and development actors to create awareness among smallholder farmers on digital literacy, enabling them to identify credible sources and agricultural channels such as Radio, Television, mobile phones, phone smartphone and extension officers. The LGAs should ensure closer monitoring of ward and village extension officers to ensure that they reach farmers regularly. Furthermore, information on seed varieties, fertilizers and pesticides should be available and the price should be uniform in agro dealers' shops including the availability

and use of government subsidies to assist farmers in accessing such needy services. Moreover, there should be collaboration with agricultural non-governmental organizations (NGOs) that can help disseminate accurate information, provide training, and support smallholder farmers in adopting sustainable and effective farming practices. Likewise, implementation systems for monitoring and evaluation of the impact of misinformation on smallholder farmers' livelihoods. Additionally, the fostering of farmer-farmer knowledge transfer should be considered. It is good to encourage experienced smallholder farmers to mentor and share their knowledge with others in their community. This peer-to-peer sharing can be a valuable source of accurate information.

APPENDICES

Appendix 1: List and Definition of Variables

Variable type	Variable name	Measurement	Scale
Dependent	Access to reliable agricultural information	Farmers were asked to Rate access to reliable information in 5 ordered points: 1=very poor, 2=poor, 3=fair, 4=good and 5=very good. During analysis the variable was categorized into three ordered points: 1= very poor and poor as “Poor”, 2=fair and 3=very good and good as “Good”.	Ordinal
Independent	Frequency uses of the agricultural information sources (X1)	Farmers were asked to rate of their frequency uses of the agricultural information sources in 5 ordered points: 1= never, 2= occasionally, 3= sometimes, 4= often	ordinal
	Knowledge of misinformation (X2)	Farmers were asked to Rate access to reliable information in 5 ordered points: 1=very poor, 2=poor, 3=fair, 4=good and 5=very good. During analysis the variable was categorized into three ordered points: 1= very poor and poor as “Poor”,	Ordinal

		2=fair and 3=very good and good as “Good”.	
	Age (X3)	The total number of years a farmer from the birth to the date interview took place which was classified at the interval of ten years;(1=18-35, 2=36-45, 3=46-65 and 65+)	Nominal
	Education (X4)	Level of education a farmer is reached 1=no formal education, 2=primary, 3=secondary, 4=certificate, 5=Diploma and 6=Degree	Nominal
	Marital status (X5)	The marital status of the farmer 1=single 2=married 3=divorce 4=widow	Nominal
	Family size (X6)	The number of people lived in the family 1=below 3, 2=4-6, 3=7-10 and 4=above 10	Nominal

Appendix 2: Questionnaire and checklist questions

I: Questionnaire

SECTION A: Basic Information

1) **Ward**_____
2) **Village**_____

SECTION B: Socio-demographic characteristics of smallholder farmers

3) Gender	**4) Age**	**5) Marital Status**	**6) Educational Level**
1) Male ☐ 2) Female ☐	Age in Years: ……	1) Single ☐ 2) Married ☐ 3) Divorced ☐ 4) Widowed ☐ 5) Widower ☐	1) No formal Education ☐ 2) Primary Education ☐ 3) Secondary Education ☐ 4) Certificate ☐ 5) Diploma ☐ 6) Degree and Above ☐

7) Household Members	**8) Land Ownership**	**9) Income**
Number of family Members:……	In Acres: ……	In Tshs Per Month: ……

10. What are sources of your livelihood/income generating activities (*Tick all that apply*)
    1. Food Crops Selling ☐
    2. Cash Crops Selling ☐
    3. Livestock Selling ☐
    4. Pet cash ☐
    5. Livestock Products Selling ☐
    6. Government Employee ☐
    7. Private Company Employee ☐

11. What common crops are grown in your area?

1. Food Crops	2. Cash Crops
1…….	1……...
2…….	2……
3…….	3……...

SECTION C: Sources of Agricultural Information among Small Holder Farmers

12. Do you have access to agricultural information? *(Tick √ Appropriated)*
    1) Yes ☐
    2) No ☐

13. How do you access agricultural information? (*Tick all that apply*)
    1) Through Radio ☐
    2) Through Television ☐
    3) Through Mobile phone ☐
    4) Through Smartphone ☐
    5) Extension officers ☐
    6) Farmers – farmers ☐
    7) Other sources *(specify*) ……

