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Adoption of recommended agricultural practices through digital advisory services and constraints faced by farmers

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Abstract

The present study was conducted to assess farmers' socio-economic characteristics, awareness and use of digital advisory platforms and adoption of recommended agricultural practices through digital advisory services. A total of 120 farmers were selected for the study and primary data were collected through a pre-tested structured interview schedule using personal interviews. The study considered selected personal, socio-economic, communication and digital characteristics of farmers, including age, gender, marital status, family size, education, occupation, annual income, landholding, access to digital devices, internet connectivity, digital literacy, extension contact and mass media exposure. The findings revealed that the majority of respondents were middle-aged (68; 56.67%), male (102; 85.00%) and married (106; 88.33%). A majority belonged to nuclear families (72; 60.00%), while 32 (26.67%) had high-school education. Agriculture was the main occupation of 48 (40.00%) respondents and 62 (51.67%) belonged to the medium-income group. Small and marginal farmers together constituted 66.67 per cent of the respondents. Television was the major agricultural information platform used by 92 (76.67%) respondents, followed by WhatsApp groups (84; 70.00%). Further, 72 (60.00%) respondents had smartphones, while 54 (45.00%) reported regular/moderate internet connectivity. The majority of farmers, 65 (54.17%), had a medium level of awareness and use of digital advisory platforms, followed by 28 (23.33%) with high and 27 (22.50%) with low levels. The findings indicate that digital advisory services have considerable potential for providing agricultural information, although improvements in digital literacy, internet connectivity, training and extension support are required to enhance their effective utilization and adoption of recommended agricultural practices.

Keywords: Digital advisory services, agricultural information, farmers, awareness, adoption, digital literacy, internet connectivity, mobile-based advisory, socio-economic characteristics, agricultural practices

Introduction

Digital advisory services have emerged as an important component of modern agricultural extension by providing farmers with timely, location-specific and easily accessible information on crop production, weather, pest and disease management, input use and marketing. Mobile phones, SMS, WhatsApp, mobile applications, YouTube and other digital platforms can help farmers obtain technical information quickly and support the adoption of recommended agricultural practices. Studies have shown that access to mobile-based agricultural information can improve farmers' access to information and reduce information gaps, thereby supporting better farm-level decisions (Aker, 2011; Mittal & Mehar, 2016) ^[1, 7]. ICT-enabled extension services have also been reported to improve farmers' awareness and adoption of improved agricultural technologies, particularly among small and marginal farmers (Balaji *et al.*, 2018) ^[2].

Despite the increasing availability of digital advisory services, their effective utilization among farmers is influenced by socio-economic and technological factors such as age, education, landholding, income, extension contact, digital literacy and access to smartphones and internet

connectivity. Farmers may also face constraints including poor network connectivity, lack of technical knowledge, language barriers, limited digital skills and inadequate guidance in using digital platforms. These factors may affect the extent to which farmers convert digital advisories into actual adoption of recommended agricultural practices. Therefore, it is important to assess the adoption of recommended agricultural practices through digital advisory services and identify the major constraints faced by farmers in accessing and utilizing these services. In this context, the present study entitled "Adoption of Recommended Agricultural Practices through Digital Advisory Services and Constraints Faced by Farmers" was undertaken to assess the extent of adoption and identify the constraints experienced by farmers.

Materials and Methods

The independent variables selected for the present study included age, gender, marital status, family size, education, occupation, type of house, annual income, landholding size, platforms for agricultural information, access to digital devices, internet connectivity, digital literacy, extension

contact and mass media exposure. These variables represent the personal, socio-economic, communication and digital characteristics of farmers that may influence their use of digital advisory platforms and adoption of recommended agricultural practices. The dependent variable was the extent of adoption level of recommended agricultural practices through digital advisory services.

Primary data were collected using a well-structured and pre-tested interview schedule developed according to the objectives of the study. The schedule covered information related to the socio-economic characteristics of respondents, access and use of digital advisory platforms and adoption of recommended agricultural practices. Personal interviews were conducted with the selected farmers after explaining the purpose of the study. Secondary information was collected from relevant published reports, official records, research articles and other documented sources related to digital agriculture and advisory services.

