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Awareness and Perception of Digital Technologies by Smallholder Farmers in the Eastern Cape Province, South Africa

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ABSTRACT

This study aimed to identify and assess smallholder farmers' awareness and perceptions of digital technologies in the Eastern Cape, South Africa. The study used a cross-sectional survey of a purposively selected sample of 250 smallholder farmers from Port St Johns (PSJ) and Ingquza Hill (IH) Local Municipalities. The Likert scale and a perceptive index were used to analyse the data. The study found that 57.4% and 74.7% of smallholder farmers were aware of digital technologies. Fifty-six percent to 70.6%of smallholder farmers were aware of a combination of smartphones, radios, and TV. There was indifference to the reliability of digital technologies as indicated by 42.7% to 52.9%, with 97.8% to 98.1% highlighting the need to improve awareness of digital technologies, mainly through awareness campaigns and information days as indicated by 51.6% from PSJ and farmer training as highlighted by 50.6% from IH. About 76.4% of the smallholder farmers did not have adequate knowledge of digital technologies, while 54.4% did not find them user-friendly. However, 88.0% indicated that it made farming easier, is labour saving (69.6%), improves agricultural production (81.2%), improves access to information (77.6%), easier access to extension (65.6%), and will increase farm output (71.6%). However, digital technologies were expensive (78.8%), caused a digital divide (69.2%), and required specific skills (81.0%). There was a negative perception towards digital technologies by 69.6% of the smallholder farmers. The study concluded that negative

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perception is mainly influenced by cost, skill requirement, lack of knowledge, and difficulty in use. There was awareness of less complicated digital technologies. Recommendations include promoting digital technologies through farmer groups or associations such as farmer field schools. Awareness campaigns through extension officers can be used to promote digital technologies to smallholder farmers.

Keywords: Awareness, Digital Technology, Perceptive Index, South Africa

1. INTRODUCTION

Agricultural development has been identified as a means to eliminate hunger and poverty in Africa's Agenda 2063 (African Union, 2022). Through the Comprehensive African Agricultural Development Programme (CAADP), the continent intends to promote economic growth through increasing agro-based investment to 10% of national budgets to achieve 6% agricultural growth. This was also resonated at the 2003 Maputo Declaration and the 2014 Malabo Summit (NEPAD, 2003). This is against an increasing demand for food, which will hit US$1 trillion between 2010 and 2030 (Kah, n.d.). Furthermore, it would result in direct and multiplier poverty reduction. According to Watts and Scales (2020), SSA's agricultural development provides a market with multipliers of positive social impact. This led to investments of US$251 billion by 2015 in the agricultural sector, mainly through Sub-Saharan Africa (SSA) government expenditures, resulting in an annual growth rate of 0.73%. This was mainly sustained through technical changes rather than improving existing practices' efficiency (Myeki et al., 2022). However, even after aligning with the Sustainable Development Goals (SDGs), a 100% increase in smallholder productivity and income has not been achieved (Matchaya, 2020; Myeki et al., 2022; UN, 2015).

In South Africa, agriculture is insignificant, contributing 2.5% to the GDP (World Bank, 2022). The most reliable statistics on agricultural households in the country are from Statistics South Africa (2016), indicating that there are 2.3 million households involved in agriculture, mainly found in the Eastern Cape and Limpopo Provinces. The largest number of households practice backyard farming (83.8%), farmland production (8.7%), and communal production (5.0%). Agriculture is the primary source of food and income for 43.7% and 5.7% of households, respectively (StatsSA, 2016). The South African government has responded by increasing public expenditure investment into the agriculture sector, with R18.2 billion forecasted for

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2024/25. Half of this expenditure will go towards transfers and subsidies targeting smallholder farmers such as the Comprehensive Agricultural Support Programme (CASP), Land Care Programme (LCP), and the Ilima/Letsema Projects. This has resulted in the country investing 2% of its agricultural expenditure on technology development (Department of National Treasury, 2022).

