

ICT Usage for Enhancing Communication Between Communal Farmers and Agricultural Advisors in Mangaung District, Free State

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ABSTRACT

This study explores the role of information and communication technologies (ICTs) in strengthening communication between communal farmers and agricultural advisors in Mangaung District, South Africa. Despite agriculture's significant contribution to the national economy, the sector faces challenges in adopting digital technologies aligned with the Fourth Industrial Revolution (4IR). A structured survey was conducted among 62 participants using closed-ended questionnaires to assess ICT ownership, usage patterns, and barriers to effective utilisation. Findings reveal that ICT platforms dominate advisory communication, with 94% of interactions occurring through mobile phones and messaging applications, compared to 35% through face-to-face contact. Mobile phone ownership was high (90.5%), and 84.1% of respondents used them to access agricultural information. However, the use of other ICT tools, such as laptops and tablets, remained low. Key barriers included limited knowledge (41.3%), lack of exposure (34%), and high data costs. While 68.3% of farmers reported receiving ICT-related information from advisors, only 17% used ICT for market purposes, and 82.3% were unfamiliar with agricultural applications. Notably, 96.4% expressed willingness to adopt ICT if provided with training. These findings underscore the need for targeted capacity-building initiatives to enhance ICT literacy and promote digital advisory systems, thereby improving agricultural productivity.

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1. INTRODUCTION

Social and institutional disparities have historically shaped agricultural extension in South Africa. According to Koch and Terblanché (2013), the South African Extension Service was officially established in 1925, when the then Minister of Agriculture, General Kemp, approved the appointment of Col. Heinrich du Toit as its head. This initial service comprised six extensionists serving the entire country, and its development was influenced by international models, including the U.S. system. Over time, services were provided through government, private, and cooperative sectors. While private and government services were largely directed at white farmers, cooperative advisory services were focused on supporting black communities (Liebenberg, 2015). Following the democratic transition in 1994, opportunities for all farmers expanded. The growing importance of information and communication technologies (ICTs) has created opportunities to address persistent challenges in agricultural extension. Despite these opportunities, significant disparities in service delivery persist. As of 2024, the Department of Agriculture, Land Reform and Rural Development (DALRRD, 2024) reported an average ratio of 1 extension officer per 1,404 farmers, far exceeding the recommended ratio of 1:250 for effective advisory support. This imbalance continues to undermine timely service delivery and agricultural productivity in communal farming systems.

Mobile technology penetration in South Africa further illustrates the potential for ICT integration. Recent reports indicate that mobile subscriptions exceed the population, and internet access continues to expand (ICASA, 2023; Stats SA, 2024). These trends suggest that ICT could play a transformative role in bridging communication gaps between farmers and advisors. However, evidence shows that adoption remains uneven. Studies highlight barriers such as limited digital literacy, language constraints, and infrastructural challenges, including unreliable connectivity and load shedding (Makaula, 2021; Das, Munshi & Kabir, 2017). Conversely, research also indicates positive developments: younger, literate farmers demonstrate a greater willingness to adopt mobile-based applications for agricultural purposes (Simelane & Kogela, 2019; Zwane, 2019).

This mixed reality highlights the need for empirical investigation. While ICT offers clear potential to improve advisory communication, structural and socio-economic barriers persist. Understanding these dynamics is crucial for designing interventions that strengthen communication linkages and foster inclusive digital transformation in communal farming systems.

2. PROBLEM DEFINITION

Agricultural extension remains central to improving productivity among smallholder and communal farmers in South Africa. However, persistent structural and institutional challenges continue to hinder its effectiveness. One of the most critical challenges is the high ratio of farmers to extension agents, which restricts timely service delivery and reduces the quality of advisory support. For instance, in Mangaung District, two extension officers serve more than 1,400 farmers, resulting in a ratio of approximately 1:726, far above the recommended 1:250 for effective service delivery (Masiteng, 2021; Koch & Terblanché, 2013). This imbalance contributes to delayed responses, inadequate on-farm visits, and weak communication linkages between farmers and advisors. Recent government reports confirm the severity of this challenge. DALRRD (2024) noted that the national average ratio stands at 1:1,404, underscoring the urgent need for innovative solutions to improve advisory coverage and efficiency. The advancement of ICTs offers a potential pathway to bridge these gaps by enabling faster and more inclusive communication. Despite widespread ownership of ICTs, particularly mobile phones, their use for agricultural purposes remains limited due to barriers such as limited awareness, limited digital skills, network access challenges, and socio-economic constraints (Makaula, 2021; Christian, 2019). These barriers prevent farmers from fully leveraging ICT to access critical information related to production, markets, and advisory services. Although global evidence demonstrates the value of ICT in agricultural development (Simelane & Kogela, 2019), research focusing on communal farmers in South Africa remains scarce. Existing studies highlight adoption trends among youth or specific regions, but there is insufficient empirical evidence on how ICT can strengthen farmer–advisor communication linkages within communal farming systems (Makaula, 2021). This gap highlights the need for targeted research in Mangaung District, where high farmer-to-advisor ratios and weak communication channels significantly undermine farm efficiency.

In response to these challenges, this study examines the role of ICT usage in strengthening communication links between communal farmers and agricultural advisors in Mangaung District, Free State. Specifically, it examines patterns of ICT ownership and utilisation, identifies barriers limiting effective use, and assesses farmers' perceptions of ICT as a tool for improving extension services.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study employed a mixed-methods approach, with a quantitative component dominant and supported by qualitative insights. A descriptive and mixed-methods design was chosen to examine ICT adoption patterns and communication practices among communal farmers and agricultural advisors. Previous ICT studies in agriculture have largely focused on commercial or subsistence farmers, while limited attention has been given to communal farmers and their specific contexts (George & Merkus, 2023). To address this gap, the study was conducted in Mangaung Municipality, Free State, focusing on registered commonages as the primary units of analysis.