14. What kind of agricultural information do you always access from the source you mentioned above? (*Tick all that apply*)
    1) Improved seed varieties ☐
    2) Pesticides ☐
    3) Fertilizers, ☐
    4) Modern equipment ☐
    5) Other (*specify*) …… ☐

15. Do you own any tool of accessing agricultural information? *(Tick √ Appropriated)*
    a) Yes ☐
    b) No ☐

16. What type of tool do you own? (*Tick all that apply*)
    1) Radio ☐
    2) Television ☐
    3) Mobile phone ☐
    4) Smartphone ☐
    5) Other …… ☐

17. How frequently do you use each of the tools you mention above in the previous Month?

1) Never ☐
2) Occasionally ☐
3) Sometimes ☐
4) Often ☐
5) Always ☐

18. Do you use the tools that you have to access agricultural information?

1) Yes ☐
2) No ☐

19. If no, please explain why.

……
……
……
……

20. Apart from getting agricultural information from the sources mentioned above, who else share agricultural information with you? (*Tick all that apply*)

1) Traditional leaders ☐
2) NGOs around the area ☐
3) Other (*mention*) ……. ☐
4) None ☐

21. What do you think is the most reliable source of getting agricultural information?

……
……
……

SECTION D: Smallholder Farmers' Knowledge of Agricultural Misinformation

22. How would you prefer to get agricultural information? (*Tick all that apply*)

a) Through Radio ☐
b) Through Television ☐
c) Through Mobile phone ☐
d) Through smartphone ☐
e) Extension officers ☐
f) Farmers – farmers ☐
g) Through Other (mention)…… ☐

Why……?

23. Do you know about agricultural misinformation?

Yes ☐
No ☐

24. If yes, how would you rate your knowledge of understanding misinformation on agriculture?

iv) Very poor ☐
v) Poor ☐
vi) Fair ☐
vii) Good ☐
viii) Excellent ☐

25. a) Have you ever come across with misinformation on agriculture? (*Tick √ Appropriated*)

1) Yes ☐
2) No ☐

b) If yes, what type of agricultural misinformation did you notice?

……
……
……
……

c) How did you notice if it is agricultural misinformation?

……
……
……
……

d) If no, explain how you never come across with misinformation on agriculture? .....
……
……

26. How would you rank your level of knowledge on the processes to acquire reliable information concerning agriculture (*please tick √ as appropriate)*

S/N	**Process**	**Very poor**	**Poor**	**Fair**	**Good**	**Excellent**
1.	Finding information					
2.	Accessing information					
3.	Evaluating information					
4.	Interpreting information					
5.	Using information					

27. Do you get information on new technology such as appropriate seeds, fertilizers, pesticides and modern equipment?

iv) Yes ☐
v) No ☐

28. How would you rate the information you get concerning new technology?

S/N		Very poor	Poor	Fair	Good	Excellent
1.	Seeds					
2.	Fertilizers					
3.	Pesticides					
4.	Modern equipment					

29. Have you ever attended any course/seminar/workshop on access to agricultural information? *(Tick √ Appropriated)*

1) Yes ☐
2) No ☐

30. How frequently do you get chances to attend trainings to get agricultural information, and gain knowledge on agricultural misinformation? *(Tick √ Appropriated)*

1) Never ☐
2) Occasionally ☐
3) Sometimes ☐
4) Often ☐
5) Always ☐

31. Assessing smallholder farmers' awareness of agricultural misinformation. *(Tick √ Appropriated)*

S/N	Statement	Yes	No
1.	I find easy-to-access agricultural information		
2.	I own sources of accessing agricultural information		
3.	I get reliable information concerning crop production		
4.	I often attend trainings concerning agriculture		
5.	I can use technology to access agricultural information		
6.	I can access information on using new technology such as appropriate seed seed seeds, fertilizers & and pesticides for crop production		
7.	Using reliable sources help me to get reliable information on crop production		
8.	I recognise that using reliable information helps to increase crop production		
9.	I access agricultural information frequently		
10.	I can understand agricultural information on sources of information		
11.	I can make a decision with the information I get on crop production		
12.	I know benefits and shortcoming of agricultural information I get		
13.	I can judge whether the agricultural information I get is right or wrong		