There is a need for effective and sustainable tools to improve global agricultural productivity and food security (Nitturkar, 2021). The surge in agricultural product demand and investment in SSA has presented a great opportunity for smallholder farmers to enhance their production through improved digital technologies. This has also multiplied in job creation, revenue increases, food self-sufficiency and foreign currency earnings from exports (Jellason et al., 2021). Private sector investment and Public Private Partnerships (PPPs) can complement government expenditures to avail digital technologies to smallholder farmers (Watts & Scales, 2020), who account for more than 80% of SSA's food and fibre production on less than an average of two hectares (Jellason et al., 2021; Kamara et al., 2019; Nitturkar, 2021).

Technological development in SSA agriculture is shaped by investments and their source. This determines what technologies are used in the sector, what training is required, and what other associated services impact productivity and growth (Matchaya, 2020). However, due to the lack of improved technology adoption, there has been low production, expanding the gap in production with developed countries through the digital divide (Engås et al., 2023). Myeki et al. (2022) state that technology-driven agricultural growth benefits from enhanced income, employment, and food security. Digital technologies provide a platform through which technologies and agricultural development interact. However, most digital technologies globally do not succeed (Nitturkar, 2021). This is particularly evident in Southern African countries with similar agricultural technologies due to dominance by smallholder farmers with outdated technologies (Myeki et al., 2022).

To improve agricultural production through technologically driven investments, there is a need to make technologies available to farmers. This raises the question of farmers' awareness and perceptions of developed technologies. This has been shaped by the past smallholder farmer experiences and their future expectations (Engås et al., 2023). Engås et al. (2023) found varying levels of awareness of digital technologies among players in the Brazilian agricultural sector. There was low awareness of digital technologies amongst medium-sized farms and native

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communities, while there was high awareness of technology start-up enterprises in the agricultural sector.

Interestingly, research institutes also have low awareness of digital technologies, choosing to focus on low-tech technologies. This will compromise the adoption of high-tech technologies amongst the farming and native communities (Engås et al., 2023). In addition, previous experience with digital technology influences their perception towards it. Perceptions are shaped by how they make sense of technological change, carved out in the relations, qualifications, and knowledge of their experiences in the digital divide. There were negative perceptions towards digital technologies in Brazil due to the low reliance on digital technologies for their activities (Engås et al., 2023). Bahrain, Al-Ammary and Ghanem (2023) also found low awareness of digital technologies, with farmers opting for low-tech technologies despite the huge infrastructures. This was compounded by a lack of understanding of improved digital technologies' advantages, lack of trust, illiteracy and ignorance (Al-Ammary & Ghanem, 2023). The lack of complementing tools has limited the awareness and use of digital technologies in Thailand (Sayruamyat & Nadee, 2020), while awareness of digital technologies is improved by existing digital skills that farmers already possess, with those lacking tending to rely on other farmers in Norway (Kvam et al., 2022). Positive perception towards digital technologies with low use in Thailand was demonstrated by Sayruamyat & Nadee (2020), while Groher et al. (2020) indicated that the perception of complexity and high cost of digital technologies has affected adoption rates in Switzerland. Russian farmers were shown by Golubev et al. (2021) to be knowledgeable about digital technologies, with however some scepticism about their abilities to use such technologies.

In South Africa, authors such as Dlamini and Ocholla (2018) and Jere and Maharaj (2016) indicated that there was awareness of digital technologies. However, Smidt and Jokonya (2022), Aguera et al. (2020), as well as Mdoda and Mdiya (2022) found that there was low awareness of digital technologies being restricted by culture, cost, service provider behaviour and lack of infrastructure. Most digital technology studies have focused on their application in higher-income countries (Jellason et al., 2021). Furthermore, there are gaps in the infrastructure, finance, skills, and knowledge of technology adoption to ensure successful adoption. Limited studies focus on the awareness and perceptions towards digital technologies in South Africa, with some using a review approach (Smidt & Jokonya, 2022; Zantsi & Nkunjana, 2021). Other studies have used qualitative approaches (Akinsola, 2014; Akinsola &

