

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 8; August 2026; Page No. 512-516

Received: 11-06-2026
Accepted: 15-07-2026

Indexed Journal
Peer Reviewed Journal

Extent of ICT adoption among farmers and its relationship with selected socio-economic variables

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i8g.4056>

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Abstract

The present study was conducted in Banda district of Uttar Pradesh to assess the extent of Information and Communication Technology (ICT) adoption among farmers and its relationship with selected socio-economic variables. The study was conducted in Tindwari and Mahua blocks, from which four villages were purposively selected and a total of 120 farmers were selected through random sampling. An ex-post-facto research design was followed and primary data were collected through personal interviews using a structured and pre-tested interview schedule. The findings revealed that the majority of respondents were middle-aged (40.84%), male (60.83%), belonged to the OBC category (44.16%), had middle school education (36.68%) and had large families (39.16%). Most respondents had marginal landholdings (31.66%), were exclusively engaged in agriculture (47.50%) and belonged to the medium categories of annual income (46.66%), material possession (54.18%), innovativeness (53.33%), mass media exposure (34.16%), extension participation (45.00%), social participation (46.66%), economic motivation (65.83%) and risk orientation (57.50%). Regarding ICT adoption, 41.66% of farmers had a medium level of adoption, followed by low (30.00%) and high (28.34%) levels. Correlation analysis revealed that caste ($r = 0.861$), economic motivation ($r = 0.969$) and risk orientation ($r = 0.999$) had strong positive and significant relationships with ICT adoption, while gender, education, family size, landholding, material possession, innovativeness, mass media exposure, extension participation and social participation also showed significant positive relationships. Occupation had a negative and significant relationship ($r = -0.384$), whereas age ($r = -0.0302$) and annual income ($r = 0.0648$) were non-significant.

Keywords: ICT adoption, farmers, agricultural information, socio-economic variables, digital agriculture, Banda district

Introduction

Information and Communication Technology (ICT) has emerged as an important means of providing timely agricultural information to farmers. ICT tools such as mobile phones, smartphones, internet services, social media and agricultural applications enable farmers to access information on weather, crop production, pest and disease management, market prices and government schemes. The increasing emphasis on digital agriculture in India reflects the growing importance of ICT in agricultural extension and decision-making. The Government of India approved the Digital Agriculture Mission in 2024 with an outlay of ₹2,817 crore to develop a farmer-centric digital ecosystem and facilitate timely and reliable crop-related information (Ministry of Agriculture & Farmers Welfare, 2024) ^[4].

Digital technologies can strengthen communication between farmers, extension personnel, scientists and markets by providing information quickly and supporting location-specific decision-making. Under the Digital Agriculture Mission, major initiatives include AgriStack, the Krishi Decision Support System and digital soil-fertility mapping. As of 5 December 2024, more than 29.99 lakh Farmer IDs

had been created and Digital Crop Surveys had been undertaken in 436 districts during Kharif 2024 (Ministry of Agriculture & Farmers Welfare, 2024) ^[5]. The Government has further targeted the creation of 11 crore Farmer IDs by 2026–27, indicating the increasing integration of digital technologies into agricultural service delivery (Ministry of Agriculture & Farmers Welfare, 2025) ^[6].

Despite the increasing availability of ICT-based agricultural services, farmers differ in their ability and willingness to adopt and utilize these technologies. Socio-economic characteristics such as age, education, income, landholding, social participation, extension contact and access to communication facilities may influence ICT adoption. Therefore, assessing the extent of ICT adoption and examining its relationship with selected socio-economic variables is important for identifying gaps and strengthening farmer-oriented digital extension services. Hence, the present study entitled “Extent of ICT Adoption among Farmers and Its Relationship with Selected Socio-Economic Variables” was undertaken to assess the extent of ICT adoption among farmers and determine its relationship with selected socio-economic characteristics.

Materials and Methods

The present study was conducted in Banda district of Uttar Pradesh to assess the extent of ICT adoption among farmers and its relationship with selected socio-economic variables. Banda district was purposively selected as the study area considering the presence of farmers using ICT and electronic media for obtaining agricultural information. Out of the eight development blocks of the district, Tindwari and Mahua blocks were purposively selected based on the availability of ICT users. From each selected block, two villages were selected, resulting in four villages for the study. Farmers who were using electronic media such as television, radio and mobile phones for obtaining agricultural information were considered as respondents. A total of 120 farmers were selected through random sampling, with 30 respondents from each selected village. The study followed an ex-post-facto research design, as the variables under investigation had already occurred naturally and were not manipulated by the researcher.