SECTION E: The Different of Crop Production to Smallholder Farmers Due to the Level of Agricultural Misinformation

32. Do you use the reliable sources to acquire information concerning crop production? *(Tick √ Appropriated)*

1) Yes ☐
2) No ☐

33. If you answered yes in the question above, do you think the information acquired is reliable? (*Tick √ Appropriated*)

1) Yes ☐
2) No ☐
3) I'm not sure ☐
4) I don't know ☐

34. Are there any chances of getting the agriculturalagricultural misinformation? *(Tick √ Appropriated)*

1) Yes ☐
2) No ☐
3) I'm not sure ☐
4) I don't know ☐

35. Have you ever gotten agricultural misinformation on crop production? (*Tick √ Appropriated)*

1. Yes ☐
2. No ☐

36. If yes, what was it about? (*please explain*)

……
……
……
……
……
……
……

37. What do you think are the causes of agricultural misinformation? (*Tick all that apply*)

S/N	Cause	
1.	Lack of reliable information sources	
2.	Lack of knowledge on how to use technology	
3.	Lack of knowledge on how to access the right information	
4.	Inadequate extension officers	
5.	Prefer to norms and traditions	
6.	Preference to get information from farmers – farmers	
7.	Poor internet connection	
8.	Poor means of communication	
9.	Low influential on using digital means to access agricultural information	

38. Did the agricultural misinformation you acquired, had any impact on crop production? *(Tick √ Appropriated)*

1) Yes ☐
2) No ☐

39. If you answered yes in the above question, please explain how or mention the impacts

……
……
……
……
……

40. From your point of view, among other factors, do you think agricultural misinformation can lead to poor crop production? *(Tick √ Appropriated)*

1) Strongly agree ☐
2) Agree ☐
3) Neither agree nor disagree ☐
4) Disagree ☐
5) Strongly disagree ☐

41. Do you think because of getting unreliable information on new technology such as appropriate seed, fertilizers, pesticides and modern equipment there is low production? *(Tick √ Appropriated)*
    1) Yes ☐
    2) No ☐

42. If you obtained information more often on reliable sources of information do you think your crop production would improve? *(Tick √ Appropriated)*
    1) Strongly Agree ☐
    2) Fairly Agree ☐
    3) Can't agree or Dis-agree ☐
    4) Disagree ☐
    5) Strongly Dis-agree ☐

43. Do you consider yourself literate in terms of accessing and using agricultural information? (*Tick √ Appropriated*)
    1) Yes ☐
    2) No ☐

44. Considering the past five years (or when you have had a good exposure to agricultural information) has your production per unit area changed?

Kindly Provide Your Best Estimate on the Production of the Following Crops

S/N	**Crops**	**Yield per acre Before (Less access to Agric Info/access to Misifo)**	**Yield per acre After (Better access to Agric Info)**

II: Checklist for Key Informant Interviews

A: Agricultural Group Leaders:

Name……. Sex:

Title……Mobile No…..……

Name of Group……..... Ward…….

S/N	Items	
01.	What kind of agricultural activities your group is currently involved in? 1. Food Crops …… …… …….. 2. Cash Crops …… …… ……..	
02.	What is the status of your group in terms of production and membership? *(Tick √ Appropriated)* 1. Very Poor ☐ 2. Poor ☐ 3. Fair ☐ 4. Good ☐ Excellent ☐	
03.	What strategies do you employ to ensure group members knowledgeable on agricultural information? *(Tick all that apply)* a) By Attending Trainings ☐ b) By Owning Television ☐ c) By Owning Smart phone ☐ d) Working with Extension office ☐ e) Using Farmers – farmers ☐ f) Through Other (mention)……. ☐	
04.	What are the most common sources of obtaining/sharing information employed by your group? 1) Through Radio ☐ 2) Through Television ☐ 3) Through Mobile phone ☐ 4) Through smartphone ☐ 5) Extension officers ☐ 6) Farmers – farmers ☐ 7) Other sources *(specify)* …… ☐	
05.	What type of misinformation does your group get on agriculture? 1) Improved seeds varieties ☐ 2) Pesticides ☐ 3) Fertilizers ☐ 4) Modern equipment ☐ 5) Other (*specify*) …… ☐	

