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### Adoption and utilization of mobile applications in agriculture and allied sectors: A farmer survey in Dharmapuri district of Tamil Nadu

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#### Abstract

This research examines the adoption and use of mobile applications in agriculture and related sectors among farmers in the Nallampalli and Dharmapuri blocks of Dharmapuri district, Tamil Nadu. Employing a structured interview schedule, a total of 120 farmers were surveyed about their smartphone ownership, digital literacy, access to digital infrastructure, awareness, usage patterns, perceived usefulness and the challenges faced in utilizing agricultural mobile applications. The findings revealed that 90.00 per cent of the farmers owned smartphones; however, only 70.00 per cent had utilized at least one agricultural application. The platforms most commonly used were Uzhavan (60.00 per cent) and YouTube (40.00 per cent), primarily for obtaining weather updates, market information, pest management and details about government schemes. Significant challenges identified included a lack of adequate technical support (75.8 per cent), issues with app installation and updates (68.3 per cent), poor connectivity (60.00 per cent) and limited digital literacy (50.00 per cent). Factors influencing adoption included education, experience, language preference and social networks. The study highlights the necessity for user-friendly, locally relevant and vernacular applications, as well as capacity-building initiatives to improve digital inclusion and the effective use of mobile technologies in agriculture. The findings offer practical insights for policymakers, extension services and technology developers who aim to enhance rural digital agriculture.

**Keywords:** Mobile applications, digital agriculture, farmer awareness, Uzhavan app, digital literacy

#### 1. Introduction

Agriculture is a crucial lifeline for millions of farmers in developing countries, particularly in India, whereas about 54.6 per cent of the population were engaged in farming activities, either directly or indirectly (Ministry of Agriculture & Farmers Welfare, 2021). This sector is currently experiencing a major transformation, fueled by technological advancements aimed at enhancing productivity, profitability and sustainability. Among these innovations, Information and Communication Technologies (ICTs), especially mobile-based solutions, have emerged as key drivers of change. The rapid growth of smartphones and mobile internet in rural India has created exciting new opportunities for knowledge sharing, decision-making support and the delivery of digital services in agriculture (Meera *et al.*, 2004; Mittal & Mehar, 2016) <sup>[4, 5]</sup>. Mobile applications are the essential tools, offering farmers real-time updates on weather, crop advice, pest and disease management, market prices, input supplies and government programs (Kumar *et al.*, 2020) <sup>[2]</sup>. They bridge the long-standing communication gap between researchers, extension services and farmers, thereby promoting a more responsive and inclusive agricultural ecosystem.

Mobile apps are becoming increasingly important across various fields such as animal husbandry, poultry, horticulture and fisheries. They serve as digital platforms for essential tasks like breed selection, veterinary services, nutrient management and product marketing (FAO, 2021). These tools empower farmers to transition from a reactive mindset to a more proactive management approach, which significantly boosts their ability to address challenges like climate change, fluctuating prices and pest issues (Narula & Bhatia, 2022) <sup>[6]</sup>. In Tamil Nadu, the state government, along with institutions like Tamil Nadu Agricultural University (TNAU) and the Tamil Nadu e-Governance Agency (TNeGA), has been actively promoting farmer-centric mobile apps such as Uzhavan, the TNAU AgriTech Portal and mKisan. These applications provide services in the local language, making it easier for more farmers to engage with them (TNAU, 2023). However, despite the availability of these digital tools, barriers like unequal access, lack of awareness, low digital literacy and insufficient infrastructure still impede their widespread use. This study seeks to assess how farmers in the Dharmapuri district of Tamil Nadu are utilizing these mobile applications also describes the benefits and challenges

encountered by them. By examining the farmer's behaviour, app usage patterns and the hurdles to adoption, this research contributes valuable insights to the ongoing dialogue about digital agriculture and rural development in India. The Objectives of the study include,

1. To study the general profile characteristics of the respondents.
2. To assess the smartphone ownership, level of digital literacy and accessibility to digital infrastructure among the respondents.
3. To examine the awareness and extent of use of agricultural mobile applications by the respondents.
4. To identify the specific agricultural mobile applications used by the respondents.
5. To evaluate the perceived usefulness and frequency of use of agricultural mobile applications.
6. To analyze the challenges faced by the respondents in using agricultural mobile applications.