The collected data were systematically coded, tabulated and analyzed using suitable statistical techniques, including frequency, percentage, mean, standard deviation and chi-square test. Frequency and percentage were used to describe the distribution of respondents, while mean and standard deviation were used to summarize and measure variation in the data. The chi-square test was applied to examine the association between selected independent variables and the extent of adoption. The analysis was undertaken to assess the adoption of recommended agricultural practices through digital advisory services and to identify the major factors associated with farmers' adoption behaviour.

Results and Discussion

The study considered 18 independent variables, namely age, gender, education, family size, occupation, land holding, annual income, type of house, organizational membership, drinking water source, agricultural assets, comfortable assets, irrigation facility, mobile phone ownership and usage, internet accessibility, mass media exposure, extension contact and training received on mobile-based agricultural advisories. Adoption level of mobile-based agricultural advisories was considered as the dependent variable (Table 1).

Socio-Economic Profile of the Farmer:

Age: Majority, 68 (56.67%), were middle-aged (36–55 years), indicating predominance of economically active farmers. Similar findings were reported by Meshram *et al.* (2024) ^[6].

Gender: 102 (85.00%) respondents were male, showing greater male participation in farming. Similar findings were reported by Fabregas *et al.* (2019) ^[4].

Marital Status: 106 (88.33%) respondents were married, indicating the predominance of married farming households. Similar observations were reported by Fabregas *et al.* (2019) ^[4].

Family Type: 72 (60.00%) respondents belonged to nuclear families, showing the predominance of nuclear households. Similar findings were reported by Bhandari *et al.* (2024) ^[3].

Education: 32 (26.67%) respondents had high-school education, while only 8 (6.67%) were illiterate, indicating a moderate educational status. Mukherjee *et al.* (2024) ^[8] reported the importance of education in digital advisory use.

Occupation: Agriculture was the main occupation of 48 (40.00%) respondents, followed by agriculture with allied activities (30.00%). This indicates dependence on agriculture. Similar findings were reported by Bhandari *et al.* (2024) ^[3].

Type of House: 96 (80.00%) respondents were from rural households, reflecting the predominantly rural nature of the farming community.

Annual Income: 62 (51.67%) respondents belonged to the medium-income group, indicating a predominantly moderate economic status. Similar findings were reported by Meshram *et al.* (2024) ^[6].

Landholding: 42 (35.00%) respondents had small holdings and 38 (31.67%) had marginal holdings. Thus, 66.67% were small or marginal farmers, similar to findings of Meshram *et al.* (2024) ^[6].

Agricultural Information Platforms: Television (92; 76.67%) was the most used source, followed by WhatsApp (84; 70.00%), indicating the importance of both traditional and digital sources. Similar findings were reported by Fabregas *et al.* (2019) ^[4].

Digital Device Access: 72 (60.00%) respondents had smartphones, indicating good potential for accessing digital agricultural services. Similar findings were reported by Mukherjee *et al.* (2024) ^[8].

Internet Connectivity: 54 (45.00%) respondents had regular/moderate connectivity, while 32 (26.67%) reported poor or irregular connectivity, indicating connectivity as an important limitation.

Digital Literacy: 52 (43.33%) respondents could use smartphones and basic applications, indicating a moderate level of digital literacy. Mukherjee *et al.* (2024) ^[8] also emphasized the importance of digital literacy.

Extension Contact: 52 (43.33%) respondents had occasional contact with extension personnel, indicating a moderate level of extension interaction. Similar findings were reported by Bhandari *et al.* (2024) ^[3].

