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Evaluating the Influence of Socioeconomic Factors on Smallholder Farmer's Social Media Adoption in the Nkomazi Local Municipality, Mpumalanga Province

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ABSTRACT

Social media has the potential to provide enhanced and faster measures of disseminating agricultural information to smallholder farmers. This study investigated socioeconomic characteristics encompassing demographic factors affecting smallholder farmers' adoption of social media. The study focused on varying livestock and crop smallholder farmers, including cattle, goats, maize, sugarcane, and leguminous crop producers. A cross-sectional survey was employed to collect the data using a structured questionnaire. Descriptive statistics and a Binary Logistic Regression was used to analyse the data. The sample size was 217 smallholder farmers. The results revealed that age, level of education, annual farming income, and cooperative membership were statistically significant ($p < 0.05$) in social media adoption. The study findings show that skills and training in ICT increase the probability of adopting social media, and the socioeconomic characteristics of smallholder farmers influence its adoption. The study concludes that stakeholders such as local government must improve smallholder farmers' basic literacy and skills in digital technology. It further recommends that policymakers formulate policies that provide the necessary infrastructure and supporting inputs such as open access internet, cell towers, and cooperative social media platforms that allow for interactive interactions with relevant stakeholders that provide advisory services.

Keywords: Social Media, Adoption, Evaluating, Socioeconomic, Smallholder Farmers

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1. INTRODUCTION

Social media has enriched how individuals interconnect, interact, and disseminate data and knowledge (Thakur, Chander & Sinha, 2017). However, the adoption and factors influencing the adoption of social media by smallholder farmers have been minimally investigated for advisory services in the Southern African context. The prevalent use of internet-based media has significantly influenced social interactions among individuals and communities (Zolkepi & Kamarulzaman, 2015). Social media is a channel of interaction in which internet users can generate, create, and exchange media content between users, allowing for voluntary communication and participation (Kaplan & Haenlein, 2010). The expediency and simplicity of using social media have stimulated a vast amount of adoption and allowed internet users to attain power over the selection of information (Durukan, Bozaci & Hamsioglu, 2012).

Social media is an Information Communications Technology (ICT) component that is dominant in facilitating speedy, cost-effective, and efficient information and knowledge dissemination to and among smallholder farmers (Godson-Ibeji *et al.,* 2020). Social media and mobile-enabled extension services can act as instruments that assist in delivering advisory services that create awareness about agricultural activities and practices amongst smallholder farmers (Mittal, Gandhi & Tripathi, 2010). Advances in ICT, nanotechnology, and biotechnology are placing agriculture on the verge of stimulating a borderline of diverse opportunities that will advance sustainability, information dissemination, human capabilities, and economic growth (Godson-Ibeji *et al.*, 2020). Adopting social media in agriculture can improve agricultural support and advisory services. Therefore, this study aimed to investigate the socioeconomic and demographic factors affecting smallholder farmers' social media adoption. The main objective was to evaluate smallholder farmers' socioeconomic characteristics that affect their adoption of social media in the Nkomazi Local Municipality.

To an enormous extent, the adoption of social media is influenced by situational and social motivation, along with personal motives, which are subject to change depending on the remarkability of motives and needs for utilising social media (Zolkepi & Kamarulzaman, 2015). The adoption of agricultural innovations and technologies, such as social media as a means of information dissemination, is further affected by other varying factors experienced by smallholder farmers and forms part of social media characteristics. The key socioeconomic and demographic aspects that play a significant part in the adoption and use of social media by

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smallholder farmers include education, farm size, social capital, annual income, age, and gender (McElroy & Moore, 2012; Karakara & Osabuohien, 2019; Aurangozeb, 2019; Liu, Bruins & Heberling, 2018). The aspects supplemented by users' singular requirements and needs substantially influence the adoption and usage of social media. The utilisers of social media can be influenced by numerous factors based on the environment and context, which, in due course, impact their usage patterns (Ainin, Jaafar & Tajudeen, 2018).

