

A Study on Smart Agriculture through Mobile Communication

OPEN ACCESS

Volume: 13

Special Issue: 2

Month: January

Year: 2026

E-ISSN: 2582-0397

P-ISSN: 2321-788X

Citation:

Lokeswari, K., and SR Ravikumar. "A Study on Smart Agriculture through Mobile Communication." *Shanlax International Journal of Arts, Science and Humanities*, vol. 13, no. 2, 2026, pp. 186–200.

DOI:

<https://doi.org/10.34293/sijash.v13iS2-i2-Jan.10542>

Dr. K. Lokeswari

*Assistant Professor, Department of Communication
PSG College of Arts & Science, Coimbatore, Tamil Nadu, India*

S. R. Ravikumar

*Research Scholar, Department of Communication
PSG College of Arts & Science, Coimbatore, Tamil Nadu, India*

Abstract

Digital platforms have transformed traditional farming practices, giving rise to the concept of Smart Agriculture. The rapid usage of mobile applications has emerged as a powerful tool for disseminating timely and relevant agricultural information. This research analyzes the utilization of mobile applications among farmers in Coimbatore District. Further, the study explores how the digital tools contribute to informed decision-making and sustainable agricultural development. Primary data were collected from 150 farmers using mobile applications through a structured questionnaire administered during Agri Intex 2025. The results show that mobile applications are important for getting information on crop management, market prices, weather forecasts, and pest control. The study emphasizes that mobile communication helps drive digital innovation in agriculture, supports knowledge sharing, and improves efficiency, productivity, and sustainability. The findings suggest that mobile-based information systems are key to advancing Smart Agriculture and recommend improving digital literacy and infrastructure to better support farming communities. Educational qualification is an important factor in helping farmers address technical, digital literacy, and information quality challenges. In contrast, education has no significant influence on social and personal barriers.

Keywords: Smart Agriculture, Mobile Communication, Digital Innovation, Agricultural Information, Sustainable Development, Coimbatore District.

Introduction

Agriculture and its allied sectors make a significant contribution to national food security, the economy, and the livelihood of most of the rural population. Agriculture faces various challenges, including changing weather patterns, rising costs of farm inputs, fluctuating market prices, crop pests, and limited access to timely, accurate information. The digital transformation in agriculture and its allied sectors has transformed traditional farming into smart agriculture, enabling improved crop production, efficient information, and the promotion of sustainable farming practices.

Among various digital tools, mobile communication has proven to be one of the most widely used and useful for farmers. The adoption of smartphones and mobile applications enabled farmers to access up-to-date information about their farming activities. Mobile platforms, social media, and farmer-centric agricultural applications have increased their ability to make informed choices at different stages of farming. These tools enable two-way communication, help farmers learn from each other and get expert advice, and allow them to share agricultural knowledge quickly.

The effective use of mobile applications depends on several factors, including understanding of digital platforms, language preferences, relevance and credibility of the content, and internet connectivity. It is important to understand how farmers use these apps, what information they seek, and the difficulties they encounter when using them.

In this context, this study aims to examine how mobile applications help meet farmers' information needs, assess farmers' views on these apps, determine their use across different age groups, and identify barriers to their practical use. This study analyses how digital tools can support Smart Agriculture and promote sustainable farming practices in the Coimbatore region by exploring how farmers use mobile apps and the kinds of information they prefer.

Review of Literature

Greco et al. (2025) stated that real-time sensor monitoring improved drying efficiency while preserving microbiological quality and product safety. The authors concluded that smart farming enhances sustainability, crop quality, and profitability in medicinal and aromatic plant cultivation.

Ahmed et al. (2024) stated that Smart Agriculture has the potential to transform agriculture, but overcoming technological, social, and policy challenges is essential for widespread implementation.

Chicaiza et al. (2024) Implementing smart farming requires a complex interplay among components such as sensors, gateways, power supplies, data storage, data processing, and information delivery. Each of these components is crucial to developing an all-encompassing ecosystem that enables farmers to optimize their agricultural practices and make well-informed decisions.

Mandal et al. (2024) highlighted that the evolution of agriculture from traditional to modern practices cannot be stopped. These technologies can connect farmers using their smartphones. Due to the ease of use and low cost of smartphones, the IoT and AI have all contributed to the integration of communication and ICT. Smart farming will satisfy the agricultural demands and provide a stable source of income.

Rawal (2024) explains that wise and intelligent farming integrates IoT, artificial intelligence, satellite technologies, and data analytics to improve agricultural productivity, efficiency, and sustainability. Climate-smart agriculture and precision farming help address climate change, resource scarcity, and food security challenges in India.

