Sources and Knowledge of Smallholder Farmers in Agricultural Information in Mvomero District, Tanzania: Where Does Misinformation Originate?

Sandy, N.J.[1]*, F. Salehe[2] and M. Magesa[3]

[1]Department of Policy Planning and Management, College of Social Sciences and Humanities, Sokoine University of Agriculture, P.O. Box 3035 Morogoro, Tanzania.
[2]Department of Development and Strategic Studies, College of Social Sciences and Humanities, Sokoine University of Agriculture, P.O. Box 3024 Morogoro, Tanzania.
[3]Department of Informatics and Information Technology, College of Nature and Applied Science, Sokoine University of Agriculture, P.O. Box 3015 Morogoro, Tanzania.

***Corresponding author email:** *niwaely@yahoo.com*

Abstract

This study examined the access to sources and knowledge of smallholder farmers in agricultural information in Mvomero District, Tanzania, and identified the origin of misinformation among these farmers. The study employed a mixed-methods approach, including a survey of 192 smallholder farmers and interviews with agricultural extension officers and key informants. The study adopted a cross-sectional research design involving both qualitative and quantitative research methods through key informant interviews and questionnaires respectively. 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 phones, smartphones, and extension officers, and this may be a problem in accessing the reliable agricultural information. Additionally, the study revealed that misinformation among smallholder farmers originates from various sources, including fellow farmers, traditional beliefs, and inadequate agricultural extension services. The study recommends interventions to improve smallholder farmers' access to agricultural information, including expanding communication channels and improving agricultural extension services, to mitigate the spread of misinformation.

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

Introduction

Most developing countries depend on the Agricultural sector for various purposes to reduce poverty through raising income and improving food security as 80% of the world's poor live in rural areas and mainly depend on farming (World Bank, 2021). 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 to increase production efficiency and income for better standard of living to the farmers. The extension system is largely important catalyst for agricultural growth (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 comprise up to 83% of the national population and contribute 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. This misinformation 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). 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 resources 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, 2017). 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 smallholder farmers are knowledgeable about agricultural misinformation.

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.

The Indigenous Knowledge Theory suggests that traditional knowledge systems and practices, which have been developed and passed down through generations within a specific cultural context, can provide valuable insights and solutions to contemporary challenges in various fields, including agriculture (Zhang & Nakagawa, 2018).

In the context of this paper, the Indigenous Knowledge Theory implies that smallholder farmers in Mvomero District possess a wealth of knowledge and expertise in traditional farming practices that help to improve agricultural productivity and sustainability.

However, the article suggests that smallholder farmers in Mvomero District face challenges in accessing reliable sources of information and knowledge, leading to the spread of misinformation. This is due to factors such as limited access to modern technologies, inadequate extension services, and cultural barriers.

To address these challenges, the article recommends the development of strategies to promote the exchange of knowledge and expertise between smallholder farmers and agricultural experts, as well as the use of appropriate communication technologies to disseminate reliable information and knowledge. By leveraging both traditional and modern knowledge systems, it is possible to

improve agricultural practices and enhance the livelihoods of smallholder farmers in Mvomero District and beyond.

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 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 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.

Methodology

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 06oC 26' south and longitude 37 oC 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) (Fig. 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 used to 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).

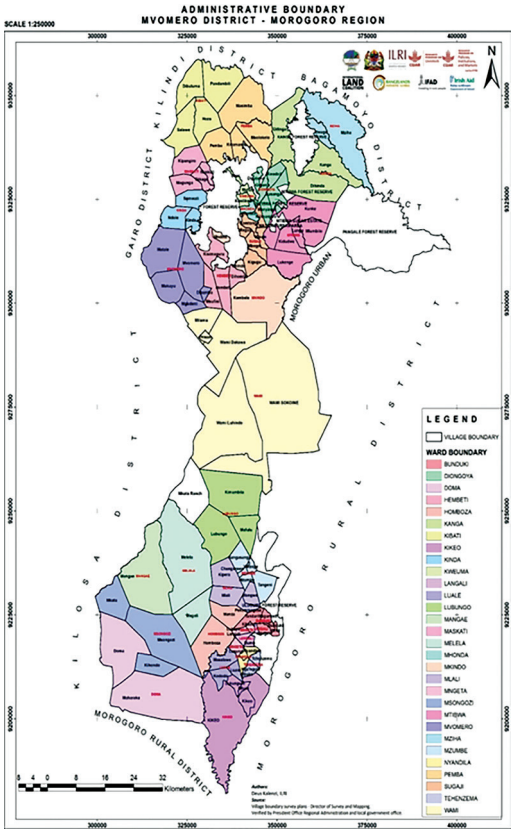

Figure 1: A map of Mvomero District showing the administrative boundary in the Morogoro region including wards of Mlali, Mzumbe & Dakawa
Source: Kalenzi (2018)

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.

