

The Use of Mobile Phones Among Sweet Potato Farmers for Agricultural Information in Ranomeeto Subdistrict in Southeast Sulawesi

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Abstract: The integration of mobile technology in agriculture has emerged as a significant innovation, especially in enhancing the accessibility and dissemination of agricultural information. This study investigates the use of mobile phones among sweet potato farmers in the Ranomeeto Subdistrict of Southeast Sulawesi, with a particular focus on the extent of mobile phone usage and the specific agricultural activities for which mobile phones are utilized. A survey methodology was employed, involving structured interviews with 20 sweet potato farmers. Responses to question used 5-point Likert scale which was the base for data analysis. The results indicate a high ownership rate of mobile phones among farmers, but the frequency of using mobile phones for various agricultural activities varied. Communication with buyers was the most frequent activity, whereas accessing weather and market information was less common. Farmers occasionally used mobile phones to communicate with extension officers and access agricultural information via the internet and social media. Several factors contribute to mobile phone adoption, including the presence of a communication network and an increased awareness of mobile technology benefits. While mobile phones are a valuable tool for sweet potato farmers, their full potential is not yet realized. Recommendations include enhancing extension services for sweet potatoes, improving digital literacy, and addressing network infrastructure issues to ensure consistent connectivity.

Keywords: agricultural information, extension, farmer, mobile phones, sweet potatoes.

1. Introduction

Agricultural extension services are essential in promoting agricultural development and improving the livelihoods of farmers. These services provide crucial support to farmers by sharing knowledge about modern farming techniques, sustainable agricultural practices, and new technologies [1], [2]. Extension agents play a key role in helping farmers increase crop yields, manage resources more efficiently, and build economic resilience against market and environmental challenges [3], [4]. Although extension services vary in their delivery models, the core goal remains consistent: to bridge the gap between agricultural research and practical farming [5] to enable higher productivity and sustainability. However, the effectiveness of these services is often constrained by logistical,

financial, and infrastructure limitations, especially in remote and underserved areas, underscoring the need for innovative solutions to enhance the reach and impact of agricultural extension.

Sweet potato is a staple food crop in many parts of the world, including Southeast Sulawesi, Indonesia. Despite not being the main staple and the main food crop in the province [6], its cultivation is a critical livelihood strategy for smallholder farmers in some production centers. In Amokuni Village in Ranomeeto subdistrict, many farmers cultivate sweet potatoes, where it is an important component of the local diet and agricultural economy and contributes to food security [7], [8] and local development. Sweet potatoes from the village is supplied regularly to Kendari, the provincial capital, and other surrounding areas. However, farmers still rely much on conventional farming techniques and face challenges related to modern agricultural practices. In this context, examining the information-seeking behaviors and technology adoption patterns of these farmers can provide valuable insights to guide the development of more effective and accessible extension programs.

The integration of mobile technology into agricultural extension services presents a substantial opportunity to overcome many of the limitations inherent in traditional systems [9]. Mobile phones, with their widespread adoption and capability for rapid communication, offer an innovative platform for the dissemination of agricultural information [10]. This technology enables extension services to reach a broader audience at a fraction of the conventional cost and time. Through mobile phones, farmers can receive instantaneous updates on weather patterns, market prices, and best farming practices directly to their devices, facilitating more informed decision-making and quicker adaptation to changing conditions. Moreover, mobile technology supports interactive learning and feedback, allowing farmers to consult experts and participate in knowledge-sharing communities without the constraints of physical distance. The scalability and flexibility of mobile-based extension services thus hold the promise of transforming agricultural education and support systems,

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making them more responsive to the needs of the farming community.

Despite the recognized potential of mobile technology to revolutionize agricultural extension services, there remains a significant research gap concerning its specific impacts and utilization patterns among different agricultural sectors and regional contexts. While numerous studies have documented the general benefits of mobile technology in agriculture, few have delved into how these benefits manifest among distinct crops and within unique geographic and socio-economic settings. Particularly, the utilization of mobile phones for extension services among sweet potato farmers in the Ranomeeto District has not been thoroughly investigated. This gap in the literature highlights the need for research to understand the nuances of mobile technology adoption and its effectiveness in this specific context.