2. LITERATURE REVIEW

2.1. Socioeconomic and Demographic Factors Influencing Social Media Adoption Among Smallholders' Farmers

2.1.1. Age

Age has been extensively utilised as a descriptive variable, yet age's influence on the adoption of social media is indeterminate and depends on many factors (Baffoe-Asare, Danquah & Annor-Frempong, 2013; Liu *et al.*, 2018). According to Zhang *et al.* (2012), younger farmers tend to be more risk-averse and innovative, whereas older farmers have augmented conservativeness and, therefore, unfavourably impact the adoption of new technologies or innovations. This usually results in a negative relation to adoption by older farmers (Baffoe-Asare *et al.*, 2013). It can be argued that older smallholder farmers have more experience and, through time, have accumulated more capital, making them more likely to invest and adopt new technologies or innovations (Nkamleu & Adesina, 2000). Many generational differences, such as the interpretations and beneficial uses of social media and the internet, are vast between individuals of dissimilar generations (Vodanovich, Sundaram, & Myers, 2010; Jarrahi & Eshraghi, 2019).

According to Mittal and Mehar (2016), older smallholder farmers are less likely to explore innovations or new information sources, making them unlikely to depend on multiple sources. It is, therefore, believed that an increase in age influences access to different sources of information (Mittal & Mehar, 2016). Correa, Hinsley and De Zúñiga (2010) state that the younger generation adopts social media much more than the older generation. Ried (2018) distinguishes two types of individuals regarding their expression towards technologies. These include digital natives, who were born after the year 1980 and are assumed to be more experienced and skilled in technology. Digital immigrants are individuals born before 1980, are much older than natives, and have fewer skills and competencies in using technology such as

social media. Alalwan *et al.* (2017) state that the millenarian age groups' adoption of social media and its attitudes are likely different between developing and developed countries due to technical, cultural, and economic infrastructure variations within the countries, especially regarding gender equality.

2.1.2. Gender

Gender reveals the variations in the users themselves in terms of their preference concerning social media and the promotional undertakings conducted during social media utilisation (Lebel & Danylchuk, 2012). Female social media users tend to be more stimulated in purchasing products, having a high fondness for maintaining their memberships and associations with varying sites and pages they visit (Clavio & Kian, 2010). Dzandu *et al.* (2016) and Ilie *et al.* (2005) also found that females value visibility and ease of social media use. In comparison, males tend to value relative advantage, perceived critical mass, and the demonstrability of results. Baffoe-Asare *et al.* (2013) established that male smallholder farmers are, at most times, more resource endowed. Females are often constrained in terms of resources such as land due to either an inheritance system or virtue within their social and cultural systems. This impacts their adoption as they lack the proper resources to adopt specific agricultural innovations and resources to implement practices received from social media. Furthermore, female farmers are generally marginalised in terms of external inputs, income, and access to information, mostly in agrarian societies (Anang, 2018).

Gender significantly influences innovation adoption by smallholder farmers, especially in terms of the factors that limit female smallholder farmers from technology adoption (Wale & Mkuna, 2023). Additionally, the household head is primarily the individual who makes adoption decisions. Men mostly hold this position and have access and control over essential resources concerning production as a result of socio-cultural norms along with values (Mignouna *et al.,* 2011). Janavi *et al.* (2021) found that more males than females adopt social media, with 55.4% of males and 44.6% of females adopting social media. Jackson *et al.* (2008) further state that females are less involved with technology than males. They are usually less likely to use social media for communication and rate their technological skills lower than males. Contrary to this, Sago (2013) found that both males and females use social media equally. Idemudia *et al.* (2017) further found that females rather than males adopt and use social media more, with 63% of

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females finding social media compatible and useful to them and only 37% of males finding it useful and compatible.

2.1.3. Farm Size

The land that smallholder farmers own is a natural asset and a determining factor of the smallholder farmers' wealth. The difference in the land possessed by smallholder farmers is noteworthy regarding accessing and using social media. This implies that social media adoption among smallholder farmers may be determined by farm size, given that land determines their wealth status (Mekonnen, Gerber & Matz, 2016). This is an outcome of the farm size tending to remain an ideal predictor of wealth in particular prospects such as agriculture. Furthermore, the farm size can be measured by the total land area under cultivation (Baffoe-Asare *et al.*, 2013). This implies that the total land in which crops are grown, maintained, and harvested determines smallholder farmers' wealth and income; the total produce received from the land area assists in wealth determination.

Given that smallholder farmers who possess more wealth are more likely to consider new communication approaches and gain access to practical information, a larger farm size can facilitate easy comprehension of benefits (Mekonnen *et al.*, 2016). This may result from economies of scale and wealth, allowing them to be more likely to adopt any innovation that benefits their farm (Baffoe-Asare *et al.*, 2013). This may also influence smallholder farmers with smaller farm sizes within the wealthier farmers' social networks to adopt social media for advisory services through benefits observed from them. However, the affordability of mobile devices and supporting inputs such as mobile data cost may constrain less wealthy smallholder farmers. This may limit them from implementing information attained through social media due to smaller land size and affordability.