## 2. Methodology

### 2.1. Research Design

The research utilized a descriptive survey design that incorporated a mixed-methods approach, integrating both quantitative and qualitative techniques. This design facilitated the evaluation of smartphone ownership, digital literacy, awareness and usage patterns of agricultural mobile applications among farmers, while also gathering their perceptions, challenges and contextual experiences. The mixed-method approach offered a thorough understanding of both quantifiable trends and the underlying behavioral factors that influence technology adoption.

### 2.2. Study Area and Sampling

The study was carried out in the Dharmapuri district of Tamil Nadu, a region noted for its dryland farming, a predominance of small and marginal farmers and a variety of agricultural activities such as crop cultivation, horticulture, livestock and poultry. Two blocks, Nallampalli and Dharmapuri, were intentionally chosen to reflect differences in farming practices, technological exposure and access to digital infrastructure. A total of 120 farmers were chosen using a purposive random sampling technique. The inclusion criteria mandated that participants be smartphone owners with previous exposure to agricultural information services through mobile devices. Equal representation from both blocks was ensured to capture a wide range of experiences and socio-economic profiles of the farmers. Primary data were gathered through a structured interview schedule, which was created after a thorough review of literature concerning information and communication technologies (ICTs), digital agriculture and mobile applications. The interview schedule was conducted in Tamil, the local language, to guarantee accurate comprehension, comfort and unbiased responses. A pilot

test was performed to refine the questions and enhance clarity.

### 2.3. Data Collection Procedure

Personal interviews were carried out face-to-face with each farmer. Enumerators clarified the study's purpose and provided assistance to participants when needed, especially for questions concerning technical skills and app usage. Data were recorded both manually and digitally, ensuring completeness and accuracy. Open-ended responses regarding perceptions and challenges were documented for later thematic analysis.

### 2.4. Data Analysis

Quantitative data were analyzed utilizing descriptive statistical tools, including frequencies, percentages and cross-tabulations, to interpret demographic characteristics, smartphone usage and application adoption patterns. Qualitative responses underwent thematic analysis, facilitating the identification of recurring challenges, user perceptions and practical barriers. Data analysis was enhanced by software tools such as SPSS for quantitative evaluation and manual coding for qualitative insights. This mixed-method approach provided a comprehensive understanding of how mobile technologies are influencing information access, decision-making and agricultural practices among farmers in the Dharmapuri district.

## 3. Findings and Discussion

### 3.1 General Profile Characteristics of the Respondents

Table 1 and Fig 1 presents the distribution of respondents according to their general profile characteristics. The findings from the Table 1 indicated that male farmers made up 70.00 per cent of the participants, whereas female farmers represented 30.00 per cent. Despite their smaller numbers, women are actively involved in agricultural activities, particularly in the areas of livestock management, preparation of inputs and marketing, especially when male family members seek employment elsewhere. This suggests that digital solutions and agricultural advisory services should incorporate content and training modules specifically designed for women, delivered in local languages, to guarantee equitable access (Vasudevan, 2025; Kumar, 2022)<sup>[12, 2]</sup>. The age distribution revealed that 60.00 per cent of the participants were aged between 31 and 50 years, which constitutes the primary decision-making demographic in both farm and household management. Farmers under the age of 30 accounted for 20.00 per cent, representing a digitally savvy group that can quickly adapt to mobile applications. Additionally, farmers over the age of 50 also comprised 20.00 per cent, emphasizing the necessity for customized training and simplified application interfaces for older users to address the digital literacy divide (Rakholia *et al.*, 2024)<sup>[7]</sup>.

