Research Article

Indian Journal of Extension Education
Vol. 61, No. 4 (October–December), 2025, (9-13)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Utilization of Smartphones for Accessing Agricultural Information by Farmers in Bokaro District of Jharkhand

Aarni Singh[1], R.K. Doharey[2], N.R. Meena[3] and Kumar Sonu[4]*

[1]M.Sc. Scholar, [2]Professor, [3]Assistant Professor, [4]Research Scholar, Department of Agricultural Extension Education, ANDUA&T, Kumarganj, Ayodhya, Uttar Pradesh, India
*Corresponding author email id: er.kumarsonu24@gmail.com

HIGHLIGHTS

- Farmers with higher annual income and greater knowledge levels showed significantly higher smartphone utilization for accessing agricultural information with a 74.58 utilization index.
- 73.13 per cent of farmers used smartphones regularly for agricultural purposes. Farmers exhibited weather forecasts, crop market prices and pest and disease management advice as the most frequently accessed information via smartphones
- Income and knowledge were the strongest predictors of agricultural smartphone use ($p < 0.001$).

ARTICLE INFO

Keywords: Agriculture, ICT, Krushkal-wallis test, Smartphone, Utilization.

https://doi.org/10.48165/IJEE.2025.61402

Citation: Singh, A., Doharey, R. K., Meena, N. R., & Kumar, S. (2025). Utilization of smartphones for accessing agricultural information by farmers in Bokaro District of Jharkhand. *Indian Journal of Extension Education, 61*(4), 9-13. https://doi.org/10.48165/IJEE.2025.61402

ABSTRACT

The study examines the utilization pattern of smartphones for accessing agricultural information among farmers in Bokaro district of Jharkhand. A total of 160 respondents were selected through a multistage sampling method across sixteen villages. Data were collected using a pre-tested interview schedule to assess the frequency, purpose, and extent of smartphone usage during 2024-25. The results revealed that the majority of farmers regularly used smartphones to access weather forecasts, market prices, and pest management information. However, usage was relatively low for advanced topics such as post-harvest practices, webinars, and online agricultural forums. The overall utilization index indicated moderate use, with 73.13 per cent of respondents falling in the medium category. Kruskal–Wallis H test showed significant differences in smartphone utilization based on education, occupation, landholding, income, and knowledge level. Correlation analysis identified annual income and knowledge as the most influential factors. Respondents with higher income and knowledge were significantly more inclined to use smartphones for agricultural purposes. In contrast, variables like age, family size, and scientific orientation showed no significant influence. The study highlights the growing role of digital tools in rural agriculture and emphasizes the need for targeted interventions to enhance digital literacy and bridge the information gap among farmers.

INTRODUCTION

Agriculture is the primary occupation for a large section of India's population, especially in rural areas. According to the Government of India (2023), nearly 65 per cent of the population is directly involved in agriculture and allied sectors such as animal husbandry and fisheries. These sectors collectively contribute around 18 per cent to the country's Gross Domestic Product (GDP) (FAO, 2022). Despite their economic importance, Indian farmers, particularly those in rural and remote regions, have long faced challenges related to timely access to reliable information. In recent years, rapid changes in climate, market demands, and farming technologies have further increased the need for quick and accurate information for effective farm management and decision-making

Received 13-07-2025; Accepted 14-08-2025

(Backus et al., 1997). The expansion of digital infrastructure and the growing use of Information and Communication Technologies (ICTs) have created new avenues for addressing these challenges. ICT refers to technologies used to collect, store, process, and share information, and includes tools such as computers, tablets, smartphones, and the internet (Graham, 2002). Among these, smartphones have gained widespread acceptance due to their affordability, portability, and multifunctionality. They allow farmers to access agricultural information, communicate with peers and experts, participate in training programs, and obtain government updates with relative ease (Kumari et al., 2019).

Smartphones are no longer limited to basic communication. They now serve as a gateway to information that was previously hard to access for small and marginal farmers (Kamal & Bablu, 2023). Through various applications and platforms, farmers can check weather forecasts, monitor market prices, get pest and disease management tips, and learn about government schemes (Kailash et al., 2017). The use of smartphones helps bridge the information gap and supports more informed and timely decision-making at the farm level. According to Swaminathan & Swaminathan (2018), smartphones hold significant potential to enhance rural livelihoods by improving the flow of relevant information.