3.2. Unit of Analysis, Study Area, and Sampling Procedure

A quota sampling method was employed to ensure representation across gender and age categories among communal farmers and agricultural advisors in Mangaung Municipality, Moseley District. Although the initial target was 165 communal farmers and 20 agricultural advisors, the study concluded with 62 participants, comprising both farmers and advisors. From each registered commonage, participants were selected using convenience sampling, based on availability and willingness to participate. The quota approach ensured balanced representation across gender and age groups, providing insights into how ICT needs and interests vary across enterprises and demographic groups. The study population consisted of all registered communal farmers in Mangaung District, totalling approximately 1,400. The sample size was guided by quota sampling principles to capture demographic variation. Participation was open to all individuals, regardless of gender identity, age, or disability status.

3.3. Data Gathering Instruments and Methods

Data was collected primarily through structured questionnaires designed to capture farmers' perceptions of ICT usage and their interactions with agricultural advisors. The questionnaire consisted mainly of closed-ended questions (98%), complemented by a small proportion of open-ended items (2%) to allow respondents to elaborate on their views. The closed-ended questions used multiple-choice and dichotomous formats to facilitate analysis and interpretation. Data collection was conducted through face-to-face interviews and, where possible, via email to accommodate participants' preferences and availability.

3.4. Data Analysis and Interpretation

Completed questionnaires were collected in hard copy during face-to-face data collection and later digitised for analysis. Data were analysed using the Statistical Package for the Social Sciences (SPSS), and descriptive statistics were used to summarise key findings. Cross-tabulations were performed to examine patterns across demographic groups. For the qualitative component, open-ended responses were analysed thematically using NVivo software, which enabled systematic coding and identification of recurring themes (Ben, 2013; Fox & Bayat, 2007).

3.5. Methodological Justification

The chosen methodology was considered appropriate for addressing the study objectives, as it combined quantitative evidence on ICT usage patterns with qualitative insights into farmer–advisor communication linkages. This mixed-methods approach ensured that the findings were both statistically reliable and contextually relevant to communal farming systems in Mangaung District.

4. RESULTS and DISCUSSION

4.1. Demographic Characteristics of Respondents

Understanding the demographic profile of respondents is essential for interpreting ICT usage patterns and communication linkages within communal farming systems. Demographic factors, such as gender, age, and farming experience, often influence access to information and the willingness to engage with digital tools. Table 1 presents the socio-economic characteristics of the

sampled farmers, providing context for subsequent analysis of ICT utilisation and advisory communication.

TABLE 1: Demographic Characteristics

Variable	Frequency	Percentage %
Gender (n=62)		
Male	36	59.8
Female	26	41.9
Age group (n=60)		
Youth (18–35)	20	33.3
Middle-aged adults (36–50)	13	29.7
Senior adults (51+)	27	45
Years of Experience (n=62)		
0–4 years	22	35.5
5–9 years	20	32.3
10–14 years	10	16.1
15–19 years	4	6.5
20+ years	6	4.7
Farmers with Dependents (n=61)		
Yes	39	63.9
No	22	36.1
Number of Dependents (n=36)		
1–3 dependents	18	50
4–7 dependents	16	44.4
8–15 dependents	2	5.6

Of the 62 valid responses, 58.1% were male and 41.9% were female, reflecting the continued male dominance in communal farming. This trend aligns with previous studies that have shown that agricultural participation in South Africa remains skewed by gender, although government policies

increasingly emphasise the empowerment of youth and women in the sector (Department of Agriculture, 2021).

In terms of age distribution, 33.3% of respondents were youth (18–35 years), 21.7% were middle-aged adults (36–50 years), and 45% were senior adults (51 years and above). The predominance of older farmers suggests that communal farming is still largely managed by senior individuals, which may influence the pace of ICT usage, as younger farmers are generally more technologically adaptive (Simelane & Kogela, 2019).

Farming experience varied considerably among respondents. More than two-thirds (67.8%) had less than 10 years of farming experience, while only 9.6% had over 20 years. This suggests that many participants are relatively new to farming, which presents both opportunities and challenges. On one hand, newer entrants may be open to using ICT-based advisory services; on the other hand, limited experience may reduce confidence in applying technological solutions without adequate support (Christian, 2019).

Socio-economic factors were also highlighted. Approximately 63.9% of respondents reported having dependants, with half of these farmers supporting between one and three dependants. The economic responsibilities associated with dependents may motivate increased productivity and openness to innovation, including the use of ICT, to secure household income.

4.2. Types of Enterprises in the Commonages

Figure 1 illustrates the distribution of enterprises among communal farmers in Mangaung District. The results indicate that piggery (58.7%) and cattle production (52.4%) were the most common enterprises. Farmers reported that pigs were preferred because they are relatively affordable to acquire, require less maintenance, and generate quicker returns through the sale of meat and piglets. Similar findings were reported by Zwane (2019), who noted that communal farmers often favour livestock enterprises that provide both short-term cash flow and household nutrition. Cattle were the second most significant enterprise, reflecting their cultural and economic importance within communal farming systems, as also observed in studies across Limpopo and KwaZulu-Natal (Sikhweni & Hassan, 2014). Small stock production was also notable, with 34.9% of farmers

keeping sheep and 33.3% maintaining goats. These enterprises contribute to household food security and supplemental income.