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

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;

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

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

Whereby;
logit(p) = Logit link function
p = Probability that farmers have high access reliable agricultural information
β_0 = Intercept
β_1-β_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 Appendix 1)

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

Table 1: Proportionate of Smallholder farmers' sample (n=192)

NO.	Ward	Stratum size	Proportional size	Sample Size
1	Mlali	22197	(22197/60884)*192	70
2	Mzumbe	17124	(17124/60884)*192	54
3	Wami Dakawa	21563	(21563/60884)*192	68
	Total	**60884**	**60884**	**192**

Source: (URT, 2021)

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

Results and Discussion

Socio-economic and demographic characteristics of smallholder farmers

Table 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).

Age of respondents

The Table 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

Table 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

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.

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), 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.

Sex of respondents

The results in Table 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).

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, 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).

Table 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

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 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

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.

Frequency uses of sources of agricultural information

Figure 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,

"We usually get and share agricultural information through farmer – farmer" (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).

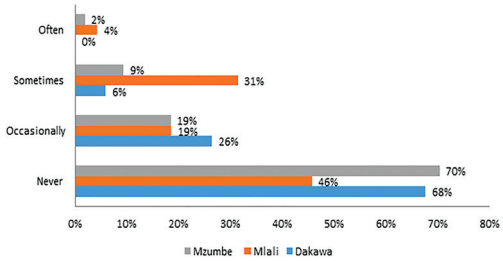

Figure 2: Frequency of using the digital devices to access agricultural information

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 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.

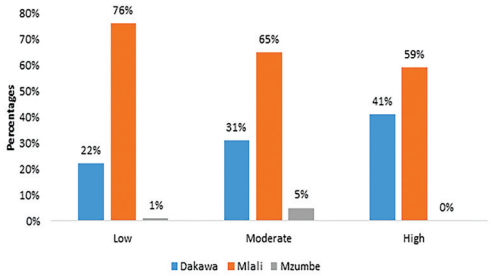

Figure 3: Knowledge level on understanding misinformation

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 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 4. 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 officer, 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, Mzumbe, 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).

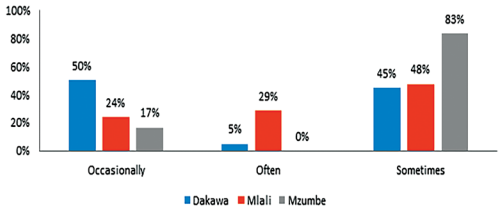

Figure 4: Frequency of attending courses/ seminars/workshops

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 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 ways 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 Jonas 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.

"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

Table 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**

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 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 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

Table 5: Ordinal logistic regression results: factors influencing farmers' access to reliable agriculture information

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	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]	0a			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]	0a			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+]	0a			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]	0a			0			

> 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 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.

Conclusion and Recommendations

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.

Recommendations

This study recommends 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.

References

Aker, J.C., Hidrobo, M., Palloni, G., Gilligan, D.O., & Ledlie, N. (2022). Paying for digital information: Assessing farmers' willingness to pay for a digital agriculture and nutrition service in Ghana. *Economic Development and Cultural Change,* 70(4), 1367-1402.

ALGIN, (2022). Source Map - Tanzania – ALIGN. [https://align-tool.com/source-map/Tanzania] site visited on 12/08/2022.

Cervantes-Godoy, D., & Dewbre, J. (2010). Economic importance of agriculture for poverty reduction. OECD. Food, Agriculture and Fisheries Working Papers. 37pp.

Daum, T., Villalba, R., Anidi, O., Mayienga, S. M., Gupta, S., & Birner, R. (2021). Uber for tractors? Opportunities and challenges of digital tools for tractor hire in India and Nigeria. *World Development,* 144, 1-11.

Kalenzi, D.P. (2018) Villages with land use plan in Mvomero District, Morogoro region. Nairobi, Kenya: ILRI. [https://cgspace.cgiar.org/handle/10568/102254] site visited on 18/09/2021.

Kiptot, E., Franzel, S., & Heijs, J. (2017). Mobile phone use among smallholder farmers: opportunities and constraints, Agricultural and rural livelihoods in developing countries, pp. 331-340

Kitchin, R. (2009). International encyclopedia of human geography. National institute of regional and spatial analysis (nirsa), John Hume Building, national university of Ireland, Maynooth, County Kildare, Ireland. [https://www.sciencedirect.com] site visited on 12/09/2021.

Jonas, A., & Brown, K. (2019). "The impact of Farmer Networks on Agricultural Information Exchange: Evidence from Case Study." Agricultural Economics Review, 21(2), 145-162.

Lopes, M.C., & Kovács, I. (2010). Employment and sustainable development: education, training and R&D in the regulation of the labour market.