Murai and Shelke (2023) emphasize that mobile applications are empowering Indian farmers by providing timely, cost-free access to agricultural information and decision-support tools. The authors argue that mobile-based ICT reduces the information gap and strengthens farmers' problem-solving capacity. They conclude that digital agriculture is essential for inclusive growth, though greater awareness and adoption are still needed among rural communities.

Verdouw et al. (2021) examine the application of Digital Twin technology in smart farming and define Digital Twins as real-time virtual representations of physical farm objects that enable monitoring, simulation, and remote control of agricultural operations. Digital Twins can transform agriculture by enabling data-driven decision-making and whole-farm digital management.

Somantri et al. (2020) discussed the growth of smart agriculture systems using IoT, Arduino, and mobile applications to automate field monitoring and operations. The research shows that IoT-based automation improves productivity, efficiency, and resource management while reducing labor dependency. They concluded that smart agriculture technologies enable small-scale farmers to achieve higher yields and better farm management.

Theoretical Framework

Diffusion of Innovation Theory (Rogers, 2003)

This study is based on Rogers' Diffusion of Innovation Theory, which explains how new ideas and technologies spread within social systems. In this context, mobile applications for Smart Agriculture are considered innovations that farmers in Coimbatore District are adopting.

Five important characteristics affect how these applications are adopted:

Relative Advantage: Farmers are more likely to use apps that provide fast access to information, are cost-effective and convenient, and help them make better decisions.

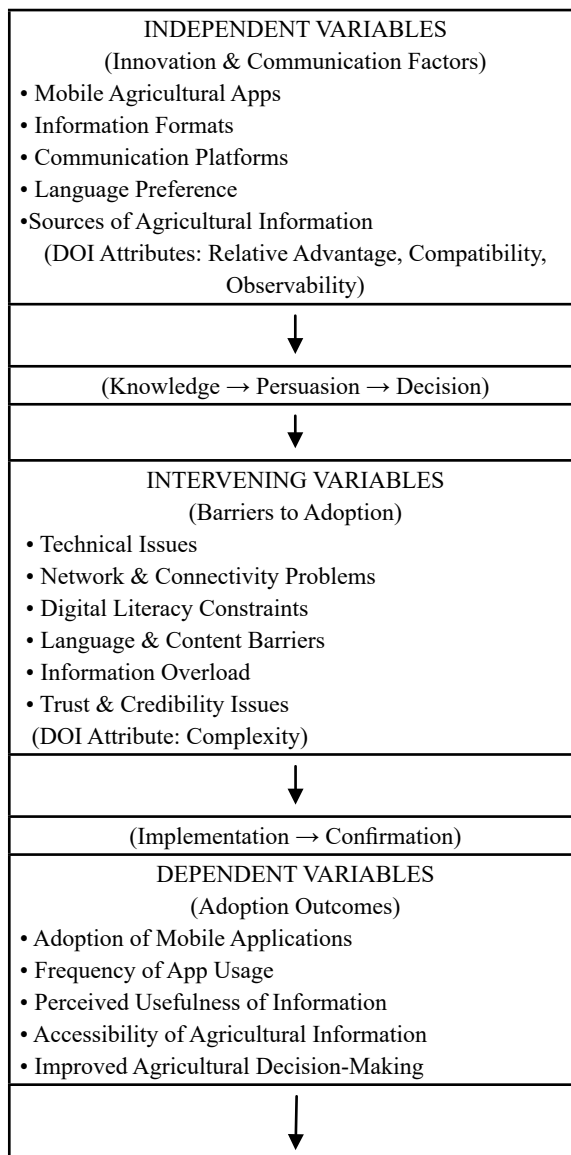
Compatibility: Apps that align with farmers’ values, language (Tamil), and daily practices are more readily accepted.

Complexity: Ease of use, lower learning difficulty, and the ability to overcome challenges related to digital literacy play a role in adoption.

Trialability: Trying out different apps for specific purposes, such as weather forecasts or pest control, helps in adopting them.

Observability: When the benefits of using these apps, like better crop management, timely market information, and recommendations from other farmers, are clearly visible, more people are encouraged to adopt them.