Access to agricultural information is crucial for small-scale farmers to improve their farming practices and productivity. In recent years, the adoption of mobile phones has shown promising potential in enhancing the dissemination of agricultural information, particularly in rural areas where traditional information channels may be limited [11]–[13]. This study investigates the use of mobile phones among sweet potato farmers in the Ranomeeto Subdistrict of Southeast Sulawesi, Indonesia, to access and utilize agricultural information.

2. Materials and Methods

This study was conducted in Amokuni village, Ranomeeto subdistrict in Southeast Sulawesi. The village is situated 114 above sea level. The population of the village in 2022 is 624, consisting of 310 male and 314 female. Like other places in Southeast Sulawesi, the village has a tropical climate with two seasons, namely rainy and dry season. Most of the people rely on agriculture as the main source of living. The main commodities are low-land rice, sweet potatoes, cattle, and vegetables. The village was selected as study location because farmers have long cultivated sweet potatoes and they supply sweet potatoes to the surrounding areas, including to Kendari, the provincial capital. Respondents were 20 sweet potato farmers selected through simple random sampling, ensuring a representative sample of smallholder farmers who actively engage in sweet potato cultivation.

This study employed a mixed-methods approach, combining quantitative and qualitative data collection techniques. Data collection involved Key Informant Interview (KII) and semi-structured interviews to gather information on the farmers' mobile phone usage patterns, access to agricultural information, and perceived benefits of using mobile technology. In addition to the interviews, field observations were conducted to gain a deeper understanding of the farming practices and the integration of mobile technology in the local agricultural context. The data collected was analyzed using qualitative methods, with a focus on identifying recurring themes, patterns, and insights related to the use of mobile phones for agricultural information among sweet potato farmers in the study area.

With respect to semi-structured interview, some of the questions in the questionnaire use five-point Likert scale. The

value of 1 meant “never,” 2 “rarely,” 3 “occasionally,” 4 “frequently,” and 5 “very frequently.” Based on the responses received, the mean score for each of the activities and the grand mean score for all the activities were calculated [14]. Based on the mean score and grand mean score, the frequency index was determined using a 5-point scale, namely, “never” (1.00-1.80), “rarely” (1.81-2.40), “occasionally” (2.41-3.20), “frequently” (3.21-4.20), and “very frequently” (4.21-5.00).

3. Results and Discussion

A. Farmers' Ownership of Mobile Phones

Study results showed that 95% of farmers reported owning mobile phones, while only 5% did not possess these devices (Fig. 1). This high rate of mobile phone ownership underscores the increasingly indispensable role that mobile phones play in the daily operations and decision-making processes of agricultural practices. The ubiquity of mobile phones among farmers reflects a substantial penetration of mobile communications technology in rural areas and indicates as well a growing recognition among farmers of the benefits provided by mobile devices.

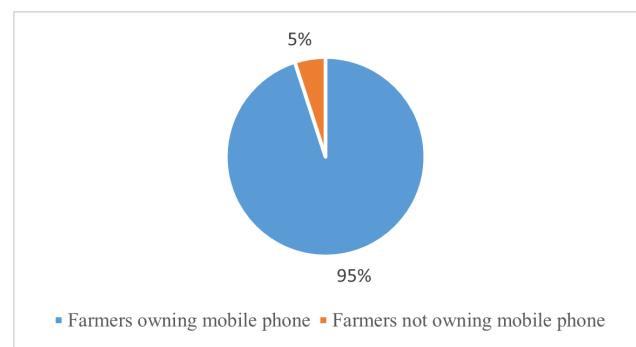


Fig. 1. Farmers' ownership of mobile phone

Several factors appear to contribute to the widespread adoption of mobile phones in this agricultural community. The availability of a mobile communication network facilitates this trend, ensuring that farmers are generally well-connected and able to receive and disseminate information effectively. However, the signal strength within the village varies, being strong in some areas and weaker in others, presenting a challenge to consistent connectivity. Despite these variations, an increased awareness of the benefits that mobile technology can offer in improving agricultural productivity and market access is likely influencing adoption rates. Education level also plays a pivotal role, as farmers with higher educational backgrounds may be more inclined to embrace technological solutions to enhance their farming operations. Farmers' decisions to bear risks related to adoption of new technologies and modern information sources such as mobile phones positively correlates with education level [15]–[17].