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Dehinbo, 2013) with others limiting the digital technologies to Information and Communication Technologies (ICTs) (Dlamini & Ocholla, 2018; Makaula, 2021; Mdoda & Mdiya, 2022), extension officers (Mabe, 2012; Mabe & Oladele, 2012; Mabe & Oladele 2015; Mabe & Oladele, 2012) and the commercial sector (Simpson & Calitz, 2014; Woodburn et al., 1994). There is a need for studies that take an empirical approach and encompass other possible digital technologies that farmers can use. The study aimed to identify and assess smallholder farmers' awareness and perceptions of digital technologies in the Eastern Cape, South Africa, through a cross-sectional survey.

2. METHODOLOGY

2.1. Study Area

The study was conducted in Port St Johns and Ingquza Hill Local Municipalities, Eastern Cape, South Africa (Figure 1). The local municipalities are located in OR Tambo District Municipality, which has a variety of agricultural activities on both commercial and subsistence scales (OR Tambo DM, 2016). Port St Johns and Ingquza Hill Local Municipalities are classified as Category B, with high poverty levels and many households depending on social grants. In PSJ, agriculture accounts for 1.4% of Gross Value Added (GVA) and 5.4% of total employment, while it is 2.0% of GVA, accounting for 4.1% of total employment in IH. Forty-seven percent of households are engaged in agriculture in PSJ compared to 53.9% in IH (ECSECC, 2017a, 2017b).

2.2. Conceptual Framework

The study used the Unified Theory of Acceptance and Use of Technology (UTAUT) Model. The UTAUT model is premised on four constructs: performance expectation, effort expectation, social influence and facilitating conditions (Byamukama et al., 2022; Omulo & Kumeh, 2020; Srinuan & Seangnoree, 2014). Performance expectation believes in the model improving performance, while effort expectancy is the comfort of using the technology. Social influence is the societal pressure to utilise the technology while facilitating conditions related to the belief of existing infrastructure to support the use of the technology (Byamukama et al., 2022; Chang et al., 2020; Venkatesh et al., 2003). According to Mabaya and Porciello (2022), although South Africa has vast communication and power infrastructure, mobile data costs have challenges and constraints. In the Eastern Cape Province, Makaula (2021) identified challenges such as unpredictable broadcasting time, poor signal, language barriers and lack of

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electricity being impediments in the utilisation of digital technologies by smallholder farmers. Such challenges and barriers will have a profound effect and are affected by the awareness and perception of digital technologies by smallholder farmers.

2.3. Study Design

The study used a cross-sectional survey design, purposively sampling 250 farmers from PSJ and Ingquza Hill Local Municipalities. A semi-structured questionnaire was used to collect data, which was analysed using the Likert scale and a perceptive index developed through the min-max normalisation.

2.4. Analytical Framework

2.4.1. Likert Scale

Mumu et al. (2022) indicate a Likert scale is four or more Likert-type items, resulting in a composite score. It measures latent variables that are difficult to measure directly, such as motivation, perception, and awareness. An individual item is not ideal for measuring the phenomenon of interest; hence, it is a composite of multiple Likert items (Mumu et al., 2022). On a Likert scale, the respondents will highlight their level of agreement with various statements about some event, person, object or attitude (Taherdoost, 2019). The study used a Likert scale to measure smallholder farmers' level of awareness and perception towards digital technologies. The five-point scaled items used in the study are shown in Table 1.

TABLE 1: Perception of Respondents Towards Digital Technologies

Perceptions of adoption of digital technologies
Adoption of digital technologies can make farming easier.
I have adequate knowledge of digital technologies.
The use of digital technologies will be labour-saving.
The use of digital technologies improves agricultural production.
Through digital technologies. Smallholder farmers access information on time.
Through digital technologies. Farmers access extension services easily.
The use of digital technologies helps smallholder farmers to access the market.
It is easy to access farm loans through digital technologies.
Digital technologies are expensive compared to other agricultural innovations.

