

Use of mobile phone technologies for accessing agricultural marketing information by grape smallholder farmers: a technological acceptance model (TAM) perspective

Mobile phone technologies and grape marketing

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Abstract

Purpose – Factors influencing the use of mobile phone technologies for agricultural market information access remain a mixed debate, and there are contradictive views among studies. This study examined factors influencing the use of mobile phone technologies for agricultural marketing information access. The study is anchored on the technological acceptance model (TAM).

Design/methodology/approach – A descriptive cross-sectional research design was adopted with a sample size of 400 grape smallholder farmers. A structured questionnaire and focus group discussions (FGDs) were used to gather data. Descriptive, ordinal logistic regression and thematic approaches were used in data analysis.

Findings – The study confirmed grape smallholder farmers generally considered mobile phone technologies as an appropriate communication channel to stay informed about agricultural marketing information. It was found that reliable electricity supply, relevance, timeliness, perceived ease of use (PEOU) and perceived usefulness (PU) of mobile phone technologies influenced the level of agricultural marketing information access.

Research limitations/implications – This research is limited to a selected number of grape smallholder farmers in Dodoma, Tanzania, and leaves out those without mobile phones. Also, the study was cross-sectional in nature, so it may not be necessarily capable of consistently providing critical and consistent information about the same population over a series of times.

Originality/value – This study contributes to the body of knowledge by integrating the use of mobile phone technologies to access marketing information in informing policy and decision-making processes to promote grape marketing.

Keywords Mobile phone technologies, Agricultural marketing information, Grape smallholder farmers, Technological acceptance model and Dodoma

Paper type Research paper

1. Introduction

Mobile phones have increasingly become important communication tools in both developed and developing countries. The adoption and use of mobile phones among smallholder farmers have



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been triggered by improved accessibility, network connectivity, user-friendliness and affordability (Khan *et al.*, 2020). The use of mobile phones holds a promising future for smallholder farmers by providing, among other things, new approaches for accessing agricultural marketing information. In America and Europe, the integration of mobile phone technology in the agriculture sector resulted in farmers accessing agricultural marketing information (Khanal *et al.*, 2021; Spielman *et al.*, 2021). In Africa, studies (i.e. Anadozie *et al.*, 2022; Kassem *et al.*, 2021; Rumata and Sakinah, 2020; Ayim *et al.*, 2020) indicate that the use of mobile phones has improved bargaining power, reduced search cost, improved coordination and increased marketing efficiency through the reduction of information asymmetry. Furthermore, studies (Mzomwe *et al.*, 2021; Nyamba and Mlozi, 2020) in Tanzania also provided evidence for improved negotiation of prices, enhanced information flow and building of networking among farmers and between traders. Access to accurate and timely agricultural marketing information especially for perishable high-value crops is of utmost importance.

Grape farming is one of the most important high-value commercial fruit crops in the Dodoma Region. Its cultivation started around the 1960s and the growth of the grape sub-sector among other things depends on the effective flow of agricultural marketing information. However, Mlay (2021), Kulwijila *et al.* (2018) argue that marketing information access remains to be a challenge among grape smallholder farmers. An understanding of agricultural marketing information accessed by grape smallholder farmers is important for informed decision-making especially when selling. Despite this fact, previous studies (Mlay, 2021; Nzowa, 2020) on grape farming in Tanzania accorded scanty attention to the use of mobile phones for accessing agricultural marketing information. They mainly focused on marketing challenges along the grape value chain, factors affecting the marketing performance of grapefruits, and economic analysis of grape production and marketing. Therefore, there is still a gap in what would explain access to agricultural marketing information by grape smallholder farmers in Dodoma. In this regard, an understanding of agricultural marketing information needs would become an important initiative to overcome information access challenges.