Farm size is significant when considering the adoption of various agricultural technologies (Bello, Baiyegunhi & Danso-Abbeam, 2021). Donkor and Owusu (2019) found that farm size was among the factors that influenced the adoption of mineral fertilisers. Pathak, Brown, and Best (2019) found that the characteristics of the farm play an essential role in the adoption of precision agriculture. Weyori *et al.* (2018) found that smallholder farmers with larger farm sizes were older, above 58 years, and had more farming experience, though with an education level of less than five years. Furthermore, Weyori *et al.* (2018) also found that smallholder farmers

with larger farm sizes were more likely to adopt high-yielding crop varieties than traditional ones. Farm size plays a positive and significant role in adopting innovations as an increase in farm size for production enhances the productivity of farmers since returns on adoption are dependent on the scale (Bello *et al.*, 2021; Baiyegunhi, Majokweni, and Ferrer, 2019). The adoption of precision agricultural technologies further has a positive influence on farm performance. However, the benefits are different according to the size of the farm and the location of the farm (Bucci, Bentivoglio & Finco, 2019). New technologies are relatively adopted by larger farms, where the main reason for adoption is the maximisation of profits (Bucci *et al.*, 2019). The diversity in field sizes, farm scale and geographical location are some challenges that lead to a lack of adoption, linked with a lack of contact with innovations and the high cost of the initial investment (Lombardo *et al.,* 2017; Bucci *et al.,* 2019).

2.1.4. Annual Farming Income

The annual farming income of smallholder farmers plays a role in the resources they have access to and can purchase (Darshen, Meena & Meena, 2017). The revenue a general household receives imitates the basic livelihood they are subjected to. Smallholder farmers with a higher farm income will have increased access to resources such as smartphones or other devices that allow them to adopt and utilise social media. Darshen *et al.* (2017) found that smallholder farmers who fall within a low to high bracket can all similarly afford devices that allow them to adopt, access, and utilise social media. Panda *et al.* (2019) claim that smart mobile phones have become supreme and easy-to-attain devices due to the availability of low-cost, basic features. This is an outcome of smartphones containing almost all available social media sites, applications, and platforms, ranging from direct instant messaging to traditional emails (Panda *et al.*, 2019).

Annual income is an essential aspect to consider as an indicator of the farming outcomes and the farm's progress as a whole (Panda *et al.*, 2019). The amount of financial capital a farming household poses and the profit made plays a role in accessing, adopting, and using social media. Most smallholder farmers earn enough annual income to break even on their farms and afford themselves basic phones. Yet, basic phones are not enough to access social media, allowing for its adoption (Masuka *et al.,* 2016). According to Panda *et al.* (2019), mobile phones are a channel for receiving agricultural services and information that help smallholder farmers strengthen their linkage to the market and implement sustainable agricultural practices. The

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impact of annual income on the affordability of technologies such as smart mobile phones, laptops and computers influences social media adoption, as access can only be attained through these devices. Generally, the income a general farming household earns reflects their living standard. Smallholder farmers with a higher income will have better access to resources such as these electronic devices.

2.1.5. Social Capital

Farmers' groups and organisations are important factors when adopting social media in agriculture. The social groups that smallholder farmers are involved in tend to have similar perceptions, values, and beliefs (Läpple & Kelley, 2015). Social groups are a measure of involvement or association with a particular social organisation, for instance, a cooperative, irrigation scheme, or union (Baffoe-Asare *et al.*, 2013). According to DFID (1999), social capital is the social resources that individuals use to create living and involved interactions with other people, including categories referred to as connections. Interactions with individuals similar to themselves are referred to as horizontal connections; relationships with more powerful people are referred to as vertical connections and the joining of groups or organisations within their community. Social capital escalates the aptitude of a person to attain and have access to crucial knowledge and information about innovations and new technologies along with the benefits thereof. Furthermore, it increases smallholder farmers' awareness and their likelihood of adopting new technologies and innovations (Conley & Udry, 2010).

Social groups allow smallholder farmers to interact and network amongst other agricultural stakeholders and themselves to produce an outcome valuable to them (Dubos, 2017). According to Dubos (2017), the importance of social capital in adoption is that it facilitates information flow and alerts communities, extension officials, and other smallholder farmers about the availability or interest of a product or unrecognised stakeholders. Additionally, social ties located in strategic locations, like those that are better informed in terms of the needs and wants of smallholder farmers, can provide information and knowledge about opportunities and better choices that were not readily available to them (Serageldin & Grootaert, 1998). Social media adoption for agricultural advisory services can reduce the transaction cost for recruiting concerning skills and cultural and technical knowledge possessed by other organisations or individuals.