06.	How easy has it been in obtaining agricultural information? *(Tick √ Appropriated)* **1)** Very poor ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐	
07.	What are the effects associated with the misinformation you get from the sources you mentioned? (*Tick all that apply*) a) Improved seeds varieties 1) Very poor ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐ b) Pesticides 1) Very poor 2) Poor 3) Fair 4) Good ☐ 5) Excellent ☐ c) Fertilizers ☐ 1) Very poor ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐ d) Modern equipment 1) Very poor ☐ 2)Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐	
08	Do you think with the sources and information you need you are vulnerable to misinformation as a group? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐	
09.	From your point of view, among other factors, do you think agricultural misinformation can lead to poor crop production? *(Tick √ Appropriated)* 1) Strongly agree ☐ 2) Agree ☐ 3) Neither agree nor disagree ☐ 4) Disagree ☐ 5) Strongly disagree ☐	
10.	Do you think because of getting unreliable information on new technology such as appropriate seed, fertilizers, pesticides and modern equipment there is low production to your group? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐	
11.	If you obtained information more often on reliable sources of information, do you think your group crop production would improve? *(Tick √ Appropriated)* 1) Strongly Agree ☐	

	2) Fairly Agree ☐ 3) Can't agree or Dis-agree ☐ 4) Disagree ☐ 5) Strongly Dis-agree ☐	
12.	What challenges do you go through as a group on accessing agricultural information?.....	
13.	Do you have any policy implantation that enables you to access agricultural information? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐ If yes, can you explain how you think they enable you?	

14. Considering the past five years (or when you have had a good exposure to agricultural information) has your production per unit area changed?

Kindly Provide Your Best Estimate on the Production of the Following Crops

S/N	Crops	Yield per acre Before (Less access to Agric Info/access to Misifo)	Yield per acre After (Better access to Agric Info)

B: Ward Extension/Agricultural Officers

Name…… Sex: ……

Title……Mobile No ……..…….

Village…….....

Ward…….

S/N	Items	
01.	How long have you been in this village/ward/district? (Years)……	
02.	What are the most common sources of obtaining/sharing information employed by the smallholder farmers in your ward? 1) Through Radio ☐ 2) Through Television ☐ 3) Through Mobile phone ☐ 4) Through phone phone ☐ smartphone ☐ 5) Extension officers ☐ 6) Farmers – farmers ☐ 7) Other sources *(specify*) ……☐	
03.	What kind of agricultural activities the smallholder farmers in your ward are currently involved in? 1. Food Crops 2. Cash Crops …… …… ……. …… …….. ……..	
04.	What is the status of smallholder farmers in your ward in term of crop production? *(Tick √ Appropriated)* 1. Very Poor☐ 2. Poor ☐3. Fair ☐ 4. Good ☐ 5. Excellent☐	
05.	What strategies do you employ to ensure smallholder farmers are knowledgeable about agricultural information? *(Tick all that apply apply apply***)** a) By Attending Training b) By Owning Television ☐ c) By Owning Smartphone Smartphone Smartphone ☐ Smartphone phone d) Working with Other Agri. Officers ☐ e) Using Farmers – farmers f) Through Other (mention)……☐	