Conceptual Framework



OUTCOME

- Effective Agricultural Information Flow
- Enhanced Smart Agricultural Practices
- Increased Adoption of Mobile-based Farming

Figure 1 Conceptual Framework For The Adoption Of Smart Agriculture Through Mobile Communication Based On Diffusion Of Innovation Theory

The conceptual framework shows how farmers' social and demographic characteristics are linked to their use of mobile apps for obtaining agricultural information. Mobile communication supports smart farming practices, but challenges such as technical issues, poor infrastructure, and limited digital skills can affect how effectively farmers can access and use this information.

Objectives of the Study

1. To examine the role of mobile applications in supporting smart agriculture by addressing the agricultural information needs of farmers in Coimbatore District.
2. To analyse farmers' perception and adoption of mobile applications for accessing agricultural information across different age groups.
3. To identify and analyse the barriers that limit farmers' access to agricultural information through mobile applications and to suggest suitable measures to enhance their adoption.

Research Questions

- RQ1: How do mobile applications support smart agriculture by meeting the agricultural information needs of farmers in Coimbatore District?
- RQ2: How does age influence farmers' perception and adoption of mobile applications for accessing agricultural information?
- RQ3: What are the significant barriers faced by farmers in accessing agricultural information through mobile applications in Coimbatore District?

Research Hypotheses

1. H1: There is a significant association between the use of mobile applications and the fulfillment of the agricultural information needs of farmers.
2. H2: There is a significant association between age and adoption of mobile applications.
3. H3: There is a significant association between the educational qualification of farmers and the barriers they face in accessing agricultural information through mobile applications.

Research Methodology

Research Design

Descriptive-analytical research design has been applied to examine how mobile communication and mobile applications support smart agriculture by meeting farmers' agricultural information needs in Coimbatore District. The design is appropriate, as the study seeks to describe existing patterns of mobile application use and analyse relationships among farmers' characteristics, perception, and adoption barriers.

Study Area

The research was conducted in Coimbatore District, Tamil Nadu, a region recognized for its diverse agricultural practices and increasing adoption of digital technologies in farming.

Population and Sample

The study population comprises farmers who use or have access to mobile phones in Coimbatore District. A total of 150 farmers from Coimbatore District were selected as the study sample using stratified random sampling, ensuring adequate representation across variables such as age, gender, educational level, experience, and farming type.

Data Sources

Primary data were collected through a structured questionnaire administered to the selected farmers during Agri Intex 2025, India's Prime agricultural Trade Fair. Secondary data were gathered from research journals, books, government reports, policy documents, and official agricultural websites.

Tools for Data Analysis

The collected data were coded and analysed using SPSS statistical software. The following techniques were employed:

- Percentage analysis to describe demographic characteristics and usage patterns.
- Mean and standard deviation to analyse Likert-scale responses.
- Chi-square test to examine associations between demographic variables and mobile application usage.

Results and Discussion**Demographic Profile of the Respondents**

The demographic characteristics of the 150 farmers surveyed are presented in Table 1. This data reveals significant patterns that provide context for understanding mobile application usage in smart agriculture.

Table 1 Demographic Description of the farmers(n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18-35	36	24.0
	36-50	79	52.7
	Above 51	35	23.3
Gender	Male	111	74.0
	Female	39	26.0
Education	Up to 10th Std.	48	32.0
	Higher Secondary	13	8.7
	Diploma	17	11.3
	Graduate	48	32.0
	Postgraduate & Others	24	16.0
Land Holding	Below 2.5 acres	37	24.7
	2.6 to 5.00 acres	46	30.7
	1 to 10 acres	39	26.0
	Above 10.1 acres	28	18.7
Farming Experience	1-10 years	60	40.0
	11-20 years	39	26.0
	21-30 years	24	16.0

Source: Primary Data

The demographic information shows that most farmers (52.7%) are in the 36-50 age group, indicating that the majority are middle-aged and actively involved in farming. A larger proportion of farmers are male, accounting for 74% of the total, suggesting that men are more likely to use mobile-based tools for agricultural activities. In terms of education, the farmers have varied levels of schooling, with equal numbers having completed secondary education (6th to 10th standard) and higher education (graduation), each accounting for 32%. About a quarter of the farmers have diplomas or higher qualifications.

When it comes to land ownership, the majority of farmers own small to medium-sized plots ranging from 2.6 to 10 acres, which account for 56.7% of the total. The data on farming experience show that 40% of farmers have 1-10 years of experience, while 26% have 11-20 years, indicating that both newer and more experienced farmers are equally represented in using mobile applications for smart agriculture.