Despite the promise of digital tools in agriculture, the extent to which farmers utilize smartphones varies widely. Factors such as age, education, income, landholding size, digital literacy, and awareness play a major role in determining smartphone usage. While some farmers actively use multiple applications to manage different aspects of farming, others may only use smartphones for voice calls or basic browsing. In districts like Bokaro in Jharkhand, it is characterized by small and marginal landholdings, erratic rainfall, limited irrigation infrastructure, and low levels of mechanisation. In such settings, access to timely, accurate, and localised agricultural information is crucial for decision-making and risk reduction. Traditional agricultural extension services in the district are often inadequate due to factors like understaffed government departments, lack of physical outreach to remote villages, and delays in information dissemination.

Present study was conducted to explore not just the frequency and purpose of usage, but also the socio-economic and personal factors that influence utilization of smartphones. By evaluating patterns of smartphone use and identifying significant predictors, the research aims to highlight areas where intervention is needed. This includes improving digital literacy, strengthening mobile network infrastructure, and increasing awareness of useful agricultural apps and platforms.

METHODOLOGY

The present study was undertaken to examine the utilization pattern and extent of smartphone usage among farmers for accessing agricultural information in the Bokaro district of Jharkhand. Bokaro was purposively selected due to its agricultural diversity and rising adoption of smartphones among rural populations. During 2024-25, data collected was employed with multistage sampling technique. Out of 9, 4 blocks were randomly selected. From each block, 4 villages were randomly selected, resulting in a total of 16 villages. From each selected village, 10 respondents were selected based on predefined criteria: each respondent must own a smartphone, have at least five years of farming experience, and be actively involved in both crop and livestock farming. This procedure yielded a total sample size of 160 respondents. Primary data were collected through a pre-tested structured interview schedule, which was administered in person. The schedule included questions regarding the frequency, purpose, and usefulness of smartphone usage for agricultural purposes, as well as socio-economic background variables. The purpose of smartphone use was operationalized as the respondent's intent in using mobile phones and related digital applications for accessing information on crop production, livestock management, weather forecasts, pest control, and market prices. Respondents were asked to identify and rate the practical utility of various categories of information accessed through smartphones. These responses were quantified using mean weighted scores, which were subsequently ranked to facilitate comparison of perceived information usefulness. To identify the specific smartphone features and applications used by respondents to obtain agricultural information, correspondence analysis was conducted. This technique helped visualise the relationships between the types of information sought and the specific tools or platforms used (e.g., YouTube, WhatsApp, agricultural apps). The extent of utilization was measured by the frequency with which respondents accessed agricultural information through their smartphones. A three-point scale was used for this purpose regularly (3), occasionally (2) and never (1). Respondents indicated their usage for each category of information. The highest attainable score for utilization was 60 (20 multiplied by 3). A Utilization index was developed.

$$\text{Utilization index} = \frac{\text{Total achievable score - Total score achieved}}{\text{Total achievable score}} \times 100$$

To analyse differences in usage patterns across different socio-economic groups, the Kruskal–Wallis H test (1952) was employed. This non-parametric test is suitable for comparing more than two independent groups when the data are ordinal or not normally distributed. It allowed for the identification of statistically significant differences in smartphone usage frequencies across various demographic segments.

RESULTS

The majority of farmers in the study reported owning smartphones and expressed readiness to use them for accessing agricultural information. Many respondents stated that voice-based services were more effective, as these allowed them to communicate directly with experts in their local language. However, they also indicated the need for text and pictorial formats to better understand technical agricultural content.

Utilization Pattern of smartphones for accessing agricultural information

Table 1 presents the utilization pattern of smartphones among farmers in Bokaro district for accessing various types of agricultural information. The analysis indicated that the highest level of smartphone use was associated with accessing weather forecasts (74.58%), suggesting that farmers placed significant value on timely

Table 1. utilization pattern of smartphones for accessing agricultural information

