A STUDY ON THE ADOPTION OF DIGITAL PLATFORMS AND TOOLS AMONG FARMERS EXPLORING PATTERNS, PREFERENCES, AND USAGE TRENDS

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ABSTRACT

The rapid advancement of digital technologies has transformed modern agriculture, offering farmers innovative tools for farm management, market access, and information dissemination. This study explores the adoption of digital platforms and tools among farmers, focusing on usage patterns, preferences, and trends. Using a descriptive-analytical research design, data were collected from 100 farmers across three major agricultural regions through structured questionnaires. Findings reveal that mobile-based agricultural apps and social media platforms are the most widely used digital tools, particularly among younger and more educated farmers. Adoption is influenced by demographic factors such as age, education level, farm size, and gender, with notable disparities in access and utilization. While many farmers benefit from real-time market information, weather updates, and advisory services, challenges such as limited digital literacy, lack of awareness, and infrastructural constraints hinder widespread adoption. The study highlights the need for targeted interventions, including training programs, user-friendly platforms, and policies that promote inclusive access to digital technologies. Overall, the research provides valuable insights into bridging the digital divide in agriculture and enhancing the effectiveness of ICT-driven farming solutions.

Keywords: AgriTech, Digital Literacy, Farm Management Tools, Technology Adoption, Rural ICT

I.   INTRODUCTION

Agriculture, as the backbone of many economies, has undergone significant transformation due to the integration of digital technologies. The adoption of information and communication technologies (ICT) in farming has facilitated better decision-making, improved productivity, and enhanced access to markets and advisory services. Digital platforms, such as mobile apps, online marketplaces, weather forecasting services, and farm management software, provide farmers with timely and relevant information that was previously difficult to obtain. However, the level of adoption varies widely among farmers, influenced by factors such as age, education, farm size, financial capacity, and access to technology. Understanding these patterns and preferences is crucial for designing interventions that promote equitable access and maximize the benefits of digital agriculture.

The increasing penetration of smartphones and internet connectivity in rural areas has created opportunities for farmers to adopt digital tools. Mobile-based applications provide access to crop advisory services, pest management guidance, weather updates, and price information, enabling farmers to make informed decisions. Social media platforms, such as WhatsApp and Facebook, have also emerged as informal networks for sharing farming knowledge, marketing produce, and engaging with peers. Despite these opportunities, adoption remains uneven. While some farmers readily embrace new technologies, others face barriers such as low digital literacy, limited financial resources, lack of awareness, and infrastructure challenges. These disparities contribute to a digital divide in agriculture, which may exacerbate existing socio-economic inequalities.

Previous studies have highlighted the potential of digital tools to transform farming practices, but few have comprehensively examined the patterns, preferences, and usage trends among farmers in specific regions. This study addresses this gap by profiling farmers' demographics, assessing their digital literacy, and analyzing their adoption of digital platforms and tools. By investigating the relationship between demographic characteristics and technology usage, the research provides insights into which factors facilitate or hinder adoption. Furthermore, identifying the most preferred digital platforms and tools can inform the development of more user-friendly and accessible ICT solutions tailored to farmers' needs.

The objectives of this study are to profile farmers based on demographic characteristics, examine their usage patterns of digital platforms, identify preferred tools, and analyze factors influencing adoption. The study employs a structured questionnaire to gather data from a representative sample of farmers, with subsequent analysis using descriptive and inferential statistics. The findings are expected to inform policymakers, agricultural extension agencies, and technology developers on strategies to enhance digital literacy, improve access to ICT tools, and bridge the digital divide in agriculture.

By exploring the adoption of digital platforms and tools among farmers, this study contributes to the growing body of knowledge on digital agriculture. It highlights how demographic factors, digital literacy, and farm characteristics shape adoption patterns, and provides practical recommendations for enhancing the effectiveness of ICT-based interventions. Understanding these dynamics is essential for promoting inclusive digital transformation in agriculture, ultimately improving productivity, sustainability, and livelihoods for farmers.