Table 2 Mobile Application Usage Pattern for Smart Agriculture (n = 150)

Aspect	Category	Percentage (%)
Preferred Language	Tamil	56.7
	English	28.0
Perception of Mobile Apps	Quick access to information	32.0
	Convenience anytime, anywhere	30.0
	Easy to understand content	18.0
	Highly beneficial	11.3
	Peer recommendation	7.3
	Cost effective	1.3
Preferred Social Media Platform	WhatsApp	54.0
	YouTube	21.3
	Instagram	13.3
	Facebook	6.0
	Telegram	5.3
Agricultural Apps Used	Uzhavan	42.0
	TNAU AAC	16.7
	eNAM	9.3
	Plantix	7.3
	Others / Not using	24.0
Time Spent per Day	16-30 minutes	52.0
	31-60 minutes	38.0
	Less than 15 minutes	4.0
	Above 61 minutes	6.0
Purpose of Use	Crop management	22.7
	Pest & disease management	18.7
	Market price updates	18.0
	Weather reports	17.3
	Agricultural marketing	16.0
	Irrigation management	6.7
	Storage practices	0.7

Source: Primary Data (Multiple Responses Allowed)

The results show that a majority of farmers prefer receiving agricultural information in Tamil, underscoring the importance of local-language content. Mobile applications are mainly valued for quick access and convenience, reinforcing their role in time-sensitive farm decision-making. WhatsApp emerges as the most preferred platform for agricultural communication, followed by YouTube. Government-supported applications such as Uzhavan and TNAU AAC are widely used, indicating trust in institutional sources. Most farmers spend 16-60 minutes daily on agricultural apps, reflecting regular engagement. Mobile applications are primarily used for crop management, pest control, market price monitoring, and weather updates, demonstrating their relevance across key farming operations. This finding supports Rogers' concept of relative advantage, as farmers are more likely to adopt mobile applications that offer immediate and practical benefits.

Table 3 Mean Scores of Farmers' Preferences for Agricultural Information Formats through Mobile Applications(n = 150)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
I prefer text messages because they are easy to read and understand.	150	1	5	2.07	1.021
Audio messages are convenient for me since I can listen while working.	150	1	5	2.61	1.054
I find images more helpful than plain text for understanding agricultural practices.	150	1	5	1.61	.897
Videos help me understand agricultural techniques better than other formats.	150	1	5	1.40	.882
I find official documents useful for getting detailed information.	150	1	4	2.23	.928
Valid N (listwise)	150				

(Strongly Agree = 1, Agree = 2, Neutral = 3, Disagree = 4, Strongly Disagree = 5)

The descriptive statistics present farmers' preferences for different content formats for accessing agricultural information via mobile applications. Responses were recorded on a five-point Likert scale, where lower mean values indicate stronger agreement.

Among the formats, video content emerged as the most preferred, with the lowest mean score (Mean = 1.40, SD = 0.882), indicating strong agreement that videos enhance understanding of agricultural techniques. This was followed by image-based content (Mean = 1.61, SD = 0.897), highlighting farmers' strong preference for visual information.

Text-based formats showed moderate preference. The statement on the ease of understanding text messages recorded a mean of 2.07 (SD = 1.021). At the same time, the usefulness of official documents for detailed information had a mean of 2.23 (SD = 0.928), suggesting acceptance but lower preference compared to visual formats. Audio messages received mixed responses, with a comparatively higher mean score (Mean = 2.61, SD = 1.054), indicating that while convenient for some farmers, audio content is not universally preferred.

Table 4 Mean Scores of Barriers faced by farmers in accessing agricultural information (n=150)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
I prefer text messages because they are easy to read and understand.	150	1	5	2.07	1.021
Audio messages are convenient for me since I can listen while working.	150	1	5	2.61	1.054
I find images more helpful than plain text for understanding agricultural practices.	150	1	5	1.61	.897
Videos help me understand agricultural techniques better than other formats.	150	1	5	1.40	.882
I find official documents useful for getting detailed information.	150	1	4	2.23	.928
Valid N (listwise)	150				

(Yes = 1, No = 2)

The results show that network-related issues are the main obstacle preventing farmers from accessing agricultural information via mobile apps, with an average score of 1.35. This is followed by challenges related to information overload in groups, with an average of 1.42, indicating that farmers find it hard to manage large amounts of repeated content on mobile platforms.

Other significant barriers include language and content difficulties (averaging 1.61) and technical problems (averaging 1.67), which point to issues with understanding the information and using the apps effectively. Farmers also face moderate challenges in identifying reliable information, with an average of 1.69, and social and cultural factors, averaging 1.73, which impact their access to information. Barriers such as low digital literacy and skills (averaging 1.77) and the presence of irrelevant posts (also averaging 1.77) are reported as less critical than connectivity and information management issues.