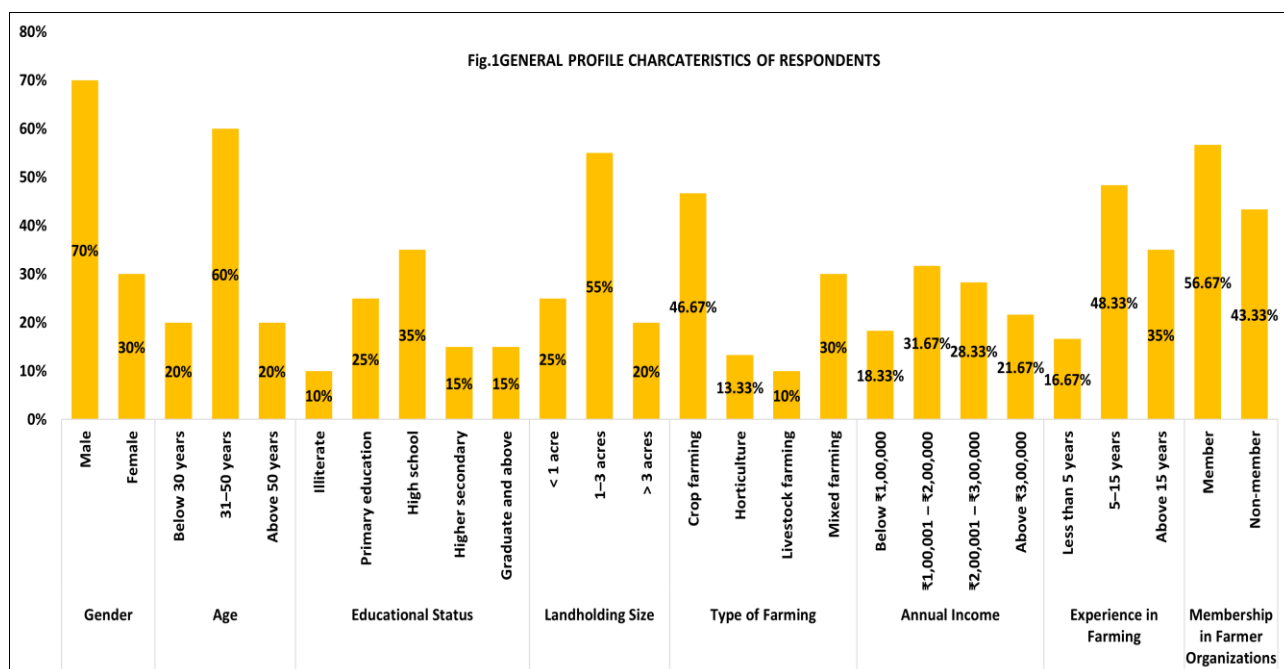
**Table 1:** General Profile Characteristics of the Respondents (n = 120)

| S. No. | Category                           | Particulars           | No. of Respondents | Percentage |
|--------|------------------------------------|-----------------------|--------------------|------------|
| 1      | Gender                             | Male                  | 84                 | 70.00      |
|        |                                    | Female                | 36                 | 30.00      |
| 2      | Age                                | Below 30 years        | 24                 | 20.00      |
|        |                                    | 31–50 years           | 72                 | 60.00      |
|        |                                    | Above 50 years        | 24                 | 20.00      |
| 3      | Educational Status                 | Illiterate            | 12                 | 10.00      |
|        |                                    | Primary education     | 30                 | 25.00      |
|        |                                    | High school           | 42                 | 35.00      |
|        |                                    | Higher secondary      | 18                 | 15.00      |
|        |                                    | Graduate and above    | 18                 | 15.00      |
| 4      | Landholding Size                   | < 1 acre              | 30                 | 25.00      |
|        |                                    | 1–3 acres             | 66                 | 55.00      |
|        |                                    | > 3 acres             | 24                 | 20.00      |
| 5      | Type of Farming                    | Crop farming          | 56                 | 46.67      |
|        |                                    | Horticulture          | 16                 | 13.33      |
|        |                                    | Livestock farming     | 12                 | 10.00      |
|        |                                    | Mixed farming         | 36                 | 30.00      |
| 6      | Annual Income                      | Below ₹1,00,000       | 22                 | 18.33      |
|        |                                    | ₹1,00,001 – ₹2,00,000 | 38                 | 31.67      |
|        |                                    | ₹2,00,001 – ₹3,00,000 | 34                 | 28.33      |
|        |                                    | Above ₹3,00,000       | 26                 | 21.67      |
| 7      | Experience in Farming              | Less than 5 years     | 20                 | 16.67      |
|        |                                    | 5–15 years            | 58                 | 48.33      |
|        |                                    | Above 15 years        | 42                 | 35.00      |
| 8      | Membership in Farmer Organizations | Member                | 68                 | 56.67      |
|        |                                    | Non-member            | 52                 | 43.33      |