Lwoga, E.T., Stilwell, C., & Ngulube, P. (2011). Access and use of agricultural information and knowledge in Tanzania. Library Review, 60(5), 383-395.

Mgendi G., Mao S., & Qiao F. (2021). Is a Training Program Sufficient to Improve the Smallholder Farmer's Productivity in Africa? Empirical Evidence from a Chinese Agricultural Technology Demonstration Center in Tanzania. *Sustainability,* 2021, 1-10.

Misaki, E., Apiola, M., Gaiani, S., & Tedre, M. (2018). Challenges facing sub-Saharan small-scale farmers in accessing farming information through mobile phones: A systematic literature review. *The Electronic Journal of Information Systems in Developing Countries*, 84(4), 1-12.

Mkiki, Z.H., & C.P. Msuya (2020). Agricultural Extension Officers' Perception towards their Roles: A Case Study of Simiyu Region. *African Journals Online,* 2020, 1-15.

Mlozi, M.R.S., Abdullahi, H. A., & Nzalayaimisi, G.K. (2015). Determinants of Students' Academic Achievement in Agricultural Sciences: A Case Study of Secondary Schools in Katsina State, Nigeria. *African Educational Research Journal,* 3(1), 80-88.

Modibo, K., Nthoiwa, G. & Tselaesele, N.M. (2010). An evaluation of factors that hinder subsistence farmers from diverting to profitable farming in Botswana: A lesson for extension officers.

Mshenga, P., Mwambi, M.M., Oduol, J., & Saidi, M. (2016), "Does contract farming improve smallholder income? The case of avocado farmers in Kenya" *Journal of Agribusiness in Developing and Emerging Economies,* 6(1), 2-20.

Mulhall, A.E., & Garforth, C. J. (2000). Equity Implications for Reforms in the Report on Research Project R6470 to the Department for International Department, the University of Reading. 45pp.

Muyobozi, S., Peter, D.K., Xu, S., Yu, W., & Sary, S. (2021). Reliability of the agricultural extension and technological services among rice farmers in the rural areas of Tanzania. *Journal of Agricultural Extension,* 25(2), 18-31.

Mwamakimbula, A.M. (2014). Assessment of the factors impacting agricultural extension training programs in Tanzania: a descriptive

study (Doctoral dissertation, Iowa State University).

Ndimbwa, T., Ndumbaro, F., & Mwantimwa, K. (2019). Delivery Mechanisms of Agricultural Information and KnowledgeKnowledge to Smallholder Farmers in Tanzania: A Meta-analysis Study. *University of Dar es Salaam Library Journal,* 14(2), 87-98.

Oyeyinka, R.A., Bello, R.O., & Ayinde, A.F.O. (2014). Farmers utilization of farm-radio programmed for marketing of agricultural commodities in Oyo State, Nigeria. *European Journal of Business and Management,* 6(35), 58-68.

Swanson, B.E., & Rajalahti, R. (2010). Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems. Washington, DC. 206pp.

Smith, J., Johnson, R., & Anderson, M. (2018). "The Role of Interpersonal Communication in Agricultural Knowledge Sharing: A case Study" *Journal of Agricultural Communication,* 42(3), 2452260.

URT (2016). President's Office: Regional Administration and Local Government Five Year (2016/17 to 2020/21) Term Medium-Term Strategic Plan for Mvomero District Council. [https://mvomerodc.go.tz] site visited on 01/11/2021.

URT (2021). President's Office: Regional Administration and Local Government Five Year (2021/22 to 2025/26) Medium-Term Strategic Plan for Mvomero District Council. 352pp.

Vraga, E.K., & Bode, L. (2020). Defining misinformation and understanding its bounded nature: Using expertise and evidence for describing misinformation. Political Communication, 37(1), 136-144.

Waldman, K.B., Isaacs, K.B., Snapp, S.S., & Chung, K. (2016). The Value of Integrating Farmer and Researcher Knowledge: Developing Resilient Bean and Maize Cropping Systems in Rwanda. *Food Security,* 8, 491-506.

Wambura, R.M. (2015). Extension Systems in Tanzania: Identifying Gaps in Research. *African Journals Online,* 2015, 1-14.

World Bank, (1998). Indigenous Knowledge Definitions, Concepts and Application. World DevelopmentDevelopment Report 1998/1999. Knowledge for development. [from http//www. worldban.org/afr/ik/ikrept.pdf] site visited on 15/09/2021.

Yamane, T. (1967). Statistics: An Introductory Analysis. Harper and Row, New York. 8pp.

Zhang, H., & Nakagawa, H. (2018). Validation of indigenous knowledge for disaster resilience against river flooding and bank erosion. Science and Technology in Disaster Risk Reduction in Asia. [https://www.sciencedirect.com] site visited on 12/09/2021.

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", 2=fair and 3=very good and good as "Good".	Ordinal
	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