The overall findings highlight that infrastructure and information-related challenges are more significant than individual skill limitations. This highlights the importance of improving network connectivity, managing content more effectively, and ensuring the accurate and reliable distribution of information through mobile platforms used in agriculture.

Research Hypotheses

H1: There is a significant relationship between the use of mobile applications and the fulfillment of agricultural information needs of farmers.

Table 5 Chi-Square Test Association Between Use Of Mobile Applications And The Fulfillment Of Agricultural Information Needs Of Farmers

Use of Mobile Applications for agricultural information	Fulfillment of agricultural information needs			Total	Chi-square Value	P Value
	Highly applicable	Moderately applicable	Slightly applicable			
Less than 15 mins	0 (0.0%)	4 (66.7%)	2 (33.3%)	6	37.754	< 0.001
16 mins to 30 mins	40 (51.3%)	38 (48.7%)	0 (0.0%)	78		
31 mins to 60 mins	26 (45.6%)	30 (52.6%)	1 (1.8%)	57		
Above 61 minutes	7 (77.8%)	2 (22.2%)	0 (0.0%)	9		
Total	73	74	3	150		

The Chi-square analysis indicates a statistically significant association between the time spent using mobile applications for agricultural information and the perceived applicability of the information received ($\chi^2 = 37.754$, $df = 6$, $p < 0.001$). Farmers who used mobile applications for 16-60 minutes per day largely perceived the information as highly or moderately applicable, reflecting effective information utilization. In contrast, those with less than 15 minutes of usage reported lower applicability, suggesting limited engagement reduces perceived usefulness.

The results confirm that increased mobile application usage enhances the fulfillment of agricultural information needs. Hence, H1 is accepted.

H2: There is a significant relationship between age and adoption of mobile applications.

Table 5 Chi-square Test association between age and adoption of mobile applications

Age	Adoption of Mobile Applications						Total	Chi-square Value	P Value
	Highly Beneficial	Quick Access Information	Cost Effective	Easy to Understand	Peer Recommendation	Convenience to Use			
18-35 Years	5 (13.9%)	17 (47.2%)	0 (0.0%)	5 (13.9%)	0 (0.0%)	9 (25.0%)	36	20.670	< 0.024
36-50 Years	6 (7.6%)	24 (30.4%)	2 (2.5%)	16 (20.3%)	4 (5.1%)	27 (34.2%)	79		
Above 51 Years	6 (17.1%)	7 (20.0%)	0 (0.0%)	6 (17.1%)	7 (20.0%)	9 (25.7%)	35		
Total	17	48	2	27	11	45	150		

The Chi-square test reveals a statistically significant association between farmers' age and their adoption of mobile applications for accessing agricultural information ($\chi^2 = 20.670$, $df = 10$, $p < 0.024$). The findings indicate that different age groups perceive and adopt mobile applications differently, reflecting variations in usage preferences and perceived benefits across age categories.

Thus, age significantly influences farmers' adoption of mobile applications, and H2 is accepted.

H3: There is a significant association between the educational qualification of farmers and the barriers they face in accessing agricultural information through mobile applications.

Table 6 Educational Qualification and Technical Barriers

Educational Qualification vs Technical Barriers					Chi-square Value	P Value
Cross tabulation						
Count						
		Technical Barriers		Total		
Educational Qualification	Low Education	9	6	15	8.337	<0.015
	Medium Education	22	35	57		
	Higher Education	19	59	78		
Total		50	100	150		

Educational Qualification and Technical Barriers

The Chi-square analysis (Table.6) reveals a statistically significant association between farmers' educational qualifications and the technical barriers encountered when using mobile applications ($\chi^2 = 8.337$, $df = 2$, $p < 0.015$). The test assumptions were satisfied, and the result was further supported by the Fisher-Freeman-Halton Exact Test ($p = 0.016$) and a significant Linear-by-Linear Association ($p = 0.004$), indicating a transparent educational gradient.

The crosstabulation shows that farmers with lower educational levels experience greater technical barriers, while the proportion of such barriers decreases with higher educational qualifications. This finding confirms that education plays a crucial role in reducing the technical difficulties associated with mobile app use.