S.No.	Statements	Utilization Index (%)	Rank
1.	Mobile apps to seek agricultural information	62.29	VI
2.	Check weather forecasts related to farming	74.58	I
3.	Check crop market prices using your smartphone	68.33	II
4.	Planning for sowing and harvesting	54.58	XIII
5.	Seek pest and disease management advice through your smartphone	66.66	III
6.	Access government schemes and subsidy information	63.33	V
7.	Look up details on crop varieties	65.00	IV
8.	Watch agricultural training videos	63.33	V
9.	Get information on soil health and testing	58.33	IX
10.	Rely on apps for financial assistance or loan-related agricultural guidance	60.00	VIII
11.	Reach out to agricultural experts	58.33	IX
12.	Tips on irrigation management?	61.66	VII
13.	Checking agricultural news updates	63.33	V
14.	Explore information on organic farming	55.20	XII
15.	Participate in online agricultural forums	48.33	XVII
16.	Manage your farm activities	52.08	XIV
17.	Access livestock care information	56.04	XI
18.	Learning about post-harvest practices?	50.00	XV
19.	Attended webinars or live agricultural sessions	49.58	XVI
20.	Guidance on fertiliser and pesticide usage	57.08	X

climatic updates to inform decisions related to sowing, irrigation, and harvesting. Smartphone usage was also notably high for checking crop market prices (68.33%) and obtaining pest and disease management advice (66.66%). These findings reflected farmers' increasing dependence on digital tools to access real-time updates and manage agronomic threats effectively. Although farmers exhibited a reasonable level of awareness regarding common pests and diseases, they continued to rely on smartphones for updated control measures and treatment recommendations. Moderate levels of usage were observed for accessing information on crop varieties (65.00%), government schemes and subsidies (63.33%), and agricultural training videos (63.33%), indicating active engagement with educational and support services delivered via mobile platforms. Similarly, the utilization index for agricultural news updates was 63.33%, suggesting that smartphones were also used to stay informed about policy changes and field-level developments. In contrast, lower utilization was recorded in domains such as soil health and testing (58.33%), agricultural expert consultations (58.33%), and guidance on fertilizer and pesticide usage (57.08%). This pattern suggested a potential information gap in more technical or field-based topics, which could be attributed to limited awareness of digital resources or insufficient digital literacy required to interpret such content. Utilization was even lower for topics such as organic farming practices (55.20%), post-harvest management (50.00%), and participation in webinars or live agricultural sessions (49.58%). The lowest level of smartphone use was found for engagement in online agricultural forums (48.33%), indicating limited interactive participation with peer farmers or agricultural experts through online platforms.

Overall utilization pattern of smartphones for accessing agricultural information

As presented in Table 2, the majority of respondents (73.13%) were categorized under medium utilization, indicating that most farmers used smartphones regularly for agricultural purposes, albeit not in an advanced or highly diversified manner. A smaller proportion (16.25%) fell into the high utilization category, while 10.62 per cent were classified under low utilization. The relatively low adoption among a subset of respondents could be attributed to several factors, including lack of awareness, limited formal education, restricted exposure to mobile technologies, and infrastructural challenges such as inadequate network connectivity.

Table 2. Overall utilization pattern of smartphones for accessing agricultural information

Categories	Frequency	Percentage
Low (< 32)	17	10.62
Medium (32- 39)	117	73.13
High (>39)	26	16.25
Total	160	100

Mean = 35.64, S.D.= 3.65

Relationship between independent variables with utilization pattern of smartphones for accessing agricultural information

Table 3 revealed that annual income ($r = 0.607$) and knowledge ($r = 0.613$) exhibited a highly significant positive correlation with smartphone utilization for agricultural purposes. Other variables, including education ($r = 0.252$), occupation ($r = 0.216$), and landholding size ($r = 0.326$), also showed significant positive relationships with utilization. A significant negative correlation was observed for gender ($r = -0.253$), indicating that male respondents demonstrated higher levels of utilization compared to their female counterparts. Additionally, innovativeness ($r = 0.173$) and family type ($r = 0.164$) were found to be significant at the 5% level. In contrast, variables such as age, marital status, family size, information-seeking behaviour, and scientific orientation did not exhibit statistically significant correlations with utilization. These

Table 3. Relationship between independent variables with utilization pattern of smartphones for accessing agricultural information

Variables (Unit)	Utilization value of 'r'
Age (Years)	-0.138
Gender (male=1; female=2)	-0.253**
Marital status (married=1; unmarried=0)	0.087
Family size (Numbers)	0.109
Family type (Nuclear= 1, Joint=2)	0.164*
Occupation	0.216**
Education	0.252**
Size of land holding under Agriculture (Acre)	0.326**
Annual income (Rs.)	0.607**
Information seeking (Score)	0.057
Innovativeness (Score)	0.173*
Scientific orientation (Score)	0.015
Knowledge (Score)	0.613**

results suggested that socio-economic and cognitive factors had a more direct influence on the adoption and use of smartphones for agricultural information than demographic or behavioural characteristics.