In terms of educational status, 35.00 per cent of the respondents had completed high school, 15.00 per cent had completed higher secondary education and another 15.00 per cent were graduates or held higher qualifications. Conversely, 25.00 per cent had only received primary education and 10.00 per cent were illiterate. This highlights the critical need for audio-visual materials, support in vernacular languages and user-friendly app designs to improve accessibility for less-educated farmers (Arangurí *et al.*, 2025; Kumar, 2022) <sup>[1, 2]</sup>. Landholding sizes varied significantly whereas 55.00 per cent of farmers owned between 1 and 3 acres, 25.00 per cent owned less than one acre and 20.00 per cent owned more than 3 acres. Farmers with smaller landholdings are heavily reliant on timely information regarding weather conditions, pest management and market trends to make economically sound decisions. In contrast, larger-scale farmers frequently utilize applications for optimizing resources, managing labor and developing marketing strategies (Vasudevan, 2025) <sup>[12]</sup>. The analysis of farming types indicated that 46.67 per cent engaged in crop farming, 30.00 per cent in mixed farming, 13.33 per cent in horticulture and 10.00 per cent in livestock farming. This highlights the necessity for adaptable agricultural practices that can provide integrated solutions for crops, livestock and

horticultural endeavors. In terms of annual income, 31.67 per cent reported earnings between ₹1,00,001 and ₹2,00,000, 28.33 per cent earned between ₹2,00,001 and ₹3,00,000, 21.67 per cent earned over ₹3,00,000 and 18.33 per cent earned below ₹1,00,000. Variations in income impact the capacity to invest in smartphones, data and digital training, which in turn affects the adoption of applications (Rakholia *et al.*, 2024; Manogna *et al.*, 2025) <sup>[7, 3]</sup>.

Farming experience varied from less than 5 years (16.67 per cent) to 5–15 years (48.33 per cent) and over 15 years (35.00 per cent). Experience plays a role in the willingness to embrace innovation, as more seasoned farmers may depend on traditional knowledge, while those with moderate experience might be more inclined to adopt new technologies (Vasudevan, 2025) <sup>[12]</sup>. Membership in farmer organizations was noted by 56.67 per cent, suggesting the potential of peer networks to promote knowledge sharing and the adoption of digital technologies (Cerjak *et al.*, 2025). Farmers who belong to associations can gain from collective training, demonstrations and extension support, thus increasing the chances of effectively adopting mobile agricultural applications.



### 3.2. Smartphone Ownership, Digital Literacy, Accessibility, Awareness, Utilization and Challenges in the Adoption of Agricultural Mobile Applications among Farmers

**Table 2:** Distribution of respondents according to Smartphone Ownership, Digital Literacy, Accessibility, Awareness, Utilization and Challenges in the Adoption of Agricultural Mobile Applications among Farmers (n = 120)