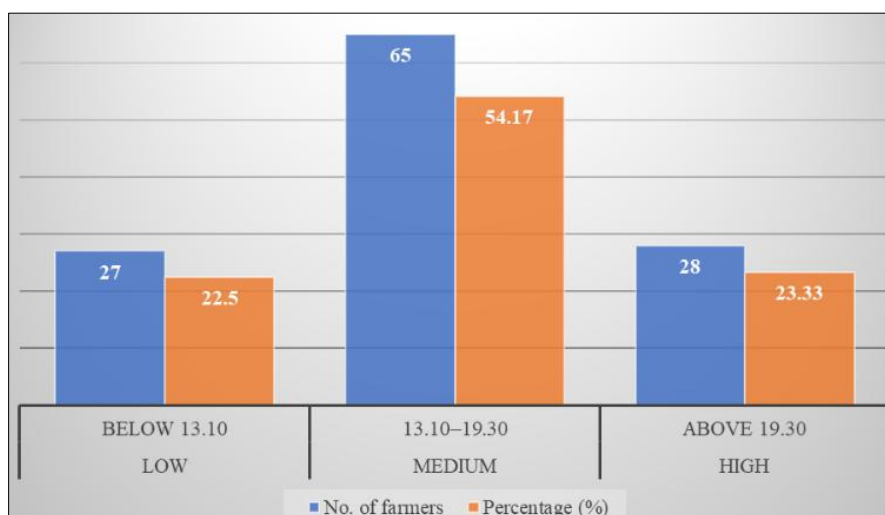
Mass Media Exposure: 64 (53.34%) respondents had medium mass-media exposure, indicating moderate access to agricultural information through mass media. Similar findings were reported by Fabregas *et al.* (2019) ^[4].

Level of Awareness and Use of Digital Advisory Platforms

The data presented in Table 1 revealed that the majority of respondents, 65 (54.17%), belonged to the medium level of awareness and use of digital advisory platforms, followed by 28 (23.33%) respondents with a high level and 27 (22.50%) with a low level. Thus, the findings indicated that most farmers had a moderate level of awareness and use of digital advisory platforms for obtaining agricultural information and supporting farm-level decision-making. The finding is supported by Kumar *et al.* (2022) ^[5], who reported that the majority of farmers had a medium level of awareness and use of digital agricultural advisory services. Singh *et al.* (2023) ^[10] observed that farmers increasingly used mobile-based platforms for accessing weather, crop management and market-related information, although overall utilization remained moderate. Similarly, Patel *et al.* (2024) ^[9] found that digital advisory services were increasingly adopted by farmers for farm-related decision-making, with most respondents falling under the medium adoption category.

Table 1: Distribution of Respondents According to Selected Variables (N = 120)

Variable	Category I	f (%)	Category II	f (%)	Category III	f (%)	Category IV	f (%)	Category V	f (%)	Category VI	f (%)
Age	Young (≤ 35 years)	30 (25.00)	Middle (36–55 years)	68 (56.67)	Old (> 55 years)	22 (18.33)	—	—	—	—	—	—
Gender	Male	102 (85.00)	Female	18 (15.00)	—	—	—	—	—	—	—	—
Marital status	Unmarried	14 (11.67)	Married	106 (88.33)	—	—	—	—	—	—	—	—
Family type	Nuclear	72 (60.00)	Joint	48 (40.00)	—	—	—	—	—	—	—	—
Education	Illiterate	8 (6.67)	Primary	16 (13.33)	Middle	24 (20.00)	High School	32 (26.67)	Higher Secondary	22 (18.33)	Graduate & above	18 (15.00)
Occupation	Agriculture	48 (40.00)	Agriculture + Allied	36 (30.00)	Agriculture + Wage Labour	24 (20.00)	Agriculture + Business/Service	12 (10.00)	—	—	—	—
Type of house	Rural	96 (80.00)	Urban	24 (20.00)	—	—	—	—	—	—	—	—
Annual income	Low ($\leq ₹1$ lakh)	28 (23.33)	Medium ($₹1.01–3$ lakh)	62 (51.67)	High ($> ₹3$ lakh)	30 (25.00)	—	—	—	—	—	—
Landholding	Marginal (≤ 1 ha)	38 (31.67)	Small (1–2 ha)	42 (35.00)	Semi-medium (2–4 ha)	26 (21.67)	Medium (4–10 ha)	11 (9.16)	Large (> 10 ha)	3 (2.50)	—	—
Kisan Call Centre	Yes	54 (45.00)	No	66 (55.00)	—	—	—	—	—	—	—	—
Kisan e-Mitra	Yes	42 (35.00)	No	78 (65.00)	—	—	—	—	—	—	—	—
WhatsApp groups	Yes	84 (70.00)	No	36 (30.00)	—	—	—	—	—	—	—	—
Mobile apps	Yes	68 (56.67)	No	52 (43.33)	—	—	—	—	—	—	—	—
Television	Yes	92 (76.67)	No	28 (23.33)	—	—	—	—	—	—	—	—
Radio	Yes	58 (48.33)	No	62 (51.67)	—	—	—	—	—	—	—	—
Digital device access	No device	6 (5.00)	Mobile/basic device	18 (15.00)	Smartphone	72 (60.00)	Smartphone + other device	24 (20.00)	—	—	—	—
Internet connectivity	No access	8 (6.67)	Irregular/poor	32 (26.67)	Regular/moderate	54 (45.00)	Regular/good	26 (21.66)	—	—	—	—
Digital literacy	Unable to operate	8 (6.67)	Basic operations	26 (21.67)	Smartphone/basic apps	52 (43.33)	Independently uses digital platforms	34 (28.33)	—	—	—	—
Extension contact	No contact	8 (6.67)	Rarely	24 (20.00)	Occasionally	52 (43.33)	Frequently	36 (30.00)	—	—	—	—
Mass media exposure	Low	28 (23.33)	Medium	64 (53.34)	High	28 (23.33)	—	—	—	—	—	—
Digital advisory platform awareness & use	Low	27 (22.50)	Medium	65 (54.17)	High	28 (23.33)	—	—	—	—	—	—