Agricultural marketing information needs if effectively met will enable smallholder farmers to make informed decisions on marketing challenges. Although grape smallholder farmers access agricultural marketing information, they are yet to get it from appropriate sources and channels (Mlay, 2021; Kulwijila *et al.*, 2018). However, there is a contradictive debate among studies on the right and appropriate sources and channels for communicating agricultural marketing information. This argument is in line with Baral (2020) and Dhehibi *et al.* (2020) who claim there is no agreement on the suitable channels for communicating agricultural marketing information. Gunapala *et al.* (2022), Nwafor *et al.* (2020), Rahman *et al.* (2020), Parmar *et al.* (2019) and Phiri *et al.* (2019) reported that fellow farmers, personal experience, friends, family members and media were the predominant sources of agricultural marketing information among smallholder farmers. Gupta *et al.* (2021) and Raza *et al.* (2020) acknowledged the use of mobile phones as the most effective channel to communicate agricultural marketing information among smallholder farmers. However, according to Baral (2020) and Iwuchukwu and Obazi (2020), the effectiveness with which smallholder farmers access agricultural marketing information is context-specific and depends on several factors. Hence, factors influencing the use of mobile phone technologies for accessing agricultural marketing information by grape smallholder farmers are a subject of concern.

Studies that ventured into factors influencing access to agricultural marketing information remain up to a mixed debate as there are contradictive views among scholars. For example, Bulenzibuto Tamubula *et al.* (2019) argue that the use of mobile phones for accessing information is influenced by complementarity with other information and communication technology (ICT) tools. Ahmad *et al.* (2021) and Wilson *et al.* (2021) considered the relevance of mobile phones as a key driver for the dissemination of marketing information. The intention of use was found to influence the ability of mobile phones to

deliver timely marketing information (Mdoda and Mdiya, 2022). Day *et al.* (2022) and Mzomwe *et al.* (2021) found that perceived usefulness (PU) and ease of mobile phone use influenced the sharing of marketing information. It is evidenced that there is no single best factor influencing mobile phone use for agricultural marketing information access. Smidt and Jokonya (2022) and Krone and Dannenberg (2018) contended that factors influencing mobile phone use are context-specific and difficult to generalise. It is from this fact, therefore, the study examined factors influencing the use of mobile phones for accessing agricultural marketing information among grape smallholder farmers. Specifically, the study sought to examine agricultural marketing information needs, investigate the sources of agricultural marketing information, determine the communication channels and examine factors influencing the use of mobile phones for agricultural marketing information access among grape smallholder farmers. Therefore, this study proposes three statistical hypotheses H_1 – H_3 :

- H1.* Mobile phone PU does not influence agricultural marketing information access.
- H2.* Electricity supply does not influence the use of mobile phones for marketing information access.
- H3.* The ease of mobile phone use does not influence marketing information access.

The paper has been organised to cover the introduction, theoretical underpinning of the study, methodology, findings and discussion, conclusion and recommendation and lastly the implications of the study.

2. Theoretical review

2.1 Technological acceptance model (TAM)

The study was guided by technology acceptance model (TAM) developed by Davis Fred in 1985. It is an information system-related theory that models how individuals accept and use technology such as ICTs. The model assumes that the acceptance of new technology is predicted by PU, perceived ease of use (PEOU) forming attitude towards use (ATU). PU refers to the user's probability that using a particular technology will improve job performance (Chan *et al.*, 2022; Mansour, 2020). Ambong and Paulino (2020) define PEOU as the degree of simplicity with the use of new technology. ATU deals with the favourable or unfavourable predisposition of users to behave in a particular manner towards the new technology (Senali *et al.*, 2022; Nur Fathin *et al.*, 2020). This in turn affects the new technology usage intentions which can directly or indirectly be explained by the PU and PEOU (Pal and Patra, 2021). According to Ali *et al.* (2020), the PU and PEOU can be accompanied by contextual-based external variables such as personal capabilities and environmental factors. Usage intentions are considered a proxy measure of the actual usage behaviour of the users. Moreover, TAM has been widely acknowledged as the most powerful theory in predicting technology adoption behaviour (Tillinghast, 2021; Christian and Agung, 2020). It has been widely tested with different control variables and on a variety of subjects such as farmers, students and working professionals (To and Trinh, 2021). It is regarded as a strong and parsimonious model because it has been well-studied and empirically tested with a well-validated inventory of measurable scales across different contexts (Lee *et al.*, 2020; Alhanatleh *et al.*, 2022; Merhi *et al.*, 2021).