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The use of agricultural digital technologies improved household income.

Digital technologies are user-friendly.

Digital technologies are complicated.

Digital technologies are the cause of the digital divide between smallholder and commercial farmers.

Unequal access to digital technologies exists among smallholders.

Digital technologies will discourage the use of Indigenous knowledge and skills.

All the digital technologies are suitable for smallholder farms.

The use of digital technology will increase smallholder farmers' farming output.

The use of digital technologies requires specific skills.

2.4.2. Perceptive Index (PI)

The Min-Max Normalisation, as used by Ngarava et al. (2020), was used to normalise and standardise smallholder farmers' perceptions towards digital technologies. The Min-Max normalisation was used to produce an indicator which fell in the range of 0 – 1, using the following formula:

$$PI_{qi} = \frac{P_{qi(obs)} - P_{qi(\min)}}{P_{qi(\max)} - P_{qi(min)}}$$

where PI_{qi} is the Perceptive index of question i, $P_{qi(obs)}$ is the observed value of perceptive question i, $P_{qi(\min)}$ is the global minimum value of question i (=1) and $P_{qi(\max)}$ is the global maximum value of question i(=5). The overall PI_{qi} for each respondent was:

$$PI_{overall(j)} = \frac{\sum_{i=1}^{n} PI_{qi}}{n}$$

where n is the number of perception questions, which is 18.

3. RESULTS

Table 1 shows more female respondents in PSJ (68.6%) and Ingquza Hill (71.4%) Local Municipalities. This might be because more South African males temporarily migrate to urban areas for better opportunities (Ginsburg et al., 2021). Most respondents in PSJ (34.0%) and Ingquza Hill (27.5%) were aged between 60 and 69, respectively. This might negatively influence awareness and potential adoption of digital technologies in the study area since old farmers typically prefer Indigenous farming techniques. The household sizes ranged between

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6 – 10 for 58.5% of households in PSJ and 51.6% for households in Ingquza Hill Local Municipalities. Close to 54.7% of the respondents from PSJ were married, while 56.0% in Ingquza Hill were married. Most respondents had secondary education in both study areas, 56.0% for PSJ and 38.5% for Ingquza Hill. This could affect the awareness and use of digital technologies, especially those that are more advanced. Four out of five respondents in each of the study areas were full-time farmers, while 67.3% of PSJ had social grants as their primary source of income in comparison to 57.1% in Ingquza Hill. In addition, 62.9% of respondents from PSJ had a monthly household income between R1001 and R5000, with 44.7% engaged in mixed farming on communal land (96.9%), which was less than 5 hectares (59.7%) with 35.5% having between 11 and 20 years of farming experience. In Ingquza Hill, 63.7% of the respondents had a monthly household income between R1001 and R5000, with 59.5% practising mixed farming on communal land (93.2%), which was less than 5 hectares (75.8%) and 36.3% having between 6 and 10 years of farming experience.

TABLE 2: Descriptive Statistics

Variable		**PSJ**	**Ingquza Hill**
Gender	Male	31.4	28.6
	Female	68.6	71.4
Age	30 – 39	13.8	14.3
	40 – 49	15.1	17.6
	50 – 59	27.0	20.9
	60 – 69	34.0	27.5
	70 and above	10.1	19.8
Household size	1 – 5	24.5	33.0
	6 – 10	58.5	51.6
	11 – 15	16.4	14.3
	15 and above	0.6	1.1
Marital status	Married	54.7	56.0
	Not married	45.3	44.0
Educational levels	None	9.4	24.2
	Primary	32.1	27.5
	Secondary	56.0	38.5