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2.1.6. Level of Education

The education level of smallholder farmers is highly significant in their adoption and use of social media (Aldosari *et al.,* 2019). A direct relationship exists between the education level and the knowledge and awareness of social media (Osundu & Ibezim, 2015). The suggestion is that the more smallholder farmers are educated, the more they are exposed to and informed about social media and the greater the desire they gain to be willing to adopt and employ social media for advisory services and attaining agriculturally related information. Haruna and Baba (2017) state that the educational background of smallholder farmers is essential and substantial in smallholder farmers' attitudes regarding the usage of the Internet for agricultural information dissemination. Higher levels of education are essential for smallholder farmers to adopt social media (Adolsari *et al.*, 2019). Literacy in technology that smallholder farmers have directly influenced their cognisance and adoption of social media (Osundu & Ibezim, 2015). It may not be simple for a smallholder farmer who has never held or seen a smartphone up close to run an application within the device, such as Facebook or WhatsApp. It is, therefore, essential to take into account the digital divide between digital natives as well as digital immigrants, given that older individuals may not be well informed about modern, easier methods of information dissemination along with communication, such as social media, as it is a recent innovation that they may be unfamiliar with (Ried, 2018).

The level of education's primary role is to measure literacy and illiteracy among smallholder farmers. Education is an essential factor influencing smallholder farmers' decision-making in bearing the risks linked to innovations and modern information dissemination sources (Mittal & Mehar, 2016). According to Feder, Just & Zilberman (1985), smallholder farmers with a higher education level tend to be early adopters of innovations and apply new technologies in a manner that is efficient throughout the adoption process. Mwangi and Kariuki (2015) state that the level of education of smallholder farmers increases their ability to use and process information related to the adoption of innovations. This is the case as a higher level of education influences smallholder farmers' thoughts and attitudes, making them more rational and open and allowing them to analyse the benefits of innovation (Mwangi & Kariuki, 2015). Therefore, a higher level of education makes the introduction of innovations to smallholder farmers easier and influences their adoption rate.

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3. METHODOLOGY

3.1. Study Area

The area of study was in the Nkomazi Local Municipality. It is found in the eastern part of the Ehlanzeni District Municipality in the province of Mpumalanga. Approximately 263 391 agricultural households in Mpumalanga are involved in livestock and crop production, and 28 004 are in the Nkomazi Municipality (Stats SA, 2017). Crops primarily cultivated in the province include leguminous crops, maize, barley, sugar cane, and wheat (Lehohla, 2016). Other crops grown within the region include nuts, deciduous and subtropical fruits, tobacco, citrus, cotton, coffee, and tea (MSA, 2021). The municipality encompasses 23% of the Ehlanzeni District Municipality and 4.07% of the entire province of Mpumalanga (Nkomazi Municipality, 2014) and is marked by the following co-ordinates 25.7097° S, 31.7195° E.

3.2. Research Design and Data Collection

Quantitative research strategies were utilised for this study. Non-probability sampling techniques were employed. This sampling technique does not forcefully impose an opinion of probability that the aspects within the study area might have a chance of being encompassed in the study sample (Vehovar, Toepoel & Steinmetz, 2016). This implies that the sample was chosen because it is non-random, and not every member of the population had the opportunity to be encompassed in the study. The participants were selected using convenience sampling. This type of sampling technique is one where the participants of the target population meet particular criteria such as their geographical location, ease of access, willingness to take part in the study, and general availability of the participants (Etikan, Musa & Alkassim, 2016). A cross-sectional survey employing a structured questionnaire was used to allow for the fundamental scheme to be suitable for all the principles of a research study, allowing the outcomes to be highly generalisable, free from prejudice, and dependable (Dannels 2018; Akhtar, 2016). Both livestock and crop smallholder farmers were sampled to mitigate sample biases. These included various vegetables, leguminous, cattle, and goat producers. The participants were selected as they occur spatially and administratively to where the research was conducted (Etikan *et al.*, 2016). The sample size was calculated utilising Yamen's (1967) simplified formula for proportions and was determined to be 217 smallholder farmers.