3. Methodology

The study employed a descriptive cross-sectional research design to explain the relationship between the predictor variables and the outcome variables of the study at a single point in

time. To determine factors influencing the use of mobile phone technologies for accessing agricultural marketing information, a mixed method was used. It was preferred to cancel out the method effect of relying on one method (Alharahsheh and Pius, 2020). The quantitative methods were meant to test the hypotheses on factors influencing the use of mobile phones for accessing agricultural marketing information, whereas the qualitative methods supplemented the quantitative method (Rosalia, 2022). The study was conducted in the Dodoma Region where grape farming is a symbol crop for the region and contributes significantly to the livelihood of grape smallholder farmers. However, irrespective of its potentiality, grape farming has been challenged by other factors, inadequate and untimely access to agricultural marketing information by grape smallholder farmers (Mlay, 2021; Kulwijila *et al.*, 2018). The target population constituted 2,914 grape smallholder farmers. The population was characterised by married middle aged farmers with primary education level based on the Tanzania education system. These grape smallholder farmers owns an average of two acres of land, with more than five years of farming experience and are moderate income earners. The sample size was constructed from an online Raosoft sample size calculator with 96.86% confidence level, 5% margin of error and 50% skewness level. According to Moraes *et al.* (2022) and Serdar *et al.* (2021), the sample size is ideally determined based on the confidence level, a margin of error and the skewness level. The Raosoft sample size calculator was used because of its flexibility to produce a representative sample for both finite and infinite populations (Alenazi *et al.*, 2022; Qazi *et al.*, 2022). According to Niebi *et al.* (2021), a sample size between 200 and 500 units is desirable for rigorous econometric statistical analysis.

The purposive sampling technique was applied to select Dodoma Region and the villages of *Hombolo Bwawani*, *Mpunguzi* and *Mbabala* because they constitute 1,063 of all the available grape smallholder farmers in Dodoma Region. A systematic sampling technique was applied where the first respondent was randomly selected followed by three intervals estimate for the subsequent respondents from the household list provided by the village executive officers (VEOs). Rahman *et al.* (2022) argued that the use of a systematic sampling technique enhances higher internal and external validity with moderate cost. Quantitative data were collected through a household survey approach with a structured questionnaire administered by the researcher. The questionnaire was pre-tested to 30 respondents in Mvumi Mission Village in Chamwino District because it is one of the leading villages in grape production the region and has similar population characteristics to those that were sampled for actual data collection. The pre-testing enabled the necessary corrections to be made to enhance the accuracy of the data collection instruments. Yusoff *et al.* (2021) recommend a sample size of 30 units for the pre-testing of a questionnaire. The questionnaire was suitable because it is commonly used within the survey method and when results are presented quantitatively (Alharahsheh and Pius, 2020).

Two focus group discussions (FGDs) each comprising seven participants selected based on marketing knowledge and experience, and gender were organised to examine the influence of mobile phones on accessing agricultural marketing information. According to Claessens *et al.* (2022), the purposive sampling technique is used to select FGD size between six to twelve participants. FGD guide complemented by a notebook and recorded audio was used to complement the collection of data. The use of FGD is justified in this study to enhance efficiency and comprehensiveness in data collection (Claessens *et al.*, 2022). The quantitative data were analysed descriptively (percentages and frequency) to describe the characteristics of the respondents, and ordinal logistic regressions were used to estimate the score of predictor variables on the outcome variable. Qualitative data were subjected to thematic analysis by first transcribing, arranging responses in codes reflective of the questions, noting common themes, theme review, redefining and naming of themes and reporting respondents' views on mobile phone usage awareness.

3.1 Operationalisation of the study variables

The ordinal logistic regression model adopted from [Diaz et al. \(2021\)](#) was used to establish factors influencing access to agricultural marketing information. The model was chosen because the dependent variable was treated as an ordered categorical variable. According to [Tutz \(2022\)](#), [Magagula et al. \(2021\)](#) and [Kurniawati et al. \(2021\)](#), ordinal logistic regression is powerful, convenient and flexible, and it is appropriately used when the dependent variable is ordinally arranged. The model is estimated as in [equation \(1\)](#)

$$\text{Logit } Y = \ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + \dots + \epsilon \quad (1)$$

where Y = Dependent variable (levels of agricultural marketing information access ranging from 1 to 5 corresponding to five-point scale levels of; 5 = very high access, 4 = high access, 3 = moderate access, 2 = low access, 1 = no access), π = Probability of an event, α = Y-intercept, β = Logit regression coefficient, X_s = A set of explanatory variables and ϵ = Error term.