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	Tertiary	2.5	9.9
Employment status	Full time farmers	82.0	80.2
	Part time farmers	18.0	19.8
Source of income	Social grant	67.3	57.1
	Salary	9.4	6.6
	Agricultural activities	22.0	31.9
	Remittances	1.3	4.4
Monthly income	Less than R1000	16.4	22.0
	R1001 – R5000	62.9	63.7
	R5001 – R10000	17.0	12.1
	More than R10000	3.8	2.2
Farming activities	Crop production	45.3	35.2
	Livestock production	10.1	5.5
	Mixed	44.7	59.5
Land tenure	Communal	96.9	92.3
	Leased	3.1	7.7
Land size	Less than 5 ha	69.8	75.8
	More than 5 ha	31.2	24.2
Experience in farming	Less than 5 years	10.1	29.7
	6 – 10 years	27.8	36.3
	11 – 20 years	35.5	25.2
	More than 20 years	26.6	8.8

Most of the respondents in PSJ (54.7%) and Ingquza Hill (74.7%) were aware of digital technologies (Table 2). Respondents were primarily aware of smartphones, radios, and TV, i.e., 56.2% of PSJs and 70.6% of Ingquza Hills. Information on digital technologies was mainly obtained from other farmers in PSJ (42.7%) and Ingquza Hill (44.1%). Most respondents in PSJ (42.7%) and Ingquza Hill (52.9%) indicated that information on digital technologies had average reliability. Most PSJ (98.1%) and Ingquza Hill (97.8%) showed a need to improve

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awareness of digital technologies. In comparison, 51.6% in PSJ indicated this should be through awareness campaigns and information days, while 50.6% in Ingquza Hill indicated that this should be done through farmer training.

TABLE 3: Awareness of Digital Technologies

Variable		**PSJ**	**Ingquza Hill**
Awareness of digital technologies	Yes	54.7	74.7
	No	45.3	23.5
Type of digital technologies aware of	Smartphone	24.7	13.2
	Radio	9.0	8.8
	TV	3.4	1.5
	Smartphone, radio, and TV	56.2	70.6
	Radio and TV	6.7	5.9
Source of information on digital technologies	Extension Officers	25.8	10.3
	Other farmers	42.7	44.1
	Farmer associations	3.4	19.1
	Media	16.9	22.1
	Other farmers and Extension Officers	6.7	1.5
	Family member	0.0	2.9
Reliability of information on digital technologies	Poor	13.5	17.6
	Below average	30.3	29.4
	Average	42.7	52.9
	Above average	10.1	0.0
	Excellent	3.4	0.0
Is there a need to improve the awareness of digital technologies	Yes	98.1	97.8
	No	1.9	2.2
How do we improve awareness of digital technologies	Awareness campaigns and information days	51.6	38.2
	Extension training	10.3	11.2
	Farmer training	38.1	50.6

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Table 3 above shows that 76.4% (34.4% + 42.0%) of the respondents did not have adequate knowledge of digital technologies, while 54.4% (28.8% + 25.6%) did not find digital technologies user-friendly. The majority of the respondents indicated that the adoption of digital technologies makes farming easier (88.0%), it is labour-saving (69.6%), improves agricultural production (81.2%), there is access to information (77.6%), easier access to extension (65.6%) and will increase farm output (71.6%). However, 78.8% indicated that digital technologies were expensive compared to other agricultural innovations, 69.2% highlighted that they cause a digital divide, and 81.0% indicated that digital technologies require specific skills. Close to 36.4% of the respondents were indifferent about whether using digital technologies improves household income.