Poultry farming, practised by 38.1% of respondents, was largely small-scale and free-range, serving household consumption needs and limited local sales. This finding is consistent with Dlamini and Tshuma (2017), who reported that poultry remains an accessible entry enterprise for resource-constrained households in communal areas.

Other enterprises, such as vegetable production, horse breeding, beekeeping, and lucerne farming, were less common (17.4%). These were mainly pursued as supplementary activities to diversify household income sources. However, respondents reported that energy constraints, minimal access to electricity, and restricted opportunities to expand enterprises, such as poultry (broilers), were prevalent. Makaula (2021) similarly identified infrastructural limitations, including energy access, as barriers to diversification in smallholder farming.

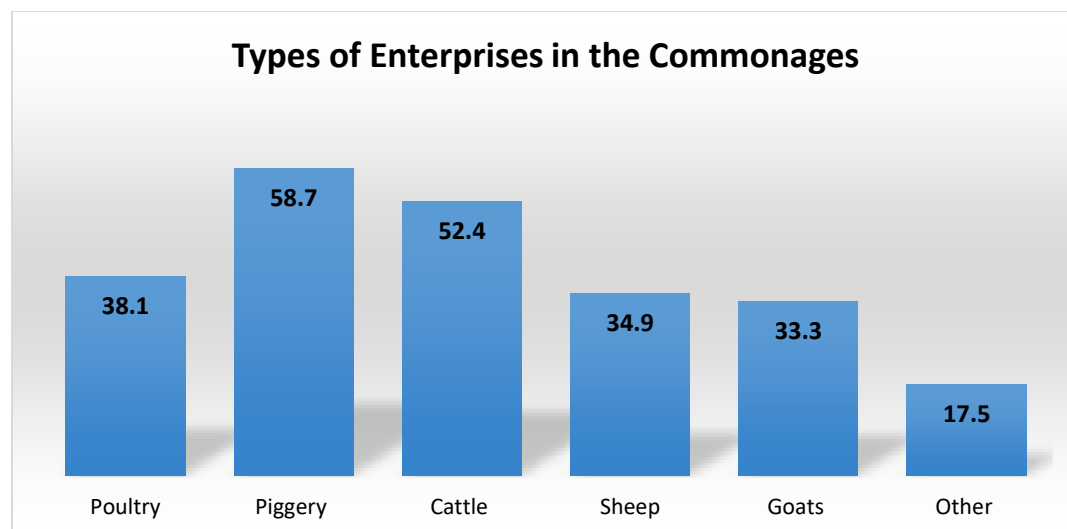


FIGURE 1: Types of Enterprises in the Commonages

The enterprise mix demonstrates a firm reliance on livestock, particularly pigs and cattle, due to their economic returns and resilience. This reflects broader patterns in communal farming across South Africa, where livestock serves not only as a production system but also as a store of wealth and a cultural asset (Ainslie, 2013). These findings highlight the need for ICT-based advisory

interventions tailored to livestock systems, while also creating opportunities to support diversification into horticulture and niche enterprises.

4.3. Variation Between Educational Level and Age Groups

Education emerged as a key determinant of ICT usage among communal farmers. Figure 2 illustrates the relationship between age groups and educational attainment. All youth respondents (aged 18–35 years) had attended either primary or secondary education, with 40% having completed tertiary studies. This suggests that younger farmers are better positioned to engage with ICT tools due to higher levels of formal education. In contrast, only 14% of middle-aged farmers (aged 36–50 years) reported having a tertiary education, while 34% had received only non-formal training. Senior adults (ages 51 and older) had the lowest levels of formal education, with fewer than 30% having attended school beyond the primary level. Their exposure was primarily limited to non-formal workshops delivered by extension officers, which relied more on physical contact than digital platforms. The relationship between education and ICT usage has been widely documented. Jo (2013) argues that education enhances the likelihood of using ICT tools, as formal schooling improves confidence and exposure to modern technologies. Similarly, Msoffe and Ngulube (2016) found that farmers with secondary or tertiary education were significantly more likely to use ICT for accessing agricultural information. In South Africa, Zwane (2019) noted that younger, academically educated farmers were more receptive to digital extension platforms compared to older farmers with limited formal schooling.