The ordinal logistic regression involved fitting an equation to the following form to the variables as indicated in [equation 2](#).

$$\begin{aligned} \text{Agricultural marketing information access} = & \alpha + \beta_1\text{electricity} + \beta_2\text{network} + \beta_3\text{relevance} \\ & + \beta_4\text{timeliness} + \beta_5\text{easiness} + \beta_6\text{feedback} \\ & + \beta_7\text{portability} + \beta_8\text{usefulness} \\ & + \beta_9\text{accessibility} + \dots + \epsilon \end{aligned} \quad (2)$$

Various explanatory variables were selected to estimate the predicted values of the outcome variable. The choice of variables was based on the studies ([Prathap et al., 2021](#); [Qui et al., 2021](#); [Ahmad et al., 2021](#); [Okello et al., 2020](#)). The description of variables included in the ordinal logistic regression model and their level of measurement are presented in [Table 1](#).

4. Results and discussion

4.1 Agricultural marketing information needed by respondents

Respondents were asked to state the most demanded agricultural marketing information to understand their information aspirations. This was important because information needs partly suggest the appropriate sources and channels of information to be used. The findings in [Table 2](#) show that most of the respondents needed buyers and price information.

The findings indicate that slightly over half (51.2%) of the respondents required information on the availability of grape buyers and almost one-third (30.1%) needed price information. Only 18.7% of the respondents needed quality, quantity and selling time information. The findings imply that grape smallholder farmers are continuously in search of up-to-date agricultural marketing information which can help them to negotiate for better prices with buyers. Understanding the specific agricultural marketing information required by grape smallholder farmers is a necessary prerequisite for factual-based decision-making especially when selling. It also assists grape farmers to decide whether to sell at the farm gate or transport the product to better-paying distant markets. The importance of agricultural marketing information was also highlighted by [Bruns et al. \(2022\)](#), [Kaddu et al. \(2020\)](#) and [Omoregbee and Idiako-Ochei \(2019\)](#) in which price, buyers and quality information were reported as commonly demanded information. This is a clear indication that the available agricultural marketing information is not sufficient as there is still high demand for

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Variable	Description	Measurement
Dependent variable		
Agricultural marketing information access	The level of marketing information access	5 = very high access, 4 = high access, 3 = moderate access 2 = low access, 1 = no access)
Independent Variables		
Reliable electricity supply	Access to reliable electricity supply	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Mobile phone network	Reliability of mobile phone network	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Relevance	Relevance of mobile phones in accessing information	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Timeliness	Timeliness of information access through mobile phone	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Easy of use	The ease of mobile phone use	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Feedback	Mobile phone facilitates user feedback	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Portability	Portability of mobile phone	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Usefulness	The usefulness of mobile phone	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA
Accessibility	Accessibility of mobile phone	Likert1 = SD, 2 = D, 3 = N, 4 = A, 5 = SA

Table 1.
Variable description and measurement

Note(s): SD=Strongly Disagree, D = Disagree, N=Neutral, A = Agree, SA=Strongly Agree
Source(s): Authors own creation

Agricultural market information	Counts (400)	Per cent (%)
Price of grapes	121	30.1
Grape buyers	205	51.2
Quality of grapes	37	9.3
Quantity of grapes	28	7.1
Grape selling time	9	2.3

Table 2.
Agricultural marketing information needed by respondents

Source(s): SPSS output

buyers and price information. The need for buyers and price information partly reflects and suggests that meeting farmers' information needs and expectations will cement the relationship with buyers of grapes and increase their bargaining power.

4.2 Sources of agricultural marketing information

The study sought to determine information sources used by respondents to identify which source meets the information needs most consistently. Respondents utilised both internal and external sources for accessing agricultural marketing information. The findings in [Table 3](#) indicate that respondents got agricultural marketing information through hearing from fellow farmers, cross-checking with traders and direct visits to markets.