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3.3. Data Analysis

The Statistical Package for Social Sciences (SPSS) 27 was utilised to analyse all the data. The data were analysed using a combination of descriptive and inferential statistics. A binary logistic regression was employed to analyse the data. Descriptive statistics were used in the analyses to attain percentages and frequencies of smallholder farmers' socioeconomic and demographic characteristics. Binomial logistic regression was used in the analyses to evaluate the influence of socioeconomic characteristics on smallholder farmer's adoption of social media.

4. RESULTS

4.1. Descriptive Statistics of Smallholder Farmers

The results represented in Table 1 were obtained from the study concerning smallholder farmers' descriptive socioeconomic characteristics.

TABLE 1: Descriptive Socioeconomic Characteristics Summary (n=217)

Variable	Description	Frequency	Per cent
Age	<20	8	3.5
	20-29	63	27.4
	30-39	50	21.7
	40-49	40	17.4
	50-59	37	16.1
	60+	32	13.9
Gender	Female	105	48.4
	Male	112	51.6
Farm size (ha)	<5	99	45.6
	6-10	82	37.8
	11-20	21	9.7
	21-30	2	.9
	31-40	7	3.2
	40<	6	2.8
Level of education	No school	39	18

	Primary	54	24.9
	Secondary	67	30.9
	Matriculated	33	15.2
	Agricultural certificate	7	3.2
	Diploma	12	5.5
	Degree	5	2.3
Cooperative membership	No	180	82.9
	Yes	37	17.1
Irrigation scheme membership	No	167	77.0
	Yes	50	23.0
Social Media Use	No	117	53.9
	Yes	100	46.1
Electronic device owned	None	13	6.0
	Basic cell phone	89	41.0
	Smartphone	103	47.5
	Smartphone/laptop	12	5.5

The data obtained from the survey concerning descriptive socioeconomic characteristics are presented in Table 1. Most (52.6%) smallholder farmers were in the age bracket <20-39. Smallholder farmers in the age group 40-49 were 17.5%. Smallholder farmers in the age group 50-59 made up 16.1%. The second lowest number of smallholder farmers was made up of the age group of 60 years and above, with 13.9%, and the lowest number of smallholder farmers was found in the age group of those under 20 years of age, with 3.5% of smallholder farmers. These findings do not concur with some studies that found the majority of smallholder farmers are of an older age group and that there is a lack of youth involvement in agriculture (Myeni *et al.,* 2019; Ntshangase, Muroyiwa, & Sibanda, 2018; Chandio *et al.,* 2020). These findings suggest that younger smallholder farmers make up a large number of the sampled population, ranging between <20-39, and those between 20-29 being the largest number within the group.

In terms of gender, men made up a majority of the smallholder farmers, with 51.6% of them taking part in the study. These findings concur with Janavi *et al.* (2021), who found more male smallholder farmers than females. Myeni *et al.* (2019) also found that males make up the

majority of smallholder farmers in South Africa. Contrary to these findings, other studies have found that there are more females heading farming households than males (Diale 2011; Thamaga-Chitja, 2012). Rodriguez *et al.* (2009) and Thamaga-Chitja, Kolanisi and Murugani (2010) associate the larger number of males with a cultural ideology that males are the heads of households and the retirement of older males who supplement their retirement package with farming activities.

The study also revealed that a high number of smallholder farmers had a land size of 5 hectares or less, with 45.6% of smallholder farmers. According to Lehohla (2016), about 68% of the Mpumalanga province's land is used for agriculture. In concurrence with the findings of this study, Samberg *et al.* (2016) found very few smallholder farms with a land size of five or fewer hectares in sub-Saharan Africa, making up 11% of smallholder farming communities. Furthermore, smallholder farmers often cultivate on very small plots of land and are the most prevalent form of agriculture globally, with family-scale production and labour (Lowder, Skoet & Raney, 2016; Samberg *et al.*, 2016). Additionally, even though smallholder farmers may own larger plots of land, they do not have the resources to cultivate the land to their maximum production capacity.

The study further found that 30.9% of smallholder farmers had a secondary level of education, followed by those with a primary level of education, constituting 24.95, and 18% had no schooling. It was also found by the Community Survey (2016) that most smallholder farmers have a limited level of education, with a majority having a secondary to no school level of education. This implies that most smallholder farmers had a limited to low level of education. These findings agree with other studies that found that smallholder farmers do not have very high levels of education, which influences their adoption rate (Mittal & Mehar, 2016; Feder, Just & Zilberman, 1985; Mwangi & Kariuki, 2015). These can be linked to previous poor educational resources and facilities along with past injustices of black people within the South African context.