| S. No.                                                                        | Statement                                                                  | Number | Percent |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------|---------|
| <b>A. Smartphone Ownership and Digital Literacy</b>                           |                                                                            |        |         |
| 1                                                                             | Farmers owning a smartphone for agricultural or personal use               | 108    | 90.00   |
| 2                                                                             | Farmers using smartphones regularly for agricultural information           | 98     | 81.67   |
| 3                                                                             | Respondents preferring Tamil as the operating language                     | 84     | 70.00   |
| 4                                                                             | Respondents preferring English as the operating language                   | 36     | 30.00   |
| 5                                                                             | Farmers who have received any form of digital training                     | 48     | 40.00   |
| 6                                                                             | Farmers aware of WhatsApp and YouTube for agricultural content             | 82     | 68.33   |
| 7                                                                             | Respondents confident in downloading and installing mobile apps            | 72     | 60.00   |
| 8                                                                             | Respondents confident in updating and managing mobile apps                 | 66     | 55.00   |
| <b>B. Accessibility to Digital Infrastructure</b>                             |                                                                            |        |         |
| 9                                                                             | Farmers reporting good mobile signal strength                              | 46     | 38.33   |
| 10                                                                            | Farmers reporting average mobile signal strength                           | 53     | 44.17   |
| 11                                                                            | Farmers reporting poor network connectivity                                | 21     | 17.50   |
| 12                                                                            | Respondents considering internet data affordable                           | 86     | 71.67   |
| 13                                                                            | Respondents residing within 3 km of a Common Service Centre (CSC)          | 79     | 65.83   |
| 14                                                                            | Respondents confident in using mobile-based agricultural apps without help | 70     | 58.33   |
| 15                                                                            | Farmers with sufficient data balance to browse agri videos and apps        | 77     | 64.17   |
| <b>C. Awareness and Use of Agricultural Mobile Applications</b>               |                                                                            |        |         |
| 16                                                                            | Farmers who have heard about agricultural mobile applications              | 94     | 78.33   |
| 17                                                                            | Farmers knowing how to download agricultural apps                          | 62     | 51.67   |
| 18                                                                            | Farmers who have used at least one agricultural mobile application         | 84     | 70.00   |
| 19                                                                            | Respondents willing to attend training on the use of agri mobile apps      | 101    | 84.17   |
| 20                                                                            | Farmers recommending agricultural apps to their peers                      | 74     | 61.67   |
| <b>D. Specific Agricultural Mobile Applications Used (Multiple Responses)</b> |                                                                            |        |         |
| 21                                                                            | Respondents using the Uzhavan mobile app                                   | 72     | 60.00   |
| 22                                                                            | Respondents using the Plantix diagnostic app                               | 41     | 34.17   |
| 23                                                                            | Respondents using the mKisan SMS advisory service                          | 36     | 30.00   |
| 24                                                                            | Respondents using the Kisan Suvidha app for scheme updates                 | 29     | 24.17   |
| 25                                                                            | Respondents using e-NAM for market price information                       | 24     | 20.00   |
| 26                                                                            | Respondents using e-Gopala / Kalnadai for livestock management             | 18     | 15.00   |
| 27                                                                            | Respondents using YouTube channels for agricultural learning               | 48     | 40.00   |
| 28                                                                            | Respondents using TNAU or other state-developed agricultural apps          | 22     | 18.33   |
| <b>E. Usefulness and Frequency of App Use</b>                                 |                                                                            |        |         |
| 29                                                                            | Farmers using mobile apps to receive weather updates                       | 70     | 58.33   |
| 30                                                                            | Farmers using apps to access daily market price information                | 58     | 48.33   |

|                                                   |                                                                   |    |       |
|---------------------------------------------------|-------------------------------------------------------------------|----|-------|
| 31                                                | Farmers using apps for pest and disease management                | 50 | 41.67 |
| 32                                                | Farmers using apps to obtain government scheme information        | 48 | 40.00 |
| 33                                                | Farmers using apps for fertilizer and input guidance              | 42 | 35.00 |
| 34                                                | Farmers using apps for crop production and advisory services      | 36 | 30.00 |
| 35                                                | Farmers using agricultural apps daily                             | 18 | 15.00 |
| 36                                                | Farmers using agricultural apps weekly                            | 34 | 28.33 |
| 37                                                | Farmers using agricultural apps occasionally                      | 38 | 31.67 |
| 38                                                | Farmers who rarely or never use agricultural mobile applications  | 30 | 25.00 |
| <b>F. Challenges in Using Mobile Applications</b> |                                                                   |    |       |
| 39                                                | Lack of technical support or guidance for app usage               | 91 | 75.83 |
| 40                                                | Difficulty in installing or updating mobile applications          | 82 | 68.33 |
| 41                                                | Poor internet connectivity limiting app performance               | 72 | 60.00 |
| 42                                                | Low digital literacy hindering effective use                      | 60 | 50.00 |
| 43                                                | App interface not user-friendly or complex to operate             | 43 | 35.83 |
| 44                                                | Frequent app crashes or software errors                           | 41 | 34.17 |
| 45                                                | Agricultural content not available in local language              | 36 | 30.00 |
| 46                                                | Fear of data theft or misuse of personal information              | 31 | 25.83 |
| 47                                                | Lack of timely updates or new agricultural content in apps        | 34 | 28.33 |
| 48                                                | Limited phone storage capacity restricting installation           | 39 | 32.50 |
| 49                                                | Lack of awareness about benefits of agricultural apps among peers | 53 | 44.17 |