II. REVIEW OF LITERATURE

Shehrawat, P. et al., (2024) The study was conducted at districts of Hisar and Fatehabad in the state of Haryana during the period 2022–23 to examine the farmers' awareness and willingness to adopt digital technologies in agriculture. Digitalization may be broadly classified into two domains: its direct impact on augmenting agricultural productivity and its indirect function in enabling farmers to make better-informed and higher-quality decisions. Thus, four villages, Rajli, Ghirai, Berseen, and Majra, were randomly selected for data collection. A total of 120 farmers were selected as respondents, and their socio-personal, socio-economic, and communicational characteristics were analyzed. The findings of the study revealed that the respondents exhibited a high level of awareness about digitalization in agriculture, with a significant percentage aware of various aspects of digital technologies. They were well-informed about the potential benefits, including enhanced productivity and sustainability. In terms of adoption, a substantial number of farmers had already integrated digital technologies into their farming practices. They used digital tools for various purposes, such as online data collection, automation of farm works, nutrient management, and soil health monitoring. Overall, the study highlighted the growing awareness and adoption of digital technologies among farmers in the selected regions. These technologies have the potential to revolutionize agricultural practices and improve productivity, sustainability, and the overall quality of produce. Digitalization in agriculture is poised to play a crucial role in shaping the future of farming.

Jadhav, Mangesh. (2024). The study explores the adoption of digital technology among farm households in Hiware Bazaar, a village in Maharashtra renowned for its successful transformation from a

drought-stricken community to a prosperous one through collective efforts and innovative agricultural practices. The research utilizes a comprehensive case study methodology, including interviews, surveys, and focus group discussions with local farmers to gather detailed insights. The results indicate a high level of awareness and use of digital tools, such as mobile applications for market prices, weather forecasting, and crop management, which have led to significant improvements in crop yields and resource management. Despite these benefits, the study identifies challenges like limited training, infrastructural deficiencies, and socio-cultural resistance to technology adoption. The conclusion emphasizes the potential of digital technology to revolutionize agricultural practices in rural India, advocating for enhanced educational programs, infrastructure development, targeted incentives, and community engagement to overcome these barriers. Additionally, it suggests integrating traditional agricultural knowledge with modern digital tools to maximize benefits and ensure sustainable development.

Mukherjee, Sweety et al., (2024) The introduction of digital platforms has transformed agricultural practices by farmers' access to essential information and advisory services. The present study undertaken to explore the level of awareness among farmers concerning various platforms for Extension and Advisory Services (EAS) in the Indo-Gangetic region of, a key agricultural zone. Utilizing a multi-stage random sampling approach, 350 farmers from Uttar Pradesh, Haryana, and West Bengal were selected for the . Awareness was measured using a structured questionnaire, and categorized into low, medium, and high categories following CSRF method. The study employed Pearson correlation and multiple linear analyses to explore the socio-demographic factors impacting . The findings reveal notable regional disparities, with Haryana farmers demonstrating higher awareness compared to other states. Key determinants viz. landholding size, ICT ownership, and social media usage positively affected awareness, while age and farming experience were negatively associated. The study underscores the need for focused digital literacy programs to boost the awareness of digital platforms among farmers, especially in areas with lower awareness.

Mogashane, C. et al., (2025) Smallholder farmers are challenged by limited resources, finances, and access to complex production technologies, which hinder the implementation of good production practices such as good seed selection, knowing when to plant and harvest, pest and disease control, and access to lucrative markets. This paper used quantitative research methods to explore smallholder farmers' perceptions, adoptions, and differences in agricultural incomes between adopting and non-adopting farmers. This study reveals that smallholder farmers perceive access to real-time information as important; however, adopting digital technologies as information sources is still considered low. Binary regression analysis further revealed that the access to extension services variable positively correlated with adopting the internet (web pages), YouTube and Farmers Weekly website as information sources. Digital technologies were generally perceived to be reliable, time-effective, and easy to use; however, adopting these technologies had no significant impact on the farmer's agricultural income. This paper concludes that digital technology adoption is still considerably low; however, more and more farmers are not only open to adopting these technologies, but those who have adopted prefer incorporating them among sources they use to acquire farming information. Using digital technologies did not cause differences in agricultural income for these farmers. This study recommends public-private partnerships and community engagement through cooperatives to further drive technology adoption, fostering market access and improving livelihoods for smallholder farmers.