06.	What reliable sources of information do you use to disseminate agricultural information to the farmers? 1) Through Radio ☐ 2) Through Television ☐ 3) Through Mobile phone ☐ 4) Face to Face ☐ 5) By using other Agri. officers ☐ 6) Other Farmers – farmers 7) Other sources *(specify)* …… ☐	
07.	What type of misinformation do smallholder farmers get on agriculture in your area? 1) Improved seed varieties ☐ 2) Pesticides ☐ 3) Fertilizers ☐ 4) Modern equipment ☐ 5) Other (*specify*) …… ☐	
08.	How easy has it been to obtain agricultural information in your ward? *(Tick √ Appropriated)* 1) Very poor ☐ 2) Poor ☐ Fair ☐ 4) Good ☐ 2) 5) Excellent ☐	
09.	What are the effects associated with the misinformation you get from the sources you mentioned? (*Tick all that apply*) a) Improved seed varieties1) Very poor ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐ b) Pesticides ☐ 1) Very poo ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐ c) Fertilizers 1) Very poor ☐ 2) Poor ☐ 3) Fair ☐ 4) Good ☐ 5) Excellent ☐ d) Modern equipment 1) Very poor ☐ 2)Poor ☐ 3)Fair ☐ 4) Good ☐ 5) Excellent ☐	
10.	Do you think with the sources and information the smallholder farmers need they are vulnerable to misinformation? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐	
11.	From your point of view, among other factors, do you think agricultural misinformation can lead to poor crop production in your area? *(Tick √ Appropriated)* 3) Strongly agree ☐	

	4) Agree ☐ 5) Neither agree nor disagree ☐ 6) Disagree ☐ 7) Strongly disagree disagree I agree ☐	
12.	Do you think because of getting unreliable information on new technology such as appropriate seed, fertilizers, pesticides and modern equipment there is low production to your area? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐	
13.	If the smallholder farmers obtain information more often from reliable sources of information, do you think their crop production would improve? *(Tick √ Appropriated)* 1) Strongly Agree ☐ 2) Fairly Agree ☐ 3) Can't agree or Dis-agree ☐ 4) Disagree ☐ 5) Strongly agree agree disagree ☐	
14.	What challenges do you go through as the ward agricultural officer on accessing agricultural information for smallholder farmers? ……..... .....…… ……..	
15.	Do you have any policy implantation that enables you to access agricultural information? *(Tick √ Appropriated)* 1) Yes ☐ 2) No ☐ If yes, can you explain how you think they enable you?	

16. Considering the past five years (or when you have had a good exposure to agricultural information) has the crop production to smallholder farmers per unit area changed?

Kindly Provide Your Best Estimate on the Production of the Following Crops

S/N	Crops	Yield per acre Before (Less access to Agric Info/access to Misifo)	Yield per acre After (Better access to Agric Info)

THANK YOU FOR YOUR INVOLVEMENT

Kuhusu Tasnifu Hii

Ili kuwa na mendeleo ya kilimo chenye tija upatikanaji wa taarifa za kilimo za kuaminika kwa wakulima ni muhimu sana. Ushahidi wa utafiti umeonyesha kuwa taarifa potofu za kilimo kuhusu uzalishaji wa mazao zipo miongoni mwa wakulima wadogo nchini Tanzania. Utafiti huu uliofanyika katika Wilaya ya Mvomero ulichunguza athari za taarifa potofu za kilimo juu ya uzalishaji wa mazao miongoni mwa wakulima wadogo. Hasa, utafiti huo ulibainisha vyanzo vya habari za kilimo, kiwango cha maarifa kati ya wakulima wadogo kuhusu taarifa potofu za kilimo, na athari za taarifa potofu za kilimo juu ya uzalishaji wa mazao kwa wakulima wadogo. Utafiti huu unaonyesha kwamba wakulima wadogo hawana elimu ya namna ya kupata taarifa za kilimo cha uhakika kupitia vyanzo sahihi. Kutokana na hili, ni muhimu kushughulia taarifa potofu za kilimo, hasa miongoni mwa wakulima wadogo ambao wanategema sana taarifa sahihi za kilimo kwa ajili ya kuboresha maisha yao kwa ujumla. Pia, ni muhimu kuelewa kwamba vyanzo na athari za taarifa potofu vinapojulikana kunaweza kusaidia kuweka afua madhubuti ili kuboresha uzalishaji wa mazao na matokea ya jumla kwenye kilimo.