Distribution of respondents according to Smartphone Ownership, Digital Literacy, Accessibility, Awareness, Utilization and Challenges in the Adoption of Agricultural Mobile Applications among Farmers was presented in Table.2 and Fig.2

### 3.2.1. Smartphone Ownership and Digital Literacy

The prevalence of smartphone ownership among farmers in the Dharmapuri district is notably high at 90.00 per cent whereas the farmers owned a smartphone for agricultural or personal use, yet only 81.67 per cent of these individuals utilize smartphones consistently for agricultural information. This suggests that mere ownership does not ensure active usage, as many farmers may prefer to use their devices for personal communication rather than for agricultural purposes (Kumar, 2022; Vasudevan, 2025) <sup>[2, 12]</sup>. The limited availability of formal digital training, which stands at 40.00 per cent, coupled with a moderate level of confidence in app management evidenced by 60.00 per cent of farmers downloading apps and 55.00 per cent of the farmers were confident in updating and managing mobile apps. Furthermore, the farmers' preference for the Tamil language, at 70.00 per cent, indicates that language barriers play a crucial role in app adoption, with English-only applications potentially deterring less-educated users (Aranguri *et al.*, 2025) <sup>[1]</sup>. The moderate level of awareness regarding platforms such as WhatsApp and YouTube, recorded at 68.33 per cent, implies that social media is becoming a more common resource for informal agricultural education; however, there remains a lack of structured guidance. The high willingness to participate in training sessions, at 84.17 per cent, reflects an openness to extension interventions that could improve both confidence and the frequency of smartphone usage. Additionally, cultural factors, including a hesitance to embrace new technologies and a reliance on traditional knowledge, may restrict the effective use of smartphones, despite the existing awareness (Cerjak *et al.*, 2025).

### 3.2.2. Accessibility to Digital Infrastructure

Access to digital infrastructure was not uniformly distributed whereas 38.33 per cent of the farmers reported

having a good signal strength, 44.17 per cent of them indicated an average signal strength and 17.50 per cent of the them experienced poor connectivity. This indicates that the reliability of the network has a direct effect on the effectiveness of application usage, as slow or disrupted services can diminish user motivation. Although 71.67 per cent of the farmers considered internet data to be affordable, some individuals may still view cost as a hindrance due to their limited income (Manogna *et al.*, 2025) <sup>[3]</sup>. Being located within 3 km of a Common Service Center (CSC) is advantageous, with 65.83 per cent of respondents acknowledged this. however, mere physical proximity does not guarantee regular engagement or access to technical support, particularly for intricate app functionalities. Furthermore, only 58.33 per cent of the farmers expressed confidence in using agricultural apps independently and 64.17 per cent of them reported having adequate data for browsing. This suggests that both digital infrastructure and skill deficiencies need to be addressed concurrently. Additionally, the seasonal agricultural workload and time constraints may further limit app usage, particularly during critical sowing or harvesting seasons (Vasudevan, 2025) <sup>[12]</sup>.

### 3.2.3. Awareness and Use of Agricultural Mobile Applications

Awareness of agricultural applications stands at 78.33 per cent where the farmers have heard about agricultural mobile applications, which is greater than the actual operational usage recorded at 70.00 per cent where the farmers have used at least one agricultural mobile application. Furthermore, only 51.67 percent of individuals are aware of how to download these applications, indicating a significant gap between knowledge and practical capability (Rakholia *et al.*, 2024) <sup>[7]</sup>. Peer influence is significant, with 61.67 per cent of users recommending applications to others, suggesting that social networks and word-of-mouth play a crucial role in the diffusion of these technologies. Additionally, the willingness of farmers to participate in training sessions, which stands at 84.17 per cent, further emphasizes the necessity of extension-led capacity-building that effectively integrates digital tools with localized knowledge (Cerjak *et al.*, 2025).