Educational Qualification and Information Quality Barriers

The Chi-square test (Table.7) indicates a statistically significant association between farmers' educational qualifications and the information quality barriers encountered when using mobile applications for agricultural information ($\chi^2 = 12.580$, $df = 2$, $p < 0.002$). The test assumptions were satisfied, and the result was further supported by the Likelihood Ratio and Fisher-Freeman-Halton Exact Test ($p = 0.002$), confirming the reliability of the findings.

Table 7 Educational Qualification and Information Quality Barriers

Educational Qualification vs Technical Barriers					Chi-square Value	P Value
Cross tabulation						
Count						
		Information Quality Barriers		Total		
Educational Qualification	Low Education	12	3	15	12.580	<0.002
	Medium Education	17	40	57		
	Higher Education	30	48	78		
Total		59	91	150		

The cross tabulation reveals that farmers with lower educational levels experience information quality barriers more frequently, while the proportion of farmers not facing such barriers increases with educational

qualification. Although some highly educated farmers also report information quality issues, they demonstrate a better ability to assess and verify the information received through mobile platforms. The Linear-by-Linear Association was not significant ($p = 0.090$), indicating that the relationship does not follow a strict linear trend.

Overall, the findings confirm a significant association between educational qualification and information quality barriers. Higher educational attainment reduces the impact of information-quality-related challenges.

Educational Qualification and Social & Personal Barriers

The Chi-square test (Table.8) shows no statistically significant association between farmers' educational qualification and social or personal barriers in accessing agricultural information through mobile applications ($\chi^2 = 1.146$, $df = 2$, $p = 0.564$). This non-significant result is supported by the Likelihood Ratio and Fisher–Freeman–Halton Exact Test, as well as a non-significant Linear-by-Linear Association, confirming the reliability of the finding.

Table 8 Educational Qualification and Social & Personal Barriers

Educational Qualification vs Technical Barriers Cross tabulation					Chi-square Value	P Value
Count						
		Social and Personal Barriers		Total		
Educational Qualification	Low Education	5	10	15	1.146	<0.564
	Medium Education	17	40	57		
	Higher Education	18	60	78		
Total		40	110	150		

The cross tabulation indicates that social and personal barriers are experienced across all educational levels, with no substantial variation among farmers with low, medium, or higher educational qualifications. This suggests that such barriers are influenced more by social context, personal attitudes, and cultural factors than by formal education. The findings imply that addressing social and personal barriers requires community-based and behavioural interventions rather than education-focused strategies alone.

Educational Qualification and Digital Literacy & Skill Barriers

The Chi-square analysis (Table.9) reveals a highly significant association between farmers' educational qualification and digital literacy and skill barriers in accessing agricultural information through mobile applications ($\chi^2 = 54.557$, $df = 2$, $p < 0.001$). The Fisher confirms the robustness of the result-Freeman–Halton Exact Test and Likelihood Ratio ($p < 0.001$), along with a significant Linear-by-Linear Association ($p < 0.001$).

Table 9 Educational Qualification and Digital Literacy & Skill Barriers

Educational Qualification vs Technical Barriers Cross tabulation					Chi-square Value	P Value
Count						
		Digital Literacy and Skill Barriers		Total		

Educational Qualification	Low Education	4	11	15	54.557	< 0.001
	Medium Education	31	26	57		
	Higher Education	0	78	78		
Total		35	115	150		

The crosstabulation indicates that digital literacy and skill barriers are concentrated among farmers with low and medium educational levels, while no such barriers are reported among farmers with higher educational qualifications. This highlights the critical role of education in developing digital competencies for effective use of mobile applications.

Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted. The findings underscore the need for targeted digital skills training programmes, particularly for farmers with lower and medium levels of education, to enhance the effective use of mobile-based agricultural information.

Conclusion for H3

H3 is partially accepted. Educational qualification significantly influences technical, information quality, and digital literacy barriers, but not social and personal barriers. This suggests that while education enhances farmers’ ability to use mobile applications effectively, social and personal challenges require context-specific, community-based interventions.