B. Length of Mobile Phone Usage

With respect to the duration of mobile phone usage among the respondents, we found a wide range of experiences. The length of time that farmers have been using mobile phones

varied significantly, with responses ranging from as recent as 1 year to as long as 15 years. This variation indicates that while some farmers are relatively new to mobile technology, others have been leveraging these devices for a considerable period. On average, the respondents reported using mobile phones for approximately 6.3 years. This average duration suggests that mobile phones are not a recent addition to the farmers' toolkit, but rather an established aspect of their daily lives and agricultural practices.

The varied lengths of mobile phone usage among the farmers also reflect differing levels of familiarity and comfort with mobile technology. Those with longer usage histories are likely to be more adept at utilizing the full spectrum of mobile phone capabilities, including accessing agricultural information and utilizing social media platforms for professional purposes. Conversely, farmers who have only recently adopted mobile phones may still be in the process of exploring and integrating these devices into their farming routines.

C. Use of Mobile Phones for General Communication

Among the farmers who reported owning mobile phones (19 individuals), their usage patterns for communication varied significantly. When asked about the functionalities they utilize beyond basic calling, the responses revealed a diverse range of preferences and technological engagement. Specifically, 6 respondents (31.6%) indicated that they exclusively use their mobile phones for calling, highlighting a reliance on traditional voice communication. This subset of farmers may be less familiar with or less confident in using more advanced features of their mobile devices, potentially due to limited digital literacy or comfort with newer technologies.

Conversely, 3 farmers (15.8%) reported using the Short Messaging Service (SMS) in addition to calling. This indicates a moderate level of technological engagement, as SMS represents a step beyond voice calls towards utilizing written forms of communication. The use of SMS suggests these farmers recognize the benefits of text-based communication, such as sending and receiving information quickly and efficiently without the need for immediate interaction.

Notably, the majority of mobile phone users (10 individuals or 52.6%) reported utilizing WhatsApp (WA) as their preferred communication platform. This significant adoption of WhatsApp underscores the increasing importance of internet-based messaging applications in rural agricultural communities. WhatsApp offers a range of features, including text messaging, voice and video calls, and the ability to share multimedia content, making it a versatile tool for communication. The preference for WhatsApp among these farmers may be attributed to its user-friendly interface, cost-effectiveness, and the capacity to facilitate group communications, which can be particularly beneficial for exchanging agricultural information, coordinating activities, and participating in broader farming networks [18], [19].

These findings highlight the varying degrees of mobile phone utilization among farmers and suggest that while traditional communication methods remain prevalent, there is a clear trend towards embracing more advanced, internet-based

technologies. This shift presents opportunities for agricultural extension services to leverage these platforms to disseminate information more effectively and engage with farmers in a more interactive and responsive manner.

D. Use of Mobile Phones Apps to Access Agricultural Information

When asked about the use of mobile phones to access agricultural information, the responses varied significantly among the farmers. Out of the 19 individuals with mobile phones, 6 (31.6%) reported that they do not use any social media platforms and rely solely on their mobile phones for calling. This indicates that approximately one-third of the mobile phone users in the study are not leveraging social media for agricultural purposes, which could be due to a lack of digital literacy, comfort with traditional methods, or unawareness of the potential benefits that social media can offer in accessing agricultural information.

Conversely, 13 farmers (68.4%) indicated that they use social media platforms for accessing agricultural information, showcasing a diverse range of preferences and technological engagement. Among these social media users, 7 respondents (36.8%) reported accessing YouTube. The popularity of YouTube can be attributed to its vast repository of visual and instructional content, which allows farmers to watch videos on farming techniques, pest control, and crop management, thus gaining practical knowledge through visual demonstrations [20].

Additionally, 6 farmers (31.6%) mentioned that they use Facebook to access agricultural information. Facebook's broad user base and interactive features, such as groups and pages dedicated to farming communities, enable farmers to connect, share experiences, and seek advice from peers and experts [13], [21]. This platform's community-oriented nature facilitates the exchange of information and support among farmers.