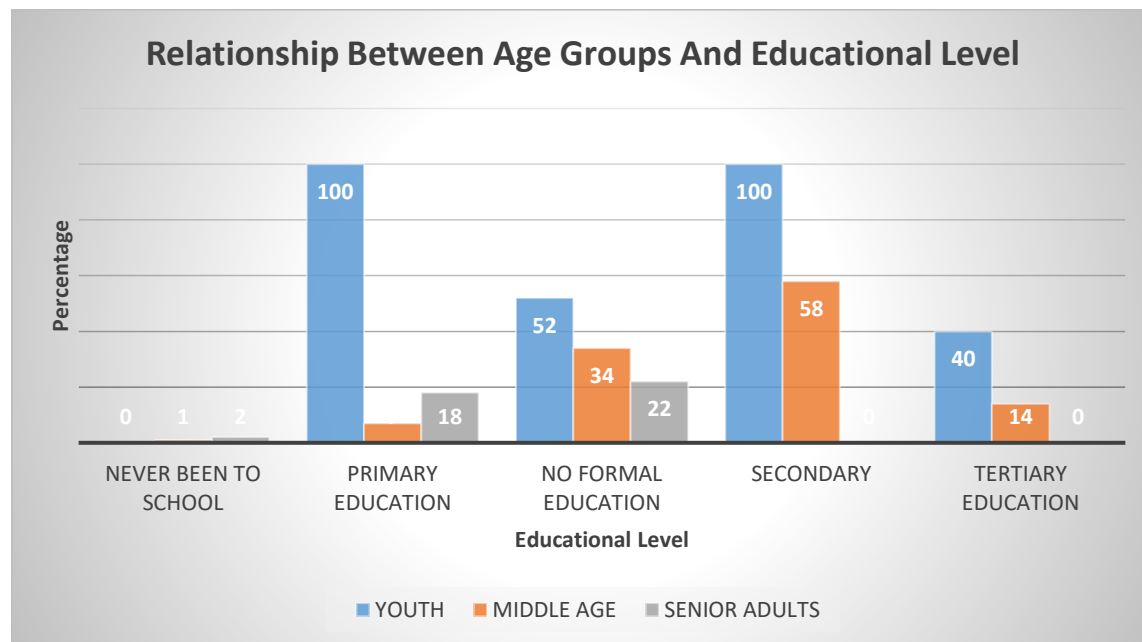


FIGURE 2: The Relationship Between Age Groups and Educational Level

The results of this study support these arguments: although youth accounted for only 33.3% of the sample (Table 1), they were more likely to have higher educational attainment, which increases their potential for utilising ICT in farming activities, external communication, and market research. These findings underscore that age and education jointly influence the use of ICT. Younger, more educated farmers are more ready to integrate ICT into farming practices. In comparison, older farmers with limited formal education may require targeted training and capacity-building interventions to bridge the digital gap.

4.4. Methods of Communication Between Extension Officers and Farmers

Figure 3 presents the frequency with which agricultural advisors use communication methods to engage with farmers. The results indicate that ICT platforms dominate interactions, with 94% of respondents reporting that they primarily communicate through mobile phones, messaging applications, and related digital platforms. In contrast, 54% of respondents reported receiving scheduled farm visits, while 47.6% noted unscheduled visits. Engagement through commodity workshops was the least frequent, at 22.2%, and largely depended on specific themes, such as

commodity-focused training. Other communication methods, such as printed notices or local gatherings, were reported by 14.3% of respondents.

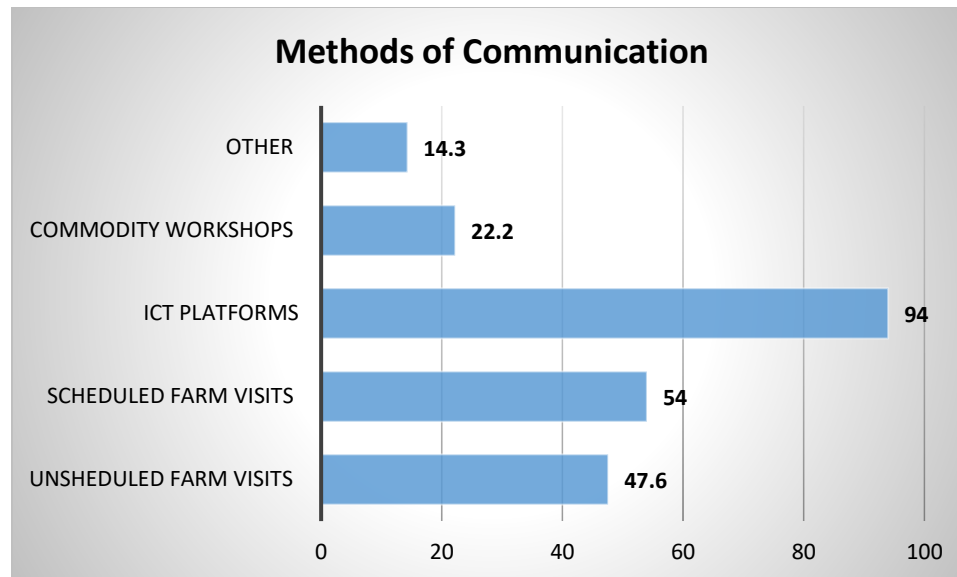


FIGURE 3: Methods of Communication Between Extension Officers and Farmers

These findings highlight a firm reliance on ICT for advisory communication, surpassing traditional face-to-face methods. This trend aligns with global evidence that ICT has become a preferred and efficient medium for extension services, enabling more exhaustive coverage despite resource constraints (Aker, 2011; Zwane, 2019). In the South African context, the increasing use of mobile applications and platforms, such as WhatsApp groups, demonstrates farmers' willingness to adapt to digital tools, even in communal areas with infrastructural challenges (Makaula, 2021).

While the uptake of ICT in communication is promising, its use remains limited primarily to basic interaction and information sharing, rather than advanced agricultural functions. Opportunities exist to expand ICT applications to areas such as market access, record keeping, weather monitoring, and animal health management. Strengthening farmers' capacity to use farming applications and online platforms could therefore enhance the impact of extension services and improve farm efficiency.

4.5. Types of ICT Tools Owned and Used by Farmers

Figure 4 illustrates the relationship between ICT tools owned by farmers and their actual use for accessing agricultural information. The results show that mobile phones are by far the most dominant ICT tool, with 90.5% of respondents owning one and 84.1% actively using it to access agricultural information, including market-related services. Radios and televisions were also widely owned (46% and 38.1%, respectively), but their use for agricultural purposes was lower (38.1% for radios and 14.7% for televisions). In contrast, ownership of laptops (19%), desktops (7.9%), tablets (4.8%), and iPads (1.6%) was limited, and usage levels were similarly low. These findings suggest that training programmes targeting mobile-based applications would provide the most practical entry point for ICT capacity building, as mobile phones are already widely owned and actively used by farmers.