The study findings indicate that 40.8% of the respondents preferred fellow farmers as the main source of agricultural marketing information followed by traders (25.3%). Other sources were visits to markets (13.5%), personal experience (12.2%) and (8.2%) cooperatives societies. It is interesting to note the reliance on fellow farmers for accessing agricultural marketing information possibly because they build strong solidarity, a shared background and a strengthening of working morale. The use of fellow farmers can mean regular contact

and communication in exchanging ideas and knowledgeable information among themselves. The choice of information sources might be attributed to awareness, convenience and ease of accessibility. The findings were further supported by the FGD, apart from relying on personal experience, participants highlighted to have depended on multiple sources of agricultural marketing information such as fellow farmers and cross-checking with traders. There were several challenges in using fellow farmers and traders who were criticised on the ground of limited knowledge of the prevailing market conditions. This has led to grape smallholder farmers waiting for the market to deliver better prices rather than searching for alternative buyers from distant markets for better profit. The findings were consistent with the studies conducted by [Brunns *et al.* \(2022\)](#) and [Konkwo and Michael \(2021\)](#) who found that farmers depended on fellow farmers as the most commonly utilised information source. This underpins the fact that smallholder farmers are yet to get trusted sources of agricultural marketing information as they do expect information from fellow farmers.

4.3 Communication channels for agricultural marketing information access

Farmers were asked about the communication channels used to access agricultural market information. There are varieties of communication channels such as pathways, vehicles or methods through which agricultural marketing information was transmitted or received. The communication channels can either support one-way or two-way communication. The findings in [Table 4](#) show that mobile phones and fellow farmers were the most communication channels used among grape smallholder farmers.

The study findings revealed that 73.3% of the respondents used mobile phones, and 18.7% used fellow farmers to stay informed about agricultural marketing information. Only 8% of the respondents mentioned farmers' cooperatives as an information pathway for receiving agricultural marketing information. Mobile phones have emerged as an important channel that respondents rely on for agricultural marketing information access due to their ability to facilitate feedback, personalised message and the potential to eliminate time barriers. The use of fellow farmers as a channel for agricultural marketing information has been embraced by grape smallholder farmers because of the proximity and the associated perceived risks. The findings imply that the use of mobile phones can facilitate agricultural marketing information search, speed up the information flow, minimise the cost of information and expand the channels for information exchange. The findings concur with

Information sources	Counts (400)	Per cent (%)
Traders	101	25.3
Fellow farmers	163	40.8
Personal experience	49	12.2
Cooperative society	33	8.2
Direct visit to the market	54	13.5

Source(s): SPSS output

Table 3.
Sources of agricultural marketing information

Communication channel	Counts (201)	Per cent (%)
Farmers' cooperative	32	8.0
Mobile phone	293	73.3
Fellow farmers	75	18.7

Source(s): SPSS output

Table 4.
Communication channels for agricultural marketing information access (n = 400)

studies by [Raza et al. \(2020\)](#) and [Hamad et al. \(2018\)](#) where the use of mobile phones was found to be a vital means of receiving agricultural marketing information. The use of mobile phone channels can be used to overcome the agricultural marketing information problem that prevents grape smallholder farmers from accessing profitable markets.

4.4 Factors influencing the use of mobile phone technologies

The ordinal logistic regression was used to determine factors influencing the use of mobile phones for accessing agricultural marketing information. Various tests were carried out to determine the soundness of the model. For instance, the proportional odds assumption was first examined. The assumption of constant values of β s is referred to as proportional odds ([Magagula et al., 2021](#); [Kurniawati et al., 2021](#)). The proportional odds (parallel lines) assumption was tested to check the validity of the model. The test yielded a chi-square value of 89.821 and $p > 0.05$ suggesting that the assumption was not violated and hence the analysis has been carried out by a standard model. [Table 5](#) presents the findings of the ordinal logistic regression showing the factors that influenced mobile phone use for agricultural marketing information access by 42.6 and 56.2% as explained by Cos and Snell R^2 and Nagelkerke R^2 . The model fitting information produced a chi-square value of 43.492 and $p < 0.005$. This means that the data adequately and significantly fit the model. Moreover, the goodness of fit contains the Pearson and deviance chi-square values of 400.421 and 404.335 and $p > 0.005$. The non-significant findings are indicators that the model exhibits a good fit for the data. Generally, the findings presented in [Table 5](#) indicate that reliable electricity supply, relevance, timeliness, PU and PEOU were significantly related to mobile phone use for agricultural marketing information access at $p < 0.005$.