Interestingly, although 10 farmers (52.6%) reported using WhatsApp for general communication, only 3 (15.8%) of them utilize it specifically to access agricultural information. These three individuals access agricultural information through WhatsApp Groups, which enable the sharing and exchange of relevant farming knowledge among group members. This group-based communication on WhatsApp can provide a supportive community where farmers can discuss challenges, share solutions, and stay updated with the latest agricultural practices. On the other hand, the remaining 7 respondents (36.8%) who use WhatsApp do participate in WhatsApp Groups; however, these groups are not oriented towards sharing and exchanging agricultural information. This suggests that while WhatsApp is widely adopted for personal and group communication, its potential as a source of agricultural information may not be fully recognized or utilized by the majority of its users in this context.

These findings underscore the importance of recognizing the varying degrees of social media engagement among farmers and the potential barriers to broader adoption. They also suggest a need for targeted educational interventions to increase awareness and digital literacy, enabling more farmers to benefit

from the wealth of agricultural information available on social media platforms.

E. Use of Mobile Phones for Various Agricultural Activities

The survey results provide a comprehensive overview of the frequency with which farmers in the study area use their mobile phones for various activities related to accessing agricultural information. The mean scores, calculated based on a five-point Likert scale ranging from 'never' (1) to 'very frequently' (5), reveal varied usage patterns across different categories of mobile phone utilization (Table 1).

Overall, the grand mean score of 2.79 suggests that, on average, farmers use their mobile phones occasionally for activities associated with agricultural information. This indicates that while mobile phones are integrated into their farming practices, there is a moderate level of engagement rather than consistent or frequent use.

The frequency of mobile phone use for specific activities ranges from 'rarely' to 'frequently,' with some activities, such as communicating with buyers, being performed more regularly than others, like accessing weather and climate information. This variation underscores the selective adoption of mobile phone functionalities based on the immediate needs and perceived benefits by the farmers.

The occasional use of mobile phones for accessing agricultural information through the internet and social media, as well as for communication with extensionists and input providers, suggests that while farmers recognize the potential of mobile technology, there may be barriers such as digital literacy, network accessibility, or relevance of the information that impact their usage patterns [18], [22], [23].

1) Communicating with extension officers and other agricultural advisors

The survey results indicate that farmers occasionally use their mobile phones to communicate with extensionists and other parties to access agricultural information, with a mean score of 2.74. This suggests that while mobile phones are recognized as a valuable tool for obtaining expert advice and technical support, they are not yet fully integrated into the routine practices of all farmers. The occasional use may be attributed to several factors, including the availability and responsiveness of extension services, the farmers' comfort and familiarity with using mobile phones for professional communication, and the relevance of the information provided. This finding is in line with the study by Lestari *et al.* [24] that farmers did not receive adequate information from extension officers, so they utilized alternative sources, including social media. Limitation in the availability and responsiveness of extension is due to, among others, government prioritization to

other crops, such as rice, maize, vegetables, and few selected plantation crops [25].

2) Communicating with buyers

Farmers frequently use their mobile phones to communicate with buyers, as evidenced by a mean score of 3.68. This high level of usage highlights the critical role that mobile phones play in facilitating market access and commercial transactions. Mobile phones enable farmers to negotiate prices, arrange logistics, and maintain regular contact with buyers, thereby enhancing their ability to secure favorable market conditions and improve their economic outcomes. The frequent use of mobile phones for this purpose underscores the importance of reliable communication networks and suggests a high dependence on mobile technology for market-related activities.

3) Accessing agricultural information via internet and social media

The mean score of 2.89 indicates that farmers occasionally use the internet and social media to access agricultural information. This level of engagement suggests a moderate adoption of digital platforms for acquiring knowledge about farming techniques, pest management, and other agricultural practices. While the occasional use points to an awareness of the benefits of online resources, it also highlights potential barriers such as digital literacy, internet accessibility, and the relevance of the available content.