Primary data were collected through personal interviews using a structured and pre-tested interview schedule. The schedule covered the socio-economic characteristics of the respondents, use of ICT tools, sources of agricultural information and extent of ICT adoption. Selected independent variables included socio-economic and communication characteristics of the farmers, while the extent of ICT adoption was considered the dependent variable. The collected data were systematically coded, classified and tabulated for analysis. Frequency, percentage, mean, standard deviation and appropriate statistical tests for measuring relationships were used to analyse the data. The findings were presented in suitable tables and interpreted according to the objectives of the study.

Extent of adoption of Information Communication Technology (ICT) tools

Adoption refers to the actual use and implementation of ICT tools for obtaining agricultural information by the respondents. A set of selected agricultural information practices accessed through ICT sources was prepared for measuring adoption. Scores of 3, 2 and 1 were assigned for high, medium and low adoption, respectively. The total score obtained across all practices represented the respondent's adoption score, which was further converted into an adoption index using the prescribed formula.

$$\text{Adoption Index (\%)} = \frac{\text{Sum of Adoption Scores Obtained by the Respondent}}{\text{Maximum Obtainable Adoption Score}} \times 100$$

Based on the computed adoption scores, the respondents were categorized into low, medium and high adoption levels using the mean and standard deviation as the basis for classification.

Instruments of Data Collection and Statistical Analysis

Primary data were collected through a structured interview schedule prepared according to the objectives of the study and pre-tested on 10 farmers from a non-sampled area. Secondary data were obtained from the Department of Agriculture, government offices, publications and other relevant sources. The collected data were coded, classified, tabulated and analysed using appropriate statistical tools such

as frequency, percentage, mean, standard deviation and correlation coefficient, according to the nature and objectives of the study.

Results and Discussion

The results of the present study, entitled "Extent of ICT Adoption among Farmers and Its Relationship with Selected Socio-Economic Variables," are presented in this chapter in accordance with the specific objectives of the study. Data were collected from 120 selected farmers using a structured interview schedule to obtain systematic, accurate and reliable information. The collected data were carefully classified, tabulated and analysed using appropriate statistical techniques to draw meaningful conclusions. The chapter presents the socio-economic characteristics of the respondents, extent of ICT adoption among farmers for agricultural purposes, sources of ICT-based agricultural information and the relationship between the extent of ICT adoption and selected socio-economic variables of the farmers.

Socio-Economic the Farmers

The data reveal that 40.84% of respondents belonged to the middle age group, followed by 32.50% in the old age group and 26.66% in the young age group. Thus, the majority were middle-aged farmers. This finding is similar to Singh *et al.* (2014) [10].

The findings show that 60.83% of respondents were male, while 39.16% were female. Thus, male respondents constituted the majority of the selected farmers.

The findings reveal that 44.16% of respondents belonged to the OBC category, followed by SC/ST (35.00%) and General category (20.83%). Thus, OBC respondents formed the largest group.

The data indicate that 36.68% of respondents had middle school education, followed by primary education (31.66%). Thus, the largest proportion had education up to the middle school level. This finding is supported by Rahangdale (2011) [8].

The findings show that 39.16% of respondents belonged to large-sized families, followed by medium (32.50%) and small families (28.34%). Thus, large-sized families constituted the largest group. This finding is supported by Shivhare (2008) [9].

The data reveal that 31.66% of respondents had marginal land holdings, followed by large (25.00%), medium (24.16%) and small holdings (19.18%). Thus, marginal farmers constituted the largest group. This finding is supported by Itwadiya (2011) [2].

The findings indicate that 47.50% of respondents were exclusively engaged in agriculture, followed by agriculture with wage work (24.16%), agriculture with business (15.00%) and agriculture with service (13.33%). Thus, agriculture was the major occupation of the respondents.

The data show that 46.66% of respondents had medium annual income, followed by low income (33.34%) and high income (25.00%). Thus