Despite high mobile phone ownership, the ability to fully utilise these devices for agricultural and market information remains constrained. This supports earlier studies that have shown knowledge and digital literacy to be significant barriers to ICT use in rural farming communities (Makaula, 2021; Aker, 2011). Similar patterns were reported by Msoffe and Ngulube (2016) in Tanzania, where high mobile ownership did not automatically translate into effective ICT use for agricultural decision-making.

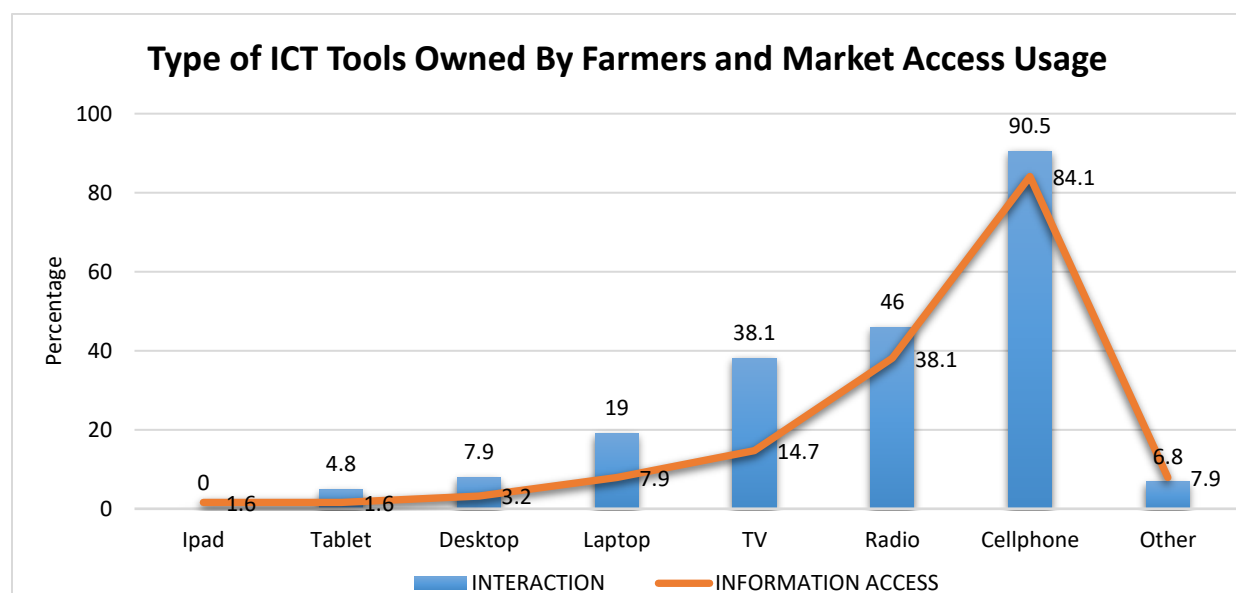


FIGURE 4: Type of ICT Tools Owned By Farmers and Their Usage to Access Related Sectoral Information

These findings suggest that training programmes targeting mobile-based applications would provide the most practical entry point for ICT capacity building, as mobile phones are already widely owned and actively used by farmers.

4.6. Extension Officers' Role in Sharing ICT-Related Agricultural Information

The results indicate that 68.3% of farmers reported receiving information related to ICT tools from extension officers, while 31.7% did not. This suggests that although most extension officers are actively sharing ICT-related information, a significant proportion of farmers remain excluded from these efforts. The limited dissemination of ICT knowledge restricts farmers' ability to fully explore the available digital tools for farm management, marketing, and production efficiency.

These findings align with Zwane (2019), who observed that while extension officers in South Africa are beginning to integrate ICT into advisory services, gaps remain in ensuring equitable access to all farmer categories. Similarly, Aker (2011) emphasised that the effectiveness of ICT in agricultural development depends not only on the availability of tools but also on consistent and inclusive dissemination strategies.

TABLE 2: Extension Officer Shares Information Related to Agricultural Communication Tools

Variable	Frequency (63)	Percentage (100)
Yes	43	68.3
No	20	31.7

The results, therefore, demonstrate the need to enhance the roles of extension officers in promoting the adoption of ICT. Ensuring that all farmers, particularly those in communal systems, have regular access to information on digital tools could accelerate ICT uptake and improve agricultural productivity. It is recommended that extension officers adopt structured ICT knowledge-sharing programmes, such as periodic workshops and digital training sessions, to reach farmers who are currently excluded.

4.7. Farmers' Familiarity with Agricultural Applications

The results indicate that only 17.7% of respondents reported familiarity with agricultural applications, while the majority (82.3%) were unaware of such tools. This low level of familiarity highlights a significant gap in farmers' exposure to digital agricultural innovations. Among the 11 respondents who reported familiarity, 16.7% had attempted to use the applications, whereas 83.3% had not, despite being aware of them. This suggests that knowledge alone does not necessarily translate into adoption, particularly when farmers lack the confidence, skills, or trust to engage with ICT tools.