### 3.2.4. Specific Agricultural Mobile Applications Used

Uzhavan utilized by 60.00 per cent of the farmers gained significant traction owing to government support, reliability of content and availability in local languages. YouTube (40.00 per cent) offers educational material, whereas applications such as Plantix (34.17 per cent) and mKisan (30.00 per cent) reported moderate usage due to their reliance on internet access and the necessity for technical literacy (Rakholia *et al.*, 2024) <sup>[7]</sup>. The lower adoption rates of Kisan Suvidha (24.17 per cent), e-NAM (20.00 per cent), e-Gopala/Kalnadai (15.00 per cent) and TNAU applications utilized by 18.33 per cent of the farmers which underscores the challenges related to their relevance, ease of use and perceived effectiveness. These observations highlight the importance of user-friendly design, content in vernacular languages, visual aids and alignment with local agricultural practices in enhancing the adoption and regular utilization of these applications (Aranguri *et al.*, 2025) <sup>[1]</sup>.

### 3.2.5. Usefulness and Frequency of App Use

Farmers mainly utilized applications for weather information (58.33 per cent), market pricing (48.33 per cent), pest control (41.67 per cent) and various schemes (40.00 per cent). In contrast, fertilizer recommendations (35.00 per cent) and crop guidance (30.00 per cent) were of lesser importance. The frequency of daily usage was minimal (15.00 per cent), suggesting that applications are employed reactively, typically during challenges or critical decision-making moments, rather than proactively as an

integral part of standard farm management. The rates of weekly (28.33 per cent) and occasional usage (31.67 per cent) imply that factors such as time limitations, workload and adherence to traditional methods affect the frequency of use. To enhance adoption, applications ought to deliver timely, location-specific and actionable guidance accompanied by audio-visual resources, thereby incorporating advisory services into the routine decision-making processes of farmers (Rakholia *et al.*, 2024) <sup>[7]</sup>.

### 3.2.6. Challenges in Using Mobile Applications

Significant obstacles included insufficient technical support (75.83 per cent), challenges in app installation and updates (68.33 per cent), inadequate connectivity (60.00 per cent) and limited digital literacy (50.00 per cent). Additionally, non-intuitive interfaces (35.83 per cent), application crashes (34.17 per cent), storage constraints (32.50 per cent), absence of content in local languages (30.00 per cent) and concerns regarding data privacy (25.83 per cent) further impede adoption. These results indicate that mere ownership does not guarantee effective utilization. Farmers need practical assistance, user-friendly interfaces, dependable networks and localized content to successfully integrate applications into their agricultural practices (Aranguri *et al.*, 2025; Vasudevan, 2025) <sup>[1, 12]</sup>. Factors such as seasonal workload, previous experience and confidence in technology also play a role in both adoption and ongoing usage.