4) Accessing weather and climate information

The use of mobile phones to access information on weather and climate is relatively rare among the surveyed farmers, with a mean score of 2.05. This infrequent use suggests that despite the critical importance of weather and climate information for agricultural planning and risk management, farmers may not be leveraging mobile technology effectively for this purpose. Possible reasons for the low frequency could include limited access to reliable weather data, a lack of awareness about available resources, or preferences for traditional methods of weather forecasting. This finding agrees to study by Amirat *et al.* that farmers used their experiences and local knowledge to make weather and climatic prediction [26]. Given the climate change and its associated impact [27], enhancing the accessibility and reliability of weather information through mobile platforms is increasingly crucial to help farmers make more informed decisions and mitigate climate-related risks.

5) Accessing market and price information

Farmers rarely use their mobile phones to access market and price information, as indicated by a mean score of 2.11. This suggests that while mobile phones have the potential to provide critical market insights that could influence selling strategies and profitability, they are underutilized in this context. Factors

Table 1

Frequency of mobile phone use for various agricultural activities among sweet potato farmers			
No.	Use of Mobile Phone	Mean Score	Category
1	Communicating with extension officers and other agricultural advisors	2.74	Occasionally
2	Communicating with buyers	3.68	Frequently
3	Accessing agricultural information via the internet and social media	2.89	Occasionally
4	Accessing weather and climate information	2.05	Rarely
5	Accessing market and price information	2.11	Rarely
6	Communicating with input supplier	2.89	Occasionally
7	Discussing and coordinating with other farmers	3.16	Occasionally
Grand mean		2.79	Occasionally

contributing to this rare use might include the availability of market information, the reliability of the data, and the farmers' trust in and familiarity with digital sources.

6) *Communicating with input suppliers*

With a mean score of 2.89, farmers occasionally use their mobile phones to communicate with inputs providers or suppliers. This indicates a moderate level of engagement in using mobile technology to procure essential agricultural inputs such as seeds, fertilizers, and pesticides. The occasional use suggests that while farmers recognize the convenience and potential benefits of mobile communication for sourcing inputs, there are likely challenges such as network reliability, the less reliance on purchased inputs such as chemical fertilizer, the availability of some inputs at the local level, and the farmers' comfort with these transactions.

7) *Discussing and coordinating with other farmers*

Farmers occasionally use their mobile phones to discuss and coordinate with other farmers, with a mean score of 3.16. This level of use reflects the importance of peer communication and collaboration in agricultural communities. Mobile phones facilitate the exchange of experiences, advice, and support among farmers, which can be crucial for collective problem-solving and innovation. However, the occasional use also indicates that there is room to further integrate mobile technology into these interactions. One contributing factor to this occasional use is the close proximity in which the farmers live. Since they stay near each other, they often prefer to meet and discuss physically rather than through mobile phones, finding face-to-face communication more immediate and effective. Promoting the benefits of mobile communication for peer coordination and enhancing the digital skills of farmers could foster more frequent and effective use of mobile phones for this purpose, complementing their physical interactions and providing additional flexibility and convenience

4. Conclusion

This study has investigated the role of mobile phones in facilitating access to agricultural information among sweet potato farmers in the Ranomeeto District of Southeast Sulawesi. The findings reveal that while mobile phones are widely owned and used by farmers, their utilization for accessing agricultural information is moderate. The average duration of mobile phone use among the farmers is 6.3 years, indicating that these devices are not new but established tools in their daily lives. However, the frequency of using mobile phones for specific agricultural activities varies, with communication with buyers being the most frequent use, while accessing weather and market information is less common.

Farmers occasionally use mobile phones to communicate with extensionists and access agricultural information through the internet and social media, reflecting a moderate engagement level. The availability and responsiveness of extension services, particularly for sweet potato cultivation, are limited due to government prioritization of other crops. Additionally, the comfort and familiarity of farmers with using mobile phones for professional communication impact their usage patterns. These factors suggest that while mobile technology holds potential,

barriers such as digital literacy, network accessibility, and relevance of the information provided must be addressed to enhance its effectiveness.

In order for agricultural extension services and support programs to better leverage mobile phones to improve information dissemination and ultimately the productivity and sustainability of sweet potato farming in the study area, it is recommended to enhance extension services, promote digital literacy, develop relevant content, and encourage peer communication.

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