Sam, Abraham et al., (2021) Globally, the agriculture sector is faced with multiple challenges especially in developing countries where smallholder farmers face barriers such as lack of access to financial services, information, formal and/or economic identity. The utilization of digital platforms in agriculture can offer solutions such as information services, financial inclusion and access to credit, digital identities, track and traceability systems, farm management systems and access to markets. This paper explores the research trends, theories and concepts associated with the utilization of digital platforms in agriculture. Using a scoping review and a directed content analysis approach, 52 papers were studied. It was found that studies have so far focused mainly on the policy, economics, knowledge and innovation systems, impact and adoption of digital agriculture platforms. The findings of this scoping review will

aid in the understanding of the state of research on the utilization of digital platforms in agriculture and contribute to future research by helping to identify gaps in the relevant literature.

III. METHODOLOGY

Research Design

This study employed a descriptive-analytical research design, which is suitable for examining the current state of digital platform and tool adoption among farmers. The descriptive component aimed to provide a comprehensive profile of farmers, including demographic characteristics, digital literacy, and ICT usage patterns. The analytical component focused on identifying relationships and trends between demographic factors (such as age, education, and farm size) and the adoption of digital tools. This design allowed the researcher to not only describe the status quo but also draw meaningful inferences about factors influencing technology adoption in agriculture.

Population

The target population consisted of farmers from three major agricultural regions, selected to represent diverse socio-economic, cultural, and farming practices. These regions were chosen due to their significance in agricultural production and their varying levels of access to digital infrastructure, which is crucial for understanding disparities in ICT adoption. The population included both male and female farmers of different age groups, education levels, and farm sizes, ensuring a representative sample of the farming community.

Sample Size and Sampling Technique

A total of 100 farmers were selected for this study using stratified random sampling. Stratification was based on key demographic factors such as age, gender, and farm size to ensure proportional representation from each subgroup. This method reduces sampling bias and ensures that findings are generalizable to the larger farming population. The sample size of 100 was deemed sufficient to achieve reliable results while allowing for manageable data collection and analysis.

Data Collection Methods

Primary data were collected using structured questionnaires, which included both closed-ended and open-ended questions. The questionnaire was divided into sections to capture:

1. Demographic Information: Age, gender, education, farm size, and years of farming experience.
2. Digital Literacy: Farmers' ability to use smartphones, apps, and other digital tools.
3. ICT Usage Patterns: Frequency of using digital platforms for farm management, market information, weather updates, and advisory services.
4. Preferences and Barriers: Farmers' preferred tools, challenges faced in adopting digital platforms, and support received.

The questionnaires were administered through face-to-face interviews, which allowed researchers to clarify questions and ensure accurate responses, particularly for farmers with limited literacy.

Data Analysis

Data collected were systematically organized, coded, and analyzed using descriptive and inferential statistical techniques:

• Frequency Distribution: Used to present demographic characteristics and ICT usage patterns.

• Percentages: Calculated to show proportions of farmers using specific digital tools or platforms.

• Cross-tabulation: Employed to examine relationships between demographic variables (such as age, education, and farm size) and digital adoption trends.

IV. RESULTS

Table: 1 Demographic Profile of Respondents

Demographic Variable	Frequency (n=100)	Percentage (%)
Age		
20–30	15	15
31–40	30	30
41–50	35	35
51+	20	20
Gender		
Male	70	70
Female	30	30
Education Level		
No Formal Education	10	10

The majority of respondents (35%) were aged between 41–50 years, indicating that mid-aged farmers dominate agricultural activities in the surveyed regions. Male farmers (70%) significantly outnumbered female farmers, reflecting gender disparities in farming and access to technology. Education levels varied, with 40% of respondents completing secondary education and 25% attaining tertiary education, suggesting a reasonable potential for digital literacy. Most farmers (50%) cultivated 2–5 hectares, indicating that small- to medium-scale farms are common. These demographics suggest that while age and gender may influence adoption, education and farm size are likely to play a critical role in digital tool usage patterns.