TABLE 3: Farmers Familiar with Any Agricultural-Related Application

Variable	Frequency (62)	Percentage (100)
Yes	11	17.7
No	51	82.3

These findings align with Makaula (2020), who identified limited awareness and language barriers as constraints to the adoption of ICT among smallholder farmers in South Africa. Similarly, Das, Munshi and Kabir (2017) observed that even when farmers are aware of digital tools, uptake remains low due to issues of trust, relevance, and ease of use. They highlight that ICT promotion strategies must go beyond simple awareness campaigns. Efforts should focus on building farmers' confidence through practical demonstrations, user-friendly applications in local languages, and support structures that encourage sustained use. It is recommended that extension services introduce farmers to agricultural applications through hands-on training and farmer-to-farmer learning platforms, ensuring that awareness is accompanied by actual adoption.

4.8. ICT Tools Farmers Were Familiar With

The majority of respondents (82.3%) reported not being familiar with any agricultural ICT tools. Only a small proportion (17.7%) reported awareness of specific applications, including SAPPO App, PESI App, Google, Agri App, QGIS, Google Earth, AccuWeather, PlantNet, XARVIO Scouting, Farmable, Field Margin, My Poultry Manager, SA Weather Service, and the Farmers' Weekly online magazine. While the range of tools mentioned suggests that some farmers have

been exposed to modern digital platforms, the low overall level of familiarity highlights a significant knowledge gap. This limited awareness restricts farmers from accessing advanced functions, such as weather forecasting, pest and disease monitoring, digital mapping, and record-keeping, which are essential for improving farm efficiency and market competitiveness.

These findings are consistent with Makaula (2020), who found that South African smallholder farmers often lack awareness of ICT tools due to language barriers, inadequate training, and weak advisory support. Similarly, Das, Munshi, and Kabir (2017) argue that awareness alone is insufficient for adoption, as farmers also require trust in the tool's relevance and usability.

The results therefore demonstrate that exposure to ICT tools among communal farmers remains low, despite the growing number of agricultural applications available. It is recommended that extension services integrate practical demonstrations of these tools into their training programmes, enabling farmers to move from awareness to effective utilisation.

4.9. Accessing Agricultural Information through ICT

The results indicate that while ICT ownership and usage were high among farmers, their application for market-related purposes remained limited. Specifically, 81% of respondents reported using ICT tools, primarily mobile phones, for general information sharing, but not for accessing markets. Only 17% actively used ICT for market information, while 2% attempted but faced restrictions such as connectivity challenges or a lack of platform knowledge.

This gap is significant because market access remains a major constraint for communal farmers. Despite high engagement with ICT for communication (e.g., SMS, WhatsApp, and social media), these tools were rarely utilised for market penetration or price discovery. This finding echoes Aker (2011), who emphasised that while ICT reduces communication costs, it does not automatically translate into improved market outcomes unless farmers are trained and supported to use ICT for marketing functions. Similarly, Makaula (2020) highlighted that South African smallholder farmers often remain disconnected from digital markets due to limited awareness of relevant platforms and inadequate digital literacy.

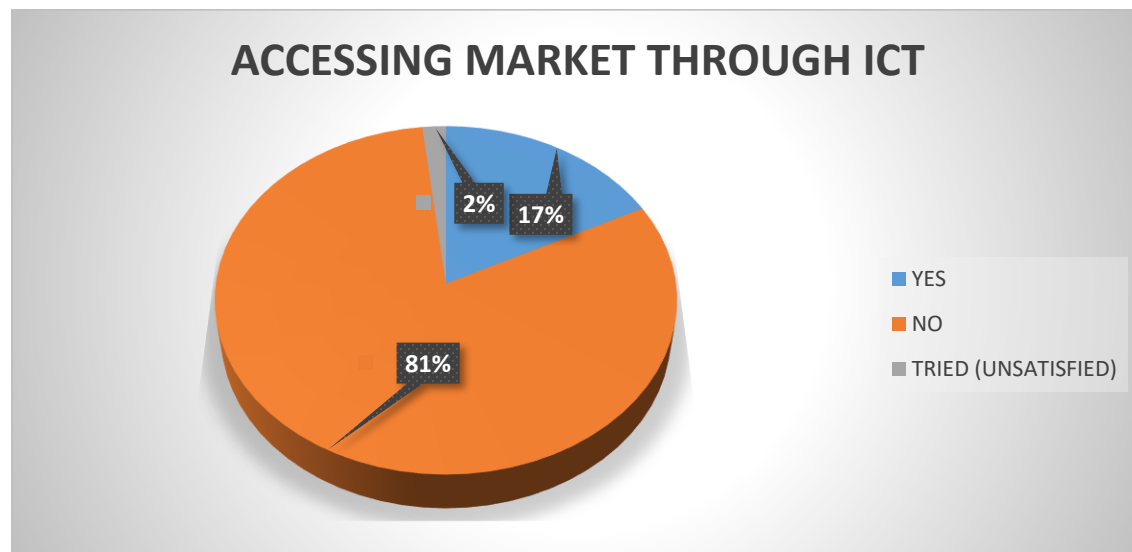


FIGURE 5: Information Access Using Any Form of ICT

The findings therefore underscore that ICT adoption among communal farmers is primarily restricted to interpersonal communication rather than to broader agricultural value-chain functions. It is recommended that extension services and farming agencies integrate market-oriented ICT training and promote digital platforms that link farmers directly with buyers, thereby addressing the persistent gap between ICT access and market participation.