**Fig 1:** Distribution of Respondents According to Level of Awareness and Use of Digital Advisory Platforms

The data presented in Table 2 revealed that poor internet connectivity in rural areas was the most important constraint faced by farmers in accessing and utilizing digital advisory services, reported by 73.33 per cent of respondents and ranked first. This was followed by lack of training on digital tools (67.50%), low digital literacy (63.33%), high cost of mobile data/internet (60.00%) and lack of awareness about digital advisory platforms (56.67%), which ranked second to fifth, respectively. Other constraints included unreliable or irrelevant information from apps (45.83%), language barriers

in digital content (42.50%), lack of smartphones or digital devices (35.00%), limited trust in digital advisory services (31.67%) and preference for traditional information sources such as extension workers and input dealers (28.33%), which was the least reported constraint. Overall, the findings indicate that inadequate digital infrastructure, insufficient training, limited digital literacy and affordability were the major barriers to effective utilization of digital advisory services.

Table 2: Distribution of Respondents According to Constraints Faced by Farmers in Accessing and Utilizing Digital Advisory Services (N = 120)

S. No.	Constraints faced by farmers	Frequency	Percentage (%)	Rank
1	Lack of smartphone or digital devices	42	35.00	VIII
2	Poor internet connectivity in rural areas	88	73.33	I
3	Low digital literacy among farmers	76	63.33	III
4	Lack of awareness about digital advisory platforms	68	56.67	V
5	Language barrier in digital content	51	42.50	VII
6	High cost of mobile data / internet	72	60.00	IV
7	Lack of training on use of digital tools	81	67.50	II
8	Unreliable or irrelevant information from apps	55	45.83	VI
9	Limited trust in digital advisory services	38	31.67	IX
10	Preference for traditional sources (extension workers, input dealers)	34	28.33	X

Conclusion

The study concluded that the respondents had a moderate socio-economic and digital profile, with 68 (56.67%) farmers belonging to the middle-age group, 102 (85.00%) being male and 106 (88.33%) being married. Nuclear families accounted for 72 (60.00%) respondents, while 62 (51.67%) had medium annual income and 66.67 per cent were small and marginal farmers. Television was the most commonly used agricultural information platform (92; 76.67%), followed by WhatsApp groups (84; 70.00%). Smartphone access was reported by 72 (60.00%) respondents, whereas 54 (45.00%) had regular/moderate internet connectivity. Overall, 65 (54.17%) farmers had a medium level of awareness and use of digital advisory platforms, compared with 28 (23.33%) having high and 27 (22.50%) having low levels. Thus, digital advisory services have good potential to support agricultural decision-making, but improved internet connectivity, digital literacy, training and extension support are required to enhance their effective utilization and adoption of recommended agricultural practices.

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