Key Findings

- A majority of respondents (52.7%) were in the 36-50 age group, indicating that middle-aged farmers are the primary users of mobile applications for agricultural information.
- Most of the farmers surveyed were male (74%), suggesting that men are more involved in using mobile-based platforms for agricultural communication.
- Tamil was the preferred language for accessing agricultural information among most farmers (56.7%), highlighting the importance of content in local languages
- WhatsApp was the most commonly used platform for agricultural communication (54%), followed by YouTube (21.3%), showing that instant messaging and video-based platforms are the most popular for sharing agricultural information.
- Government-backed agricultural applications, such as Uzhavan (42%) and TNAU AAC (16.7%), were the most frequently used, indicating that farmers trust information from institutional and expert sources.
- Farmers strongly preferred visual content formats, with videos (Mean = 1.40) and images (Mean = 1.61) ranked higher than text or audio formats for understanding agricultural practices.
- Mobile applications were primarily used for crop management (22.7%), pest and disease management (18.7%), market price updates (18%), and weather information (17.3%), underscoring their relevance for key farming decisions.
- Network connectivity problems (Mean = 1.35) and information overload in mobile groups (Mean = 1.42) were identified as the major barriers to effective utilization of mobile applications.
- Hypothesis testing showed significant links between the use of mobile applications and the fulfillment of agricultural information needs, as well as between age and the adoption of mobile applications.
- Educational qualifications had a significant impact on barriers related to technical skills, digital literacy, and the quality of information, with more educated farmers facing fewer challenges.

Conclusion

The research findings highlight that mobile communication plays a significant role in supporting Smart Agriculture for farmers in Coimbatore District. Mobile applications provide timely, relevant agricultural information, particularly on crop management, pest control, market prices, and weather forecasts. Farmers' preference for visual content, such as videos and images, underscores the importance of designing user-friendly, well-structured digital platforms to ensure effective use. The findings indicate that mobile apps effectively address farmers' information needs, with varying levels of adoption across age groups.

Middle-aged farmers tend to engage more with these applications. Educational qualifications are found to play a vital role in reducing challenges related to technical skills, digital literacy, and the reliability of information. However, social and personal barriers are not strongly influenced by formal education, suggesting that strategies beyond education are needed to improve the adoption of mobile apps for Smart Agriculture. These results are consistent with Rogers' Diffusion of Innovation Theory, which suggests that the adoption of mobile applications for Smart Agriculture is influenced by factors such as relative advantage, compatibility, reduced complexity, trialability, and observability. Overall, mobile communication is identified as a vital tool that supports informed decision-making, sustainable farming practices, and more inclusive agricultural development.

References

1. Abdullahi, H. O., Mahmud, M., & Abdul Rahim, E. E. (2025). Mobile technology in agriculture: A systematic literature review of emerging trends and future research directions. *Ingénierie des Systèmes d'Information*, 30(2), 307-315.
2. Adesiji, G. B., Adelowo, J. Y., Komolafe, S. E., & Adesiji, T. T. (2024). Farmers' perceived rating and usability attributes of agricultural mobile phone apps. *Smart Agricultural Technology*, 8, 100501.
3. Ahmed, B., Shabbir, H., Naqvi, S. R., & Peng, L. (2024). Smart agriculture: Current state, opportunities, and challenges. *IEEE Access*, 12, 144456-144478.
4. Alam, M. Z., & Uddin, M. R. (2018). Use of information and communication technologies by the farmers in receiving agricultural information. *Research in Agriculture, Livestock and Fisheries*, 5(1), 27-32.
5. Athirah, R. N., Norasma, C. Y. N., & Ismail, M. R. (2020). Development of an Android application for smart farming in crop management. *IOP Conference Series: Earth and Environmental Science*, 540, 012074.
6. Atul, M. M., & Shelke, P. P. (2023). Mobile apps: Empowering Indian farmers to make informed decisions. *Just Agriculture*, 4(3), 175.
7. Awais, M., Wang, X., Hussain, S., Aziz, F., & Mahmood, M. Q. (2025). Advancing precision agriculture through digital twins and smart farming technologies: A review. *AgriEngineering*, 7, 137.
8. Chicaiza, K., Paredes, R. X., Sarzosa, I. M., Yoo, S. G., & Zang, N. (2024). Smart farming technologies: A methodological overview and analysis. *IEEE Access*, 12, 1-15.
9. Dhanaraju, M., Chenniappan, P., Ramalingam, K., Pazhanivelan, S., & Kaliaperumal, R. (2022). Smart Farming: Internet of Things (IoT)-Based Sustainable Agriculture. *Agriculture*, 12(10), 1745.
10. Doshi, J., Patel, T., & Bharti, S. K. (2019). Smart farming using IoT, a solution for optimally monitoring farming conditions. *Procedia Computer Science*, 160, 746-751.
11. Greco, C., Gaglio, R., Settanni, L., Sciarba, L., Ciulla, S., Orlando, S., & Mammano, M. M. (2025). Smart farming technologies for sustainable agriculture: A case study of a Mediterranean aromatic farm. *Agriculture*, 15, 810.