4.10. Factors Restricting Farmers' Use of ICT Tools

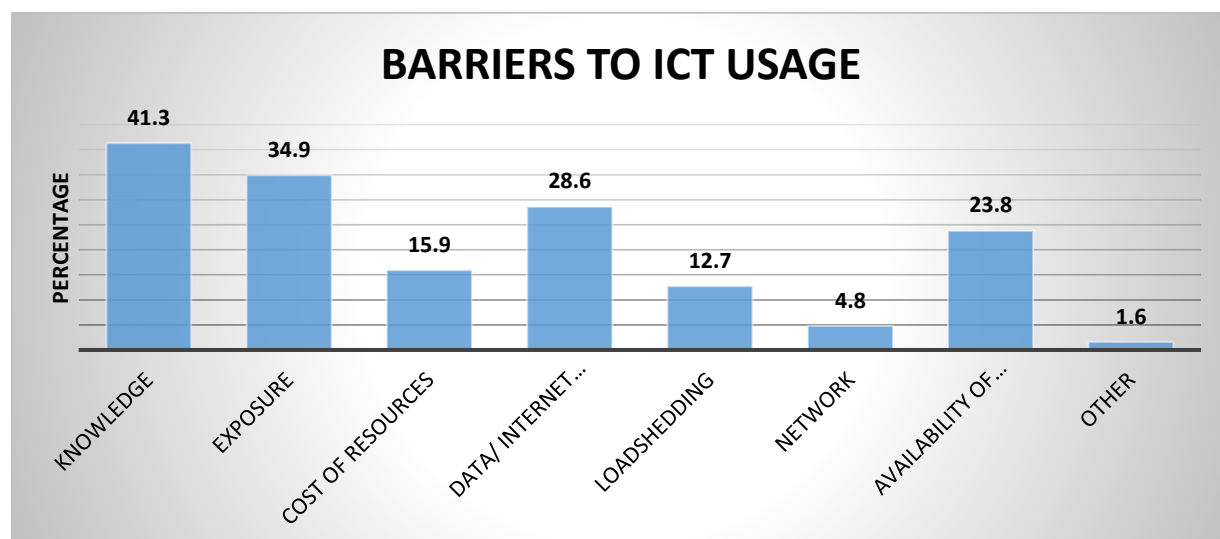


FIGURE 6: Factors Restricting Farmers from Using ICT

Figure 6 illustrates the key factors restricting farmers' adoption and effective use of ICT tools. The most prominent barriers include limited knowledge (41.3%) and lack of exposure (34.9%). Although 90.5% of the respondents reported owning mobile phones, and 93% of those users indicated that they use their phones for ICT-related purposes, a small minority (7%) remain excluded due to insufficient knowledge and exposure. While this is a relatively small proportion, it highlights a critical gap that undermines the broader utilisation of ICT in communal farming systems.

Other significant constraints include the cost and availability of ICT resources (39.7%) and unstable network connectivity and high data costs, which jointly affect 33.4% of farmers. Load shedding, a persistent national challenge in South Africa, was identified as a barrier by 12.7% of the participants. Meanwhile, a small fraction (1.6%) cited "other" factors, such as lack of interest or resistance to new technologies.

These findings emphasise that despite the widespread availability of mobile phones, farmers' limited knowledge and exposure remain the most pressing barriers to ICT adoption. This suggests that investment in farmer training, digital literacy programmes, and awareness initiatives is essential for enabling farmers to fully leverage ICT tools for information access, record-keeping, marketing, and farm management. Das, Munshi and Kabir (2017) support similar observations, and Makaula (2020) argues that without targeted capacity building, the transformative potential of ICT in agriculture cannot be fully realised.

The identified barriers to ICT adoption, particularly limited knowledge and low exposure, directly influence the extent to which farmers are familiar with specific ICT tools. While most farmers have mobile phones and use them for basic communication, their awareness of and practical engagement with dedicated agricultural applications remain limited. Understanding which tools farmers already recognise, and the extent of their familiarity, provides a critical foundation for designing targeted interventions to improve digital literacy and promote the uptake of agricultural ICT innovations.

4.11. The Usage of ICT Tools to Strictly Access Market and Market-Related Information

TABLE 4: The Knowledge of Using Any ICT Tool to Access the Market

	FREQUENCY (57)	PERCENTAGE (100)
Yes	20	35.1
No	37	64.9

The results indicate that only 35.1% of farmers reported knowing how to use ICT tools to access market-related information, while the majority (64.9%) lacked such knowledge. This finding corresponds to the low actual use of ICT for market purposes, as previously discussed. Notably, 92% of farmers reported never receiving any ICT training, despite 96.4% expressing interest in learning to use ICT tools for agricultural purposes.

This gap highlights a clear opportunity for capacity building: although farmers demonstrate willingness and interest in adopting ICT for market access, their knowledge deficit restricts practical uptake. Given the persistent challenges of market access for communal farmers, extension officers are well-positioned to bridge this divide by providing regular ICT-focused workshops and training sessions. Such interventions should target farmers across age groups, educational levels, and production scales, ensuring that interest is converted into actual skills and sustainable practice.

While the findings demonstrate strong farmer interest in ICT adoption, they also reveal a considerable knowledge and skills gap that limits practical usage, particularly for market-related purposes. This situation raises an important question: are extension officers sufficiently equipped to provide the necessary guidance and training on ICT tools? To address this, the study further examined extension officers' understanding and knowledge of agricultural ICT tools, as well as their ability to effectively transfer these skills to farmers.

4.12. Extension Officers' Understanding and Knowledge of ICT Tools

The capacity of extension officers to understand and apply ICT tools is critical for effective information dissemination to farmers. The results indicated that four out of five extension officers primarily interacted with subsistence farmers, while only one focused on communal farmers. Furthermore, two of the five extension officers reported mainly engaging with youth, whereas the

remaining three have primarily been involved with farmers aged 40 years and older. These findings suggest that youth remain underrepresented in subsistence and communal farming, a pattern that may affect the pace of ICT adoption, given that younger farmers are generally more receptive to digital technologies (Simelane & Kogela, 2019).