The findings in [Table 5](#) indicate that electricity supply was significantly related to the use of mobile phones for agricultural marketing information access at $p < 0.005$, Wald = 20.766 and Exp (β) = 2.945. The Wald statistic value of 20.766 shows the significant effect of electricity on mobile phone use for agricultural marketing information access. Thus, the null hypothesis that electricity supply does not influence the use of mobile phones for agricultural marketing information access was rejected. The findings entail that with a reliable electricity supply, the use of mobile phones increased by 2.945, and the odds ratio is 1.080 suggesting that the increased mobile phone usage for accessing agricultural marketing information was 1.080 times higher with the reliable electrical supply. Such a relationship was also noted during FGDs where it was reported that electricity connection and reliable supply guaranteed

Variable	β	S.E	Wald	Df	Sig	Exp(β)
Constant	8.607	1.832	22.073	1	0.000	0.000
Electricity supply	1.080	0.237	20.766	1	0.002	2.945
Network connection	0.202	0.215	0.883	1	0.345	1.224
Relevance	1.356	0.288	22.168	1	0.002	3.881
Timeliness	1.116	0.591	3.566	1	0.048	3.053
Ease of use	1.455	0.277	27.591	1	0.001	4.284
Feedback	0.031	0.181	0.029	1	0.862	1.031
Portability	0.781	0.496	2.479	1	0.116	2.184
Usefulness	1.452	0.211	47.355	1	0.000	4.272
Accessibility	0.155	0.100	2.403	1	0.123	1.168

Table 5. Factors for the use of mobile phone technologies (n = 400)

Note(s): Model summary: Cos and Snell $R^2 = 0.424$, Nagelkerke $R^2 = 0.562$, Model fit information Chi-square 43.492 ($p = 0.000$). The goodness of fit, Pearson and Deviance Chi-square (400.421 and 404.335, $p = 0.701$ and 0.626), parallel line, chi-square = 89.821 and $p = 0.087$

Source(s): SPSS output

the adoption and use of mobile phone technologies for agricultural marketing information access. This is a clear indication that an efficient and reliable electricity supply is essential for running and using mobile phones for accessing agricultural marketing information. The findings are ascribed by the fact that a reliable electricity supply provides confidence in the purchase and continued usage of mobile phones for agricultural marketing information access. The study confirms the TAM which elucidates that external factors such as electricity supply enhance the adoption and use of technology. The finding tally with [Muhihi and Pascal \(2021\)](#) and [Okello *et al.* \(2020\)](#) who established that electricity supply was significantly related to the adoption and use of ICTs in Tanzania. Therefore, a reliable electricity supply makes it possible for farmers to increase the prospects of mobile phone use for accessing agricultural marketing information.

The relevance of agricultural marketing information resulting from the use of mobile phones was statistically significant at $p < 0.005$, Wald = 22.168 and Exp (β) = 3.881. The Wald statistic of 22.168 signifies that the use of mobile phones contributed significantly in predicting the possibility of proving relevant agricultural marketing information. The findings mean that the use of mobile phones increased the possibility of providing relevant agricultural marketing information by 3.881 with an associated odd ratio of 1.356 implying that farmers who used mobile phones were 1.356 more likely to access relevant agricultural marketing information. The use of mobile phone technologies is valuable to grape smallholder farmers based on its ability to provide need-based information which addresses problems related to what to produce and for which market to produce. During FGDs, participants reported that they were in frequent contact with traders and fellow farmers because the use of mobile phones had increased access to relevant agricultural marketing information. Mobile phones, therefore, ensure a connection with potential buyers and aid decision-making in the face of the changing grape marketing environment. The findings are in line with [Okello *et al.* \(2020\)](#) who found that the perception of the relevance of mobile phones affected the accessibility to agricultural marketing information. The findings might be attributed to the inherent advantage of mobile phones over traditional communication channels. The mobile phone has both audiovisual and text content features and hence can be used by both literate and illiterate farmers. The findings suggest that the use of mobile phones can provide relevant agricultural marketing information to be effectively applied by farmers in making informed decisions.