TABLE 4: Perceptions of Digital Technologies

Perceptions of adoption of digital technologies	Strongly agree	Agree	% Neutral	Disagree	Strongly Disagree
Adoption of digital technologies can make farming easier.	41.6	46.4	8.8	1.6	1.6
I have adequate knowledge of digital technologies.	---	1.6	22.0	34.4	42.0
Use of digital technologies will be labour-saving.	29.6	40.0	22.0	4.4	4.0
Use of digital technologies improves agricultural production.	43.2	38.0	16.4	2.4	---
Through digital technologies. smallholder farmers access information on time.	35.2	42.4	18.8	2.8	0.8
Through digital technologies. farmers access extension services easily.	30.8	34.8	22.0	8.0	4.4
The use of digital technologies helps smallholder farmers to access the market.	20.0	35.2	22.8	6.8	15.2

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It is easy to access farm loans through digital technologies	16.8	29.6	25.2	11.6	16.8
Digital technologies are expensive compared to other agricultural innovations.	48.4	30.4	15.6	1.6	4.0
The use of agricultural digital technologies improved household income.	19.2	29.2	36.4	11.2	4.0
Digital technologies are user-friendly.	3.2	6.4	36.0	28.8	25.6
Digital technologies are complicated.	32.0	26.0	30.8	4.8	6.4
Digital technologies are the cause of the digital divide between smallholder and commercial farmers.	37.6	31.6	16.8	8.8	5.2
Unequal access to digital technologies exists among smallholders.	27.6	25.6	24.0	13.6	9.2
Digital technologies will discourage the use of Indigenous knowledge and skills.	33.2	17.2	17.6	14.4	17.6
All the digital technologies are suitable for smallholder farms.	17.6	24.4	27.2	11.2	19.6
Use of digital technology will increase smallholder farmers' farming output.	35.6	36.0	24.4	2.8	1.2
Use of digital technologies requires specific skills.	38.7	42.3	4.8	2.8	11.3

Figure 1 shows that nearly 70% of respondents had a somehow negative perception of digital technologies. 27.5% of respondents from Ingquza Hill had extremely negative perceptions,

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while 17.0% of respondents from PSJ had somehow a positive perception towards digital technologies.

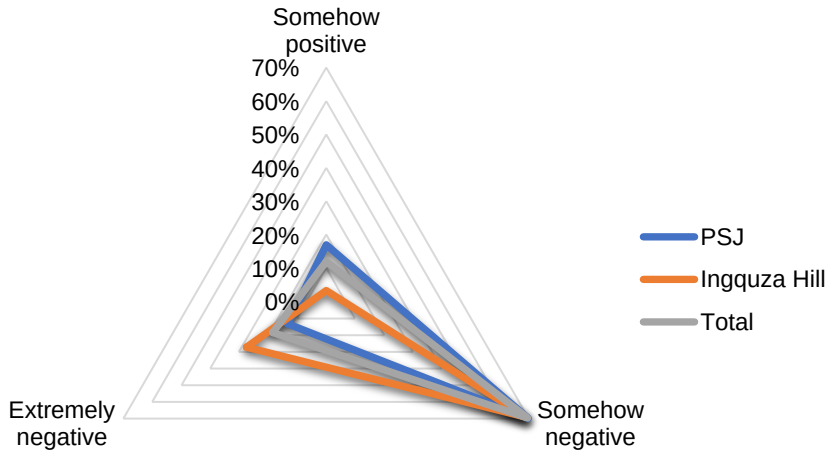

FIGURE 1: Perceptive Indices for Digital Technologies

4. DISCUSSION

The results showed more female respondents, aged between 60 and 69, with household sizes ranging between 6 and 10, mostly married, with secondary education and social grants as the primary source of income. Household incomes ranged between R1001 and R5000, mainly practising mixed farming on less than five hectares of communal land with six to 20 years of farming experience. Wazimap (2022b) highlights that PSJ has a female population of 54.0%, with only 4.0% aged between 60-69 and 33.0% having income below R5000. In addition, 38.0% had completed secondary education. In Ingquza Hill, Wazimap (2022a) also showed that 53.0% were female, 4.0% were aged between 60 and 69, 43.0% had secondary education and 23.0% had an income below R5000. The results show consistency with previous statistics of female populations being the largest, making the findings relative and relevant to the study areas. However, as shown in the study, a worrying picture is painted by the low overall statistical populations of those aged between 60 and 69, the most dominant age group in smallholder farming. This indicates a very advanced age of smallholder farmers. This is complemented by the large proportion of respondents having six to 20 years of farming experience. Drewry et al. (2019) and Srivetbodee and Igel (2021) indicated that the utilisation of digital technologies in agriculture depends on the user's age, with use mainly prominent

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among the youth. According to Smidt and Jokonya (2021), some impediments to the utilisation of digital technologies include low educational levels and incomes, which tend to influence the adoption of digital technology.