All five extension officers reported owning and using ICT tools in their advisory work. However, differences in their level of expertise were observed. Two officers described themselves as well-informed about ICT applications, while three reported moderate knowledge. Notably, only four officers indicated they could facilitate ICT-related workshops for farmers. This partial capacity suggests a gap between ICT access and effective ICT-driven extension practice.

The results are consistent with Zwane's (2019) findings, which noted that although extension officers in South Africa increasingly rely on ICT tools, many lack the advanced skills required to train farmers beyond basic communication. Similarly, Aker (2011) argues that the effectiveness of ICT in agriculture depends not only on the availability of tools but also on the knowledge and capabilities of intermediaries, such as extension officers.

These findings highlight the importance of strengthening extension officers' ICT skills, particularly in relation to farmer training and facilitation. Without adequate capacity, extension officers may perpetuate existing inequalities in access to information, especially between subsistence and communal farmers. This suggests the need for continuous professional development programmes that prioritise ICT capacity-building for extension officers to enhance service delivery and support digital transformation in agriculture.

5. RESEARCH FINDINGS

This section presents the study's findings in relation to its stated objectives. The results reveal both the opportunities and limitations of ICT use in enhancing communication between communal farmers and agricultural advisors in Mangaung District.

5.1. ICT use in Farmer–Advisor Communication

The study found that ICT has become the dominant medium of interaction, with 94% of respondents using ICT platforms to communicate with extension officers and fellow farmers. By

contrast, only 35% of engagements occurred through face-to-face meetings. This demonstrates that ICT has already reduced the time and costs associated with advisory communication. However, ICT use remains limited, primarily to basic communication rather than more advanced agricultural functions, such as market access, record-keeping, or weather monitoring. This underutilisation limits ICT's contribution to overall farm efficiency.

5.2. Barriers to ICT Adoption

Although most farmers owned ICT tools, particularly mobile phones, several factors constrained their use for agricultural purposes. The results identified knowledge gaps as the most critical barrier: while 85.7% of farmers expressed a willingness to learn about ICT, few had the necessary skills to utilise it for record-keeping, marketing, or accessing production-related information. Educational level and age also influenced ICT adoption, with younger, better-educated farmers demonstrating greater readiness than older, less educated farmers (Makaula, 2020; Jo, 2013). These findings align with Das, Munshi and Kabir's (2017) report, which noted that age, education, and awareness remain key determinants of ICT adoption in the agricultural sector.

5.3. Role of Extension Officers

The findings also showed that extension officers possess ICT tools and use them in advisory services, with four out of five reporting that they can facilitate ICT-related workshops. This suggests that extension officers have sufficient capacity to support the adoption of ICT among farmers. However, limited engagement with communal farmers compared to subsistence farmers indicates an imbalance that could perpetuate inequalities in information access.

5.4. Farmers' Willingness to Adopt ICT

Notably, the results indicate a high willingness among farmers to adopt ICT-based communication strategies. Over 80% of participants expressed interest in learning to use ICT tools to access agricultural and market information. This willingness presents an opportunity for extension services to expand ICT use beyond communication into more productive areas such as marketing, weather forecasting, and farm management.

6. DISCUSSION

The study confirms that ICT has shifted from a supplementary tool to the primary communication channel between farmers and advisors, reducing reliance on face-to-face engagement. However, its use remains primarily confined to basic interaction, with limited application for market access, record-keeping, and production monitoring. Barriers such as limited digital literacy, age, and education persist, despite strong farmers' willingness to adopt ICT. Extension officers possess ICT tools but require advanced facilitation skills to support equitable adoption among communal farmers. These findings underscore the need for targeted capacity-building interventions and policy measures to bridge the gap between ICT ownership and effective utilisation.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusion

ICT has transformed advisory communication in communal farming systems, yet its potential to improve productivity and market integration remains underutilised. While farmers demonstrate a strong willingness to adopt ICT, and extension officers show moderate capacity and knowledge, gaps in exposure, particularly among older and less educated farmers, continue to constrain effective use. Addressing these barriers through structured training, enhanced extension support, and improved connectivity is essential to unlock ICT's full benefits for communal agriculture in South Africa.

7.2. Recommendations

The study revealed that ICT is already the dominant communication channel between farmers and advisors. Yet its use remains primarily limited to fundamental interactions rather than advanced agricultural functions, such as market access, record-keeping, and weather monitoring. To address this gap, structured ICT training programmes should be introduced for communal farmers, focusing on practical applications that enhance farm efficiency and market integration. These programmes must be tailored to different age groups and literacy levels, with youth empowered as digital champions to accelerate adoption. Given that extension officers possess ICT tools but vary in their facilitation capacity, continuous professional development is essential to strengthen their ability to deliver ICT-driven advisory services equitably across communal and subsistence farming

systems. Policy interventions should prioritise rural connectivity and affordable internet access, while fostering partnerships with ICT developers to create farmer-friendly applications in local languages with offline functionality for areas affected by poor connectivity and load shedding.

Furthermore, advisory systems should formalise the use of widely adopted platforms, such as WhatsApp and Agri-Apps, by expanding their functions to include market linkages and farm management tools. This approach promotes interactive platforms that enable two-way communication rather than one-directional information transfer. Ultimately, future research should incorporate longitudinal studies to evaluate the long-term effects of ICT adoption on productivity and livelihoods, comparative studies across provinces to identify scalable best practices, and larger sample sizes to enhance the reliability and generalisability of the findings.

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