The ability of the mobile phone to deliver timely agricultural marketing information was statistically significant at $p < 0.005$, Wald = 3.566 and Exp (β) = 3.053. The Wald of 3.566 suggests that mobile phone was significant in the delivery of timely agricultural marketing information to farmers. The findings imply that the use of mobile phones increased the chance of accessing timely agricultural marketing information by 3.566. The odds ratio of 1.116 indicates that farmers who used mobile phones were 1.116 more likely to access timely agricultural marketing information. Having the right agricultural marketing information at the right time improves grape smallholder farmers' decision-making on the prices to charge, and availability of buyers and enhances transparency which is fundamental for reducing information asymmetric problems. [Okello *et al.* \(2020\)](#) also established that the perceived timeliness of mobile phones increased the chance for farmers in developing countries to access agricultural input information. If farmers use a shorter time to access agricultural marketing information, it improves the level of economic transactions with trading partners.

The ease of mobile phone use for accessing agricultural marketing information was statistically significant at $p < 0.005$, Wald = 27.591 and Exp (β) = 4.284. It is worthwhile noting that the Wald statistic value of 27.591 shows that the ease of mobile phone technologies use predicted significant access to agricultural marketing information. Therefore, the null hypothesis that the ease of mobile phone use does not significantly

influence access to agricultural marketing information was rejected. The findings imply that when farmers perceived mobile phones as easy to use, it increased the possibility of agricultural marketing information access by 4.284 with the corresponding odds ratio of 1.455 showing that farmers who thought of mobile phones as an easy and user-friendly technology were 1.455 times able to access agricultural marketing information. This can be because when the mobile phone is user-friendly, it can suitably be used to access agricultural marketing information. Study participants contrasted voice calls and text messages in FGDs and revealed that it was easy for farmers to call and receive calls by pressing the red and green buttons on their mobile phones. However, it was pointed out that texting was difficult for most of them mainly due to language problems, poor eyesight and using too old phones with cracked screens. This suggests that farmers perceived mobile phones as a supportive tool for voice communication rather than for texting. The findings supported the TAM which highlights the degree to which the technology would be perceived as free of effort. Similarly, it was observed by [Castiblanco Jimenez *et al.* \(2021\)](#) and [Mercurio and Hernandez \(2020\)](#) who found that when the technology is perceived as easy to use, it paves a way for its usage. The findings suggest that there is realistically PEOU for voice communication and limited use for innovatory mobile phone features such as WhatsApp in sharing agricultural marketing information.

The findings indicate that PU was significantly related to the use of mobile phones for agricultural marketing information access at $p < 0.005$, Wald 47.355 and $\text{Exp}(\beta) = 4.272$. Likewise, Wald of 47.355 implies that PU contributed significantly to predicting farmers' agricultural marketing information access. This resulted in the rejection of the null hypothesis which stated that PU does not influence the use of mobile phones for agricultural marketing information access. Furthermore, the findings suggest that the more farmers perceived mobile phones as useful the probability of agricultural marketing information access increased by 4.272, and the odd-ratio of 1.452 indicated that farmers who perceived mobile phones as useful were 1.452 more likely to access agricultural marketing information. The PU tends to be on the path of facilitating communication of agricultural marketing information which can provide more opportunities for enhancing grape buyer relationships. Grape smallholder farmers would inform grape buyers about the price, grape quality and the suitability of the order and remind them about the grape orders. It was reported, during the FGDs, that despite the PU of mobile phones for agricultural marketing information access, farmers have not yet taken full advantage of all the services they afford. The findings entail that although the mobile phone is useful, the ability of farmers to take full advantage of the multiple services provided is still complicated by the conditions surrounding its usage. The discussion shows an acknowledgement of the possibility of mobile phone use for agricultural market information access despite the cumbersome nature of the features of the mobile phone which requires learning for conversant use. The findings have revealed useful insight into the TAM by reflecting the PU as one of the most influential factors for farmers to use mobile phones because it provided the benefit of communicating agricultural marketing information. The findings agreed with [Okoroji *et al.* \(2021\)](#) and [Ngongo \(2019\)](#) who found that PU had a significant effect on the use of ICTs among farmers in Nigeria and Kenya, respectively. PU has proved to be an important predictor for the use of mobile phones allowing for timely access to agricultural marketing information which eventually allows better decision-making.