There was high awareness of smartphone, TV and radio digital technologies, with information mainly obtained from other farmers. Information from digital technologies was unreliable, with respondents indicating the need to improve awareness of digital technologies through awareness campaigns and farmer training. The study findings of smartphone, TV and radio as being the most utilised digital technologies align with authors such as Dlamini and Ocholla (2018), Makaula (2021), Maumbe (2010), Oladipo and Wynand (2019), Otiso and Moseley (2009). Dlamini and Ocholla (2018) also highlight that lack of awareness was a major constraint for smallholder farmer's utilisation of digital technologies. This explains the limited awareness of a wider and more complicated range of other digital technologies, such as precision agriculture, GIS, and Radio Frequency Identification (RFID) (Munyua et al., 2009; Zantsi & Nkunjana, 2021). Cost hindrances (Migiro & Kwake, 2007) and complicated devices (Dlamini & Ocholla, 2018) can also be the reason for limited awareness of more advanced digital technologies. This is perpetuated by the main digital information source from other farmers, who preserve simple digital technologies such as smartphones, TV, and radio.

There was inadequate digital technology knowledge, with the available technologies not being user-friendly. However, adopting digital technologies made farming easier, with improved access to information and access to extension, consequently increasing farm output. However, the digital technologies were expensive, caused the digital divide and required specific skills. In addition, there was an overall negative perception towards digital technologies. Lack of awareness, knowledge and skill, as well as device complication and cost, were some of the factors affecting the utilisation of digital technologies as identified by Dlamini and Ocholla (2018), Akinsola (2014) and Groher et al. (2020).

In contrast to the study findings, Jere and Maharaj (2016) found that digital technologies were user-friendly, with traditional agricultural knowledge support systems such as extension being inadequate and requiring digital technologies (Akinsola, 2014). Furthermore, they saved time and effort and increased income and production despite a lack of support services, expertise, training and high cost (Al-Ammary & Ghanem, 2023). Engås et al. (2023) and Reissig et al. (2022) identified a negative perception of digital technologies mainly influenced by a generally

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negative attitude towards agriculture. This is also influenced by digital technology's prohibitive acquisition costs and use (Bodescu et al., 2022), which can affect farmer welfare through their negative effect on disposable incomes. Lack of policy coherence and neglecting community heterogeneity can impact perception towards digital technologies, leading to a lack of confidence (Engås et al., 2023).

5. CONCLUSION AND RECOMMENDATION

There was awareness of simple digital technologies such as smartphones, TV, and radio, with other farmers acting as sources of information for such digital technologies. There was, however, a lack of knowledge of digital technologies, with the ones available not being user-friendly. Furthermore, digital technologies are expensive and require specific skills and improved access to information, making farming easier and improving output. There was an overall negative perception towards digital technology. The study concludes with a negative perception mainly influenced by cost, skill requirement, lack of knowledge and difficulty in use.

Furthermore, even though there was awareness of digital technologies, they were mainly less complicated. The study recommends taking advantage of the experience in agriculture and utilising other farmers as a source of digital technologies for promotion. Farmer groups or associations such as Farmer Field Schools (FFS) can be used as conduits to promote expanding existing, less complicated digital technologies and introducing more complicated ones. Extension officers can play a key role in promoting various digital technologies. These offer platforms to raise awareness and influence negative perceptions of digital technologies. Awareness campaigns can be used to facilitate the use of digital technologies in making farming decisions. There is also a need to lobby for providers to make more user-friendly and cheaper digital technologies available.

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