Kruskal–Wallis H test of independent variables with utilization pattern of smartphones for accessing agricultural information

Table 4 revealed that education level had a significant influence on smartphone utilization (K = 11.336, p = 0.045), indicating that respondents with higher education levels were more likely to use smartphones for agricultural purposes. Highly significant differences were observed to size of landholding (K = 31.140, p < 0.001), occupation (K = 14.002, p < 0.001), annual income (K = 40.355, p < 0.001), and knowledge level (K = 41.032, p = 0.001). These results suggested that respondents with larger landholdings, higher incomes, specific occupational categories (likely commercial farmers), and greater knowledge were more likely to utilise smartphones for agricultural information. On the other hand, variables such as age (K = 3.956, p = 0.138), family size (K = 3.965, p = 0.138), information seeking behaviour (K = 2.103, p = 0.349), and innovativeness (K = 2.156, p = 0.340) did not show statistically significant differences. This implies that these variables had limited influence on smartphone usage patterns in the studied context.

Table 4. Kruskal–Wallis H test of independent variables with utilization pattern of smartphones for accessing agricultural information

Variable	K-Statistic	P-value
Age	3.956	0.138
Family size	3.965	0.138
Education	11.336*	0.045
Size of land holding under Agriculture	31.140**	<0.001
Occupation	14.002**	<0.001
Annual income	40.355**	<0.001
Information seeking	2.103	0.349
Innovativeness	2.156	0.340
Knowledge	41.032**	0.001

DISCUSSION

Most farmers (73.13%) used the internet to access information related to agriculture and animal husbandry. This finding is consistent with the results reported by Kumari et al., (2019); Mukherjee & Jha (2024) & Niranjan et al., (2023). The relatively lower use of internet services in the study area can be attributed to several specific factors, including lack of digital infrastructure, low internet availability, high cost of digital tools, and limited knowledge about ICT use among farmers. The data show that farmers prioritize specific types of agricultural information. In Bokaro district, weather forecasting and market price information were the most frequently accessed topics, reflecting their importance in daily farming decisions. These results align with the findings of Dhaka & Chayal (2010) & Nain et al., (2015).

Annual income and knowledge are the two most influential factors affecting utilization. Respondents with higher income levels (r = 0.607) and better knowledge (r = 0.613) demonstrated a significantly greater tendency to adopt and utilise the subject matter. This relationship highlights the critical role of economic stability and awareness in enabling adoption, as individuals with better financial means and understanding are more likely to invest in and apply new practices. These findings are supported by earlier research conducted by Sonu & Jha (2025) & Silva (2022), who also found income and knowledge to be key drivers of adoption behavior. A similar trend was observed for education (r = 0.252) and occupation (r = 0.216), both of which were positively associated with utilization. Educated individuals are often more open to change, and occupational engagement–especially in agriculture or related sectors—may enhance exposure to new information. Landholding size (r = 0.326) also had a significant positive effect, suggesting that larger landowners are more inclined or better positioned to adopt innovations. This supports the observations made by Mukherjee & Jha (2024).

The study found that annual income and knowledge were the most influential factors affecting smartphone utilization for agricultural information. Respondents with higher income and better knowledge were significantly more likely to use smartphones, highlighting the role of financial capacity and awareness in digital adoption. These results are consistent with the observations made by Haqyar et al., (2025) & Silva (2022), who noted that higher educational attainment and occupational specialization positively influence the adoption of agricultural innovations. These results highlight how economic stability and cognitive awareness enable better access and effective use of digital tools. Financially stable individuals are more capable of purchasing and maintaining smartphones, while knowledgeable individuals are more likely to seek out and apply relevant agricultural information. These findings align with earlier studies by Mondal et al., (2024), who similarly identified income and knowledge as strong predictors of technology adoption in rural settings. Significant differences were also observed with education, occupation, and landholding size, indicating that educated individuals, those engaged in farming occupations, and large landowners had greater adoption rates. Farmers also showed high interest in plant disease management and improving production efficiency. However, knowledge about post-harvest handling practices was limited. In the area of livestock management, farmers paid attention to feeding practices and animal care, indicating concern for animal health.