5. Conclusion and recommendations

The study revealed that buyers and price information were mostly needed by grape smallholder farmers. This underscores the fact that meeting such information needs would translate into an improved relationship among grape actors for profitable business relations. On the other hand, the efforts to meet the stated agricultural marketing information needs to

have resulted in heavy reliance on interpersonal and mobile phone sources and channels of agricultural marketing information. This situation indicates that grape smallholder farmers are yet to get trusted sources of agricultural marketing information. Therefore, the ability to make factual-based marketing decisions is still questionable. However, the successful use of the mobile phone was partly linked to factors within (electricity supply, PEOU and PU) and beyond (relevance and timeliness) the TAM framework. The relationship among these factors increased the chance of accessing real-time agricultural marketing information. Based on the findings, it is recommended to the Ministry of Agriculture to regularly conduct agricultural marketing information needs assessment in order to locate agricultural marketing experts, to encourage the use of multiples sources of information to share and widen distribution of agricultural marketing information to supplement the verbal information sources, strengthening the capacity of cooperative societies by creating awareness as a viable information channel which can be used together or complementarily with mobile phones to source and disseminate agricultural marketing information, the Ministry of Agriculture in collaboration with the Ministry of Information, Communication and Technology should consider designing and develop strategies for effective and efficient use of communication channels with ability to provide relevant and timely agricultural marketing information, and power grids systems need to be improved by Tanzania Electric Supply Company Limited (TANESCO) through regular repair and maintenance to create confidence for farmers to continuously use mobile phones for agricultural marketing information access.

6. Implications, limitations and future research

6.1 Theoretical implications

The findings supported and added to the body of knowledge because so far, studies conducted on grape farming in Tanzania focused mainly on value chain analysis, post-harvest losses, and economic analysis of grape production and marketing and employed a quantitative methodological approach. This study shifted a focus to mobile phone and agricultural marketing information access and adopted both quantitative and qualitative approaches for data collection, analysis and interpretation hence contributing to the body of knowledge.

6.2 Practical implications

Mobile phone developments should not be viewed as difficult to embrace and they can be used by most of the smallholder farmers to increase access to agricultural marketing information and reduce transaction cost associated with underdeveloped infrastructural systems in the African context. Smallholder farmers should also understand that information-seeking behaviour is self-created, and thus choosing information sources is a self-driven activity to meet information needs for better market accessibility. As revealed from the study findings such an intervention should consider the nature of grape smallholder farmers especially within the study area to reflect factors such as electricity supply, PEOU and PU. An understanding of the related factors will help ICT developers to design farmer-specific mobile phone applications and considers farmers key aspects such as information needs and sources/channels mostly used.

6.3 Policy implications

For a long time, access to real-time agricultural marketing information to smallholder farmers has remained to be a critical challenge. As a result, the study provides policy makers with pertinent information to aid them take strategic initiatives that will increase the use of digital

tools for accessing agricultural marketing information. Generally, there is a need for agricultural-related policies addressing ICTs' adoption to ensure relevance and suitable agricultural marketing information are communicated through digital platforms for agricultural development. Additionally, such policies should make it easy for smallholder farmers to receive digital training to improve their awareness on the use of proper tools for accessing agricultural marketing information.

6.4 Limitations and future research

The study had a limitation on the selection of grape smallholder farmers and considered only those who owned and used mobile phones and left those without mobile phones. The selection of the villages was done purposively by considering the volume of grape production, thus the sample could not represent the reality of the entire population. This has implications concerning the generalisation of the study in other related areas with similar nature. The study was cross-sectional in nature, so it may not be necessarily capable of consistently providing critical and consistent information about the same population over a series of times. To mitigate this, future studies should be directed longitudinally in different contexts to validate the study findings.

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