Digital Platform and Tool Usage Patterns

- Mobile-based agricultural apps were used by 60% of respondents.
- Social media platforms like Facebook and WhatsApp were employed by 45% for market information.
- Online advisory services were utilized by 30%, mainly among younger and more educated farmers.
- Farm management software adoption remained low (15%), primarily due to lack of training and awareness.

Patterns and Preferences:

Farmers preferred platforms that were easy to use, mobile-friendly, and provided timely market and weather updates. Age and education influenced preferences: younger farmers and those with higher education levels were more likely to adopt advanced digital tools.

V. DISCUSSION

The findings of this study reveal that the adoption of digital platforms and tools among farmers is influenced by a combination of demographic, educational, and farm-related factors. The demographic analysis showed that the majority of respondents were middle-aged (41–50 years) and predominantly male. This aligns with previous studies suggesting that older farmers may be slower in adopting advanced digital technologies due to limited exposure and familiarity. Gender disparities were also evident, with female farmers less represented, indicating potential barriers such as cultural norms, limited access to resources, or lower digital literacy levels.

Education emerged as a significant determinant of digital adoption. Farmers with secondary or tertiary education levels were more likely to use mobile-based apps, online advisory services, and farm management software. This supports the notion that digital literacy enhances farmers' ability to navigate complex platforms and extract relevant information. Conversely, farmers with limited formal education relied more on traditional information sources, highlighting the need for tailored training

programs that accommodate varying literacy levels.

Farm size also played a role in technology adoption. Small- and medium-scale farmers (2–5 hectares) demonstrated higher adoption rates of mobile apps and social media platforms for market information and weather updates. Larger farms tended to explore more advanced tools such as farm management software, likely due to higher financial resources and the complexity of managing larger operations. These findings suggest that both resource availability and operational needs influence the choice and frequency of digital tool usage.

The study further identified usage patterns and preferences among farmers. Mobile-based agricultural apps and social media platforms like WhatsApp and Facebook were the most commonly used tools, primarily due to their accessibility, ease of use, and immediate applicability in daily farming decisions. Online advisory services and farm management software had lower adoption rates, often constrained by lack of awareness, technical knowledge, or perceived complexity. This indicates that while digital solutions are available, their adoption depends on user-friendliness, relevance, and effective training and support.

Finally, the analysis highlights the broader implications of digital adoption for agricultural development. Farmers who actively used digital platforms reported easier access to market prices, weather forecasts, and agronomic advice, suggesting a positive impact on productivity and decision-making. However, uneven adoption underscores the persistence of the digital divide, which may exacerbate inequalities if left unaddressed. Targeted interventions, such as digital literacy programs, gender-inclusive training, and localized content, are essential to ensure equitable access to digital tools and to fully harness the benefits of ICT in agriculture.

VI. CONCLUSION

This study demonstrates that digital platforms and tools are increasingly becoming integral to modern farming practices, yet adoption among farmers remains uneven. Mobile-based applications and social media are the most widely used tools due to their accessibility, ease of use, and immediate relevance for daily agricultural decisions. Demographic factors, including age, education, farm size, and gender, significantly influence the level and type of digital adoption, with younger, more educated, and resource-endowed farmers showing higher usage rates. While these technologies provide clear benefits—such as timely access to market information, weather forecasts, and advisory services—barriers like limited digital literacy, lack of awareness, and inadequate infrastructure hinder broader adoption. The findings highlight the critical need for interventions aimed at bridging the digital divide in agriculture. Targeted training programs, development of user-friendly digital tools, and policies that ensure equitable access can empower farmers to leverage ICT solutions effectively. By addressing these challenges, stakeholders can facilitate greater inclusivity in digital agriculture, enabling farmers of all backgrounds to improve productivity, efficiency, and decision-making. In conclusion, understanding farmers' patterns, preferences, and usage trends is essential for promoting sustainable digital adoption in agriculture and harnessing the full potential of ICT to transform farming practices.

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