The majority (82.9%) of smallholder farmers were not part of a cooperative. The findings are concurrent with those of Mojo, Fischer and Degefa (2017), who found that most smallholder farmers were not part of a cooperative, with only 46% being members and 54% not participating in cooperatives. Similarly, Nwafor *et al.* (2020) found that only 13% of smallholder farmers were part of a cooperative, and most were not members. Concurrently, the majority of

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smallholder farmers were found to be not part of an irrigation scheme, constituting 77%. The findings from the study agree with the findings of Muchara *et al.* (2014), who found that most smallholder farmers are non-members of irrigation schemes. Contrary to these findings, Phakathi *et al.* (2021) found that most smallholder farmers were part of irrigation schemes. These findings imply that social group membership is subject to context site specificity, as certain areas have more social initiatives than others.

The results also suggested that most smallholder farmers, with a percentage of 53.9%, did not use social media even though a large number (47.5%) of the sampled population had smartphones that could access social media. The findings agree with previous studies that suggest that most smallholder farmers do not use social media (Young *et al.* 2021; Thakur & Chander, 2018; Davis & Sulaiman, 2016; Anderson, 2012; Zondo & Ndoro, 2021). Furthermore, smallholder farmers need to be fully aware of social media's benefits in relation to information and knowledge dissemination and advisory services (Thakur & Chander, 2018). They also lack the skills and knowledge to use social media and its platforms, resulting in lower adoption (Joffre *et al.,* 2017).

The study also revealed that many smallholder farmers from the sample population owned smartphones that could access social media (47.5%). Those who owned a basic cell phone and could not access social media amounted to 41%. These findings suggest that many smallholder farmers owned some type of electronic device; however, social media adoption and use remained low. The findings are in agreement with other studies that suggest that many smallholder farmers may own mobile and electronic devices; however, they are constrained by factors such as perceptions of mobile phones being only useful for voice communication, credit or data charges, network coverage, and battery power limits that stifle their adoption of social media (Zondo & Ndoro, 2021; Wyche & Steinfield, 2016; Thiga & Ndungu, 2015; Krell *et al.,* 2021).

4.2. Socioeconomic Factors that Influence Social Media Adoption Among Smallholder Farmers

4.2.1. Binomial Logistic Regression Model Results: Socioeconomic Factors Influencing Social Media Adoption by Smallholder Farmers

Table 2 represents the empirical results of the factors influencing social media adoption by smallholder farmers in the Nkomazi Local Municipality. The results from the model indicated that social media adoption is significantly influenced by age, level of education, annual farming income, and cooperative membership. However, farm size (p = 0.988), gender (p = 0.363), and irrigation scheme membership (p = 0.479) had no significant influence on social media adoption by smallholder farmers in the study area.

TABLE 2: Binomial Logistic Regression Model Results on Socioeconomic Factors that Influence Social Media Adoption by Smallholder Farmers (N=217)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Age***	-1.173	.273	18.509	1	.000	.309	.181	.528
	Gender	.483	.531	.828	1	.363	1.622	.572	4.595
	Education level***	2.876	.522	30.388	1	.000	17.739	6.381	49.315
	Farming annual income(R)***	1.469	.557	6.955	1	.008	4.347	1.458	12.955
	Farm size	-.005	.346	.000	1	.988	.995	.505	1.962
	Co-operative** membership	1.996	.877	5.180	1	.023	7.362	1.319	41.079
	Irrigation scheme membership	-.436	.617	.500	1	.479	.647	.193	2.165
	Constant	-3.783	1.113	11.546	1	.001	.023		
Overall Percentage		88%							
-2 Log-likelihood		97.781[a]							
Cox & Snell R Square		.605							
Nagelkerke R Square		.809							

Hosmer and Lemeshow Test	Chi-square 7.662
	df 8
	Sig. 0.467

***S.E is the Standard error in parentheses* (*p < 0.1, **p < 0.05, ***p < 0.01).**

The general binary logistic regression model was statistically significant, given its comparison with the null model ($\chi 2$ (7, N =217) = 201.712 p < 0.005). This implies that it could distinguish between smallholder farmers adopting social media and those not. It explained 80.9% (Nagelkerke R Square) and 60.5% (Cox & Snell R Square) of the variation of social media adoption and appropriately classified 88% of the cases. A preliminary analysis showed that the multicollinearity assumption was met (tolerance < 0.1), inferring no multicollinearity. The Likert scale type data was transformed from ordinal to scale data. The results obtained indicated that age (p < 0.01), education level (p < 0.01), annual farming income (p < 0.01), and cooperative membership (p < 0.1) were the main variables that had a significant influence on social media adoption by smallholder farmers in the Nkomazi Local Municipality as presented in Table 2. The odds ratio between non-adopters and adopters was also taken into account. Non-adopters were 0.309 times more likely to be influenced by age and 17.739 times influenced by the level of education than adopters. It was further found that non-adopters were 4.347 times more influenced by annual farming income and 0.023 times more likely to be influenced by cooperative membership than adopters of social media.