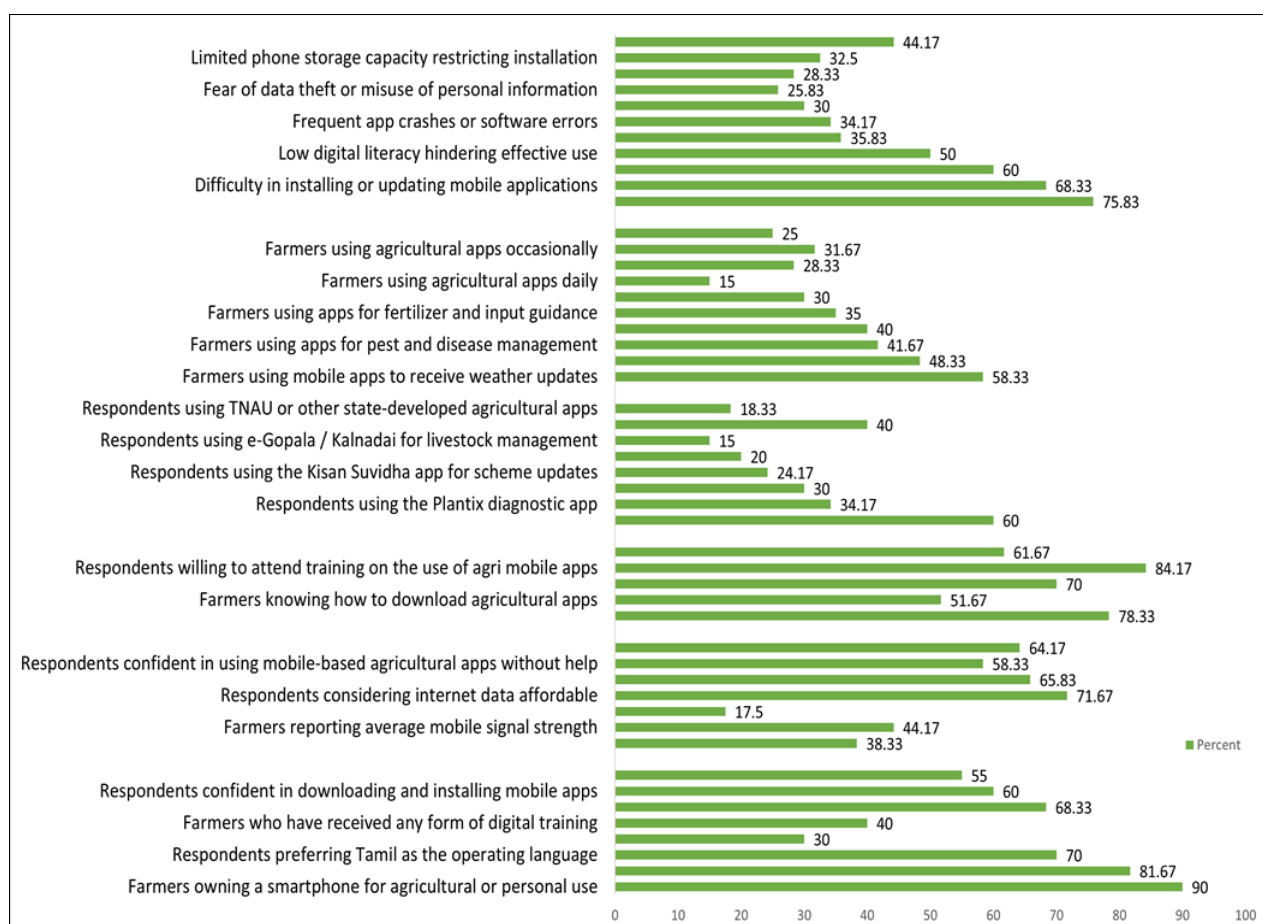


**Fig 2:** Smartphone Ownership, Digital Literacy, Accessibility, Awareness, Utilization and Challenges in the Adoption of Agricultural Mobile Applications among Farmers

#### 4. Conclusion

The results clearly demonstrate that although digital integration in agriculture is progressing, its effective application remains in a transitional phase among farmers in the Dharmapuri district. The extensive availability of smartphones has established a basis for digital inclusion; however, insufficient digital literacy, inconsistent infrastructure and language barriers continue to hinder the complete potential of mobile agricultural applications. The research emphasizes that education, farming experience and participation in organizations significantly affect farmers' confidence and their willingness to utilize digital tools. Farmers who possess moderate education, economic stability and social networks are more inclined to adopt mobile applications, while older and less-educated farmers tend to hesitate due to limited technical skills and unfamiliarity with application functionalities. This illustrates that the adoption of digital technology in agriculture is not solely dependent on access to technology but is also influenced by capability, relevance and social support.

The preference for content in the Tamil language and locally customized applications like Uzhavan highlights the necessity of cultural and linguistic contextualization in digital extension initiatives. It also indicates that farmers prioritize practical, location-specific information—especially concerning weather, market prices and pest management—over generalized data. This indicates a distinct requirement for content that directly supports on-farm decision-making rather than merely providing passive information dissemination. The findings further indicate that infrastructural disparities particularly inadequate network coverage and limited technical support pose operational challenges that reduce user satisfaction and trust in digital platforms. Even when farmers are aware of various agricultural applications, inconsistent connectivity and the absence of personalized assistance limit their consistent usage.

#### Author Contributions

Conceptualization, Methodology, Data collection and analysis, Writing—original draft preparation by Mr. D. Lokeshwaran Writing (review and editing) by Dr. J. Meenambigai (reviewed and corrected errors). All authors have read and agreed to the published version of the manuscript.

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