CONCLUSION

The study highlights the emerging role of smartphones as a valuable tool for farmers in Bokaro district. Most respondents demonstrated moderate utilization, primarily for accessing essential information like weather updates, market prices, and pest management. However, a clear digital utilization gap exists, with low engagement in advanced areas such as post-harvest practices and interactive platforms. The results indicate that socio-economic factors, including annual income, education, and landholding size, significantly influence smartphone adoption for agricultural use. In contrast, age and family size showed no significant impact. These findings underscore the critical need for targeted interventions. Efforts should focus on strengthening digital literacy, improving rural connectivity, and promoting agriculture-specific mobile applications. By enhancing awareness and providing necessary support, smartphones can effectively bridge the rural information gap, empower farmers to make informed decisions, and drive sustainable agricultural growth.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the farmer respondents of the study during the course of the research.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

Publisher's note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors, and the reviewers. Any product/ process or technology that may be evaluated in this article, or a claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

REFRENCES

Backus, G. B. C., Eidman, V. R., & Dijkhuizen, A. A. (1997). Farm decision making under risk and uncertainty. *Netherlands Journal of Agricultural Science*, *45*(2), 307-328.

Dhaka, B. L., & Chayal, K. (2010). Farmers' experience with ICTs on transfer of technology in changing agri-rural environment. *Indian Research Journal of Extension Education*, *10*(3), 114-118.

Food and Agriculture Organization. (2022). The State of Food and Agriculture 2022: Leveraging automation in agriculture for transforming agrifood systems. FAO. https://www.fao.org/documents/card/en/c/cc2211en

Government of India (2023). India's agriculture sector contributes significantly to the economy and employment: Shri Narendra Singh Tomar. Press Information Bureau. https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1939473

Graham, S. (2002). Bridging urban digital divides? Urban polarisation and information and communications technologies (ICTs). *Urban studies*, *39*(1), 33-56.

Haqyar, Z., Rohila, A. K., Malik, J. S., & Kumar, A. (2025). Usage pattern of information and communication Technology tools among university faculty members. *Indian Journal of Extension Education*, *61*(1), 108-112.

Kailash, K., Mishra, O. P., Singh, S. K., Verma, H. K., & Kumar, L. (2017). Utilization Pattern of Mobile Phone Technology (Smartphone) among the Farmers of Nagaur District in Rajasthan. *Agriculture Update*, *12*(3): 399–404.

Kamal, M., & Bablu, T. A. (2023). Mobile applications empowering smallholder farmers: A review of the impact on agricultural development. *International Journal of Social Analytics*, *8*, 36-50.

Kumari, R., Kumar, P., & Ojha, P. (2019). Agricultural development with accessibility of information and communication technology (ICT) by farmers in Bihar state (Samastipur). *International Journal of Current Microbiology and Applied Sciences*, 9, 327-330.

McKight, P. E., & Najab, J. (2010). Kruskal Wallis test. *The Corsini Encyclopedia of Psychology*, 1-1.

Mondal, A. H., Dana, S. S., Ray, M., Kumari, N., & Karjee, R. (2024). Communication behaviour of fish farmers of the FFPO on scientific fish farming. *Indian Journal of Extension Education*, *60*(2), 11-16.

Mukherjee, S., & Jha, S. K. (2024). Utilization pattern of information and communication technologies among the farming community of West Bengal. *Indian Journal of Extension Education*, *60*(1), 7-13.

Nain, M. S., Singh, R., Mishra, J. R., & Sharma, J. P. (2015). Utilization and linkage with agricultural information sources: a study of Palwal district of Haryana state. *Journal of Community Mobilization and Sustainable Development*, *10*(2), 152-156.

Niranjan, S., Singh, D. R., Kumar, N. R., Jha, G. K., Venkatesh, P., Nain, M. S., & Krishnakumare, B. (2023). Do information networks enhance adoption of sustainable agricultural practices? Evidence from northern dry zone of Karnataka, India. *Indian Journal of Extension Education*, *59*(1), 86-91. http://doi.org/10.48165/IJEE.2023.59118

Silva, K. N. (2022). Social network to accelerate agricultural technology adoption: evidence from Hambanthota district, Sri Lanka. *Indian Journal of Extension Education*, *59*(1), 1-6.

Sonu, K., & Jha, K. K. (2025). Knowledge gap and path analysis of adoption of Makhana (Euryale Ferox Salisb) growers in Bihar. *Indian Journal of Extension Education*, *61*(1), 83-88.

Swaminathan, M., & Swaminathan, M. S. (2018). ICT and agriculture. *CSI Transactions on ICT*, *6*(3), 227-229.