4.2.1.1. Age

The results from Table 2 show that the variable age had a positive and statistically significant influence (p = 0.000) on social media adoption by smallholder farmers. Regarding a unit increase in age, the odds of a smallholder farmer adopting social media are 0.309. The results from the study suggest that smallholder farmers within the younger age group are more likely to adopt social media than those in older age groups. This implies that an increase in age is associated with a reduction in adoption. An elucidation of the results suggests that smallholder farmers who are in the digital natives' age group are more likely to adopt social media than digital immigrants. This is in agreement with findings from other studies (Zhang *et al.,* 2012; Baffoe-Asare *et al.,* 2013; Vodanovich *et al.,* 2010; Jarrahi & Eshraghi, 2019) that suggest that older smallholder farmers tend to be late adopters and laggards when it comes to new

technology adoption. According to Mittal & Mehar (2016), older smallholder farmers are in the age of digital immigrants. They are usually less likely to adopt innovations such as social media (Mittal & Mehar, 2016). Moonsammy and Moonsammy (2020) also add that age significantly influences smallholder farmers' social media application in extension programmes.

Contrary to these findings, Wale and Mkuna (2023) found that no significant influence exists between the age of smallholder farmers and adoption. However, it is evident from the findings that younger smallholder farmers are most likely to be innovators and early adopters of social media. Different studies conflict regarding age being a determining factor in social media adoption; some findings indicate a positive influence, and others indicate a negative influence (Yokamo, 2020). However, age is a major determinant of technology adoption, whether positive or negative, and it plays a significant role in adoption.

4.2.1.2. Level of Education

The variable level of education also had a positive and significant influence ($p = 0.00$) on social media adoption by smallholder farmers. Aimed at a single unit increase in education, the odds of a smallholder farmer adopting social media are 17.74. Smallholder farmers with a higher education are more likely to adopt social media. These findings agree with other studies that suggest that education plays a significant role in smallholder farmers' intention to adopt (Aldosari *et al.,* 2019; Osundu & Ibezim, 2015; Haruna & Baba, 2017; Osundu & Ibezim, 2015). The higher the education level of smallholder farmers, the earlier they tend to adopt innovation, placing them in the innovator and early adopter categories and allowing them to understand and analyse the benefits of innovations, as well as make use of them (Mittal & Mehar, 2016; Feder *et al.,* 1985; Mwangi & Kariuki, 2015). Farmers who are more literate and educated are better suited to process new information and knowledge, allowing them to explore various agricultural technologies that will assist them in improving their farming practices (Yokamo, 2020; Aldosari *et al.,* 2019). Oyinbo *et al.* (2019) and Fadeyi, Ariyawardana and Aziz (2022) state that smallholder farmers possessing any form of education, both formal and informal, have a higher rate of agricultural technology adoption. This is because the comprehension and complexity of agricultural technologies are simpler for smallholder farmers with a higher education and literacy level.

4.2.1.3. Annual Farming Income

The results further showed that annual farming income significantly influenced social media adoption (p = 0.008). For a unit increase in annual farming income, the odds of a smallholder farmer adopting social media are 4.35, which suggests that smallholders with a higher annual farming income are more likely to adopt social media as an advisory tool. This implies that smallholder farmers with a higher income are in a position that is financially suitable for them to buy electronic devices and other incentives required for adopting and making use of social media (Panda *et al.,* 2019). According to Masuka *et al.* (2016), even though smallholder farmers can make enough income to break even on their farms, allowing them to own electronic devices such as mobile phones may not be enough to access social media. Annual farming income is an important factor in smallholder farmer's decisions to adopt, as it significantly facilitates the purchase of inputs and agricultural technologies (Yokamo, 2020). It also enhances smallholder farmers' capacity to invest in long-term, diversified farming practices (Knapp *et al.,* 2021). Annual farming income is the operating profit and surplus a farming household acquires for farm-related services and products, ultimately allowing them to sustain their livelihoods and increase their farming capacity (Fadeyi *et al.,* 2022). The income acquired will enable farmers to procure relevant and effective farm technologies that better their farming practices, such as smart devices for obtaining information and advisory services.