12. Goon, S., Debbarma, S., Debbarma, A., Deb, P., Baul, A., & Debbarma, R. (2022). A research paper on smart agriculture system using IoT. *International Research Journal of Engineering and Technology (IRJET)*, 9(6), 2088-2092.
13. Kiran, Saikanth, D. R. K., Saikia, A. R., Chintey, R., Talukdar, N., Bahadur, R., & Vasuki, A. (2023). Smart agriculture: Technologies, practices, and future directions. *International Journal of Environment and Climate Change*, 13(12), 689-695.
14. Mahawar, N., Bamboriya, J. S., Dhegavath, S., Chiranjeeb, K., Naik, B. S. S. S., Rupesh, T., Somdutt, & Diwaker, P. (2020). Smart farming: A better technological option for modern farming society under theme of doubling of farmers' income. *International Journal of Current Microbiology and Applied Sciences*, Special Issue 11, 976-992.
15. Mandala, S., Yadav, A., Panme, F. A., Devi, K. M., & Kumar, S. M. S. (2024). Adaption of smart applications in agriculture to enhance production. *Smart Agricultural Technology*, 7, 100431.
16. Meena, R. L., Jirli, B., Kanwat, M., & Meena, N. K. (2018). Mobile applications for agriculture and allied sector. *International Journal of Current Microbiology and Applied Sciences*, 7(2), 2317-2326.
17. Mendes, J., Pinho, T. M., dos Santos, F. N., Sousa, J. J., Peres, E., Boaventura-Cunha, J., Cunha, M., & Morais, R. (2020). Smartphone applications targeting precision agriculture practices-A systematic review. *Agronomy*, 10(6), 855.
18. Mohamed, E. S., Belal, A. A., Abd-Elmabod, S. K., El-Shirbeny, M. A., Gada, A., & Zahran, M. B. (2021). Smart farming for improving agricultural management. *The Egyptian Journal of Remote Sensing and Space Sciences*, 25(3), 971-984.
19. Mukhopadhyay, R. (2024). Precision agriculture using AI-based smart mobile-apps. In D. Mayuri & S. Saileja (Eds.), *Interdisciplinary research on sustainability of business* (p. 169). New Bannur Research & Higher Education Trust.
20. Oteyo, I. N., Marra, M., Kimani, S., De Meuter, W., & Gonzalez Boix, E. (n.d.). A survey on mobile applications for smart agriculture: Making use of mobile software in modern farming. *SN Computer Science*. Springer.
21. Patokar, A. M., & Gohokar, V. V. (2024). Design and development of an intuitive Android application for smart farming. *Current Agriculture Research Journal*, 12(1), 408-416.
22. Rawal, R. M. (2024). A study of smart and intelligent farming: The future of agriculture—Literature review. In *Artificial Intelligence and Emerging Technologies* (pp. 29-34).
23. Samal, S., & Barik, S. K. (2018). From smart farming towards Agriculture 5.0: A review on crop data management. *International Journal of Engineering Research and Applications*, 8(7, Part III), 105-123.
24. Shitu, A. (2018). Estimation of evapotranspiration using the Penman-Monteith model. *Agricultural Water Management*, 204, 1-10.
25. Somantri, Supriatna, Herdiana, H., Mulyana, U., & Junfithrana, A. P. (2020). Smart agriculture based IoT and mobile apps. *International Journal of Engineering and Applied Technology (IJEAT)*, 3(2), 86-96.
26. Verdouw, C., Tekinerdogan, B., Beulens, A., & Wolfert, S. (2021). Digital twins in smart farming. *Agricultural Systems*, 189, 103046.
27. Walter, A., Finger, R., Huber, R., & Buchmann, N. (2017). Smart farming is key to developing sustainable agriculture. *Proceedings of the National Academy of Sciences of the United States of America*, 114(24), 6148-6150.

Websites

1. <https://horizon.uplb.edu.ph/3q-horizon-magazine-2019/mobile-apps-for-smart-agriculture/>
2. <https://smart-agriculture.adamasuniversity.ac.in/>
3. <https://smart-agriculture.org/>
4. <https://www.cropin.com/blogs/smart-farming/>
5. <https://www.fao.org/climate-smart-agriculture/en/>
6. <https://www.ibm.com/think/topics/smart-farming>
7. <https://www.ifa.ie/resources/smart-farming-farm-apps/>
8. <https://www.youtube.com/watch?v=QISbuZOBfZo>
9. <https://www.youtube.com/watch?v=zDUGRPDL0iY>
10. <https://www.worldbank.org/en/topic/climate-smart-agriculture>