4.2.1.4. Social Capital

The variable social capital was analysed under cooperative membership and irrigation scheme membership. Social capital allows smallholder farmers to interact and network amongst varying stakeholders and themselves to produce valuable outcomes (Dubos, 2017). This places them in a situation where they are part of social media groups that share diverse information about their farming activities. Social capital is a measure of involvement or association with a particular social organisation, for instance, a cooperative, irrigation scheme, or union (Baffoe-Asare *et al.,* 2013).

The study found that cooperative membership had a positive and statistically significant influence (p = 0.023) on social media adoption. For a unit increase in the variable social cooperative membership, the odds of a smallholder farmer adopting social media was 7.36. These findings agree with other findings that found that cooperative membership has a positive significant relationship with adopting innovations (Deji 2005; Meena, Dudi & Sharma, 2013;

Heffernan, Thomson & Nielsen, 2008; Kithendu, 2018). They can be associated with social interaction, such as being part of a group and asserting that smallholder farmers can communicate using different methods, as distance and time might not allow them to communicate easily. Being part of social groups such as cooperatives escalates the aptitude of an individual to attain and have access to crucial knowledge and information about innovations and new technologies, along with the benefits thereof through mutual interests and interactions. It increases smallholder farmers' awareness and likelihood of adopting social media to increase their knowledge, information access, and sharing (Conley & Udry, 2010).

Irrigation scheme membership, however, had no statistical significance ($p = 0.479$) on social media adoption. This is mainly linked to a large number of irrigation schemes being located in the province of Limpopo (56%), followed by Eastern Cape (23%) and KwaZulu-Natal (12%) (van Averbeke *et al.,* 2011; Denison & Manona, 2007). Furthermore, variables such as off-farm income, age method of pumping water, duration of irrigation scheme membership, access to agricultural training, and location in the scheme have a significant influence on smallholder farmers' decision-making and water security (Sinyolo, Mudhara & Wale, 2014; Sinyolo, 2013; Eguavoen & Tesfai, 2012). According to van Averbeke *et al.* (2011), the Mpumalanga province has nine schemes, of which three are operational gravity-fed surfaces and four are overhead. There are two non-operational schemes, and one is overhead with only one gravity-fed surface. This limited number of irrigation schemes constrains smallholder farmers' participation in irrigation schemes and limits their social capital in this regard.

5. CONCLUSIONS AND RECOMMENDATIONS

Social media has become imperative in many societies' everyday lives. The information disseminated has moved from mere personal instant messaging among people to sharing vital operational information. Its implementation in the agricultural sector is also becoming a reality in sharing factual and diverse agricultural information. This study was carried out to comprehend smallholder farmers' adoption of social media and investigate the socioeconomic factors that influence its adoption by smallholder farmers in the Nkomazi Local Municipality. The results showed that smallholder farmers were aware of social media and its various platforms. However, most smallholder farmers did not use social media for reasons such as age, education level, language barriers, and lack of electronic devices to access social media. Mediums of disseminating vital information, such as newspapers, television, and radio, have

been essential in the past. However, they are limited in terms of time and immediate and instant information sharing. This makes it essential for agricultural enterprises to adopt social media.

On the contrary, the infrastructure required to access social media and financial constraints relating to the affordability of smartphones and mobile data remain key components in social media adoption. The findings of this study suggest that smallholder farmers see the benefits of adopting social media for advisory services and information dissemination. However, this depends on providing technical skills and training in ICT usage and knowledge about the benefits of social media. The results show that stakeholders in smallholder farmer interventions need to consider improving basic literacy and skills, as well as their literacy and basic skills concerning technology in general and ICT, to allow them better access and use of social media. It is, therefore, recommended that the necessary infrastructure and supporting inputs, such as open-access internet and social media software, be considered in social media in the agricultural sector to foster adoption. In partnership with relevant stakeholders in the private and government sectors, extension officials should encourage wider social media adoption by smallholder farmers. The relevant stakeholders should collaborate to provide infrastructure and facilities, such as community computer labs for smallholder farmers to train and access social media. Policymakers at local and provincial levels need to consider creating guidelines that will allow extension advisory services, NGOs, and private practitioners to develop and facilitate programmes for social media adoption among smallholder farmers. These policies should cater to smallholder farmers with varying socioeconomic characteristics, enhance ICT literacy and skills, and encourage wider adoption of social media for information dissemination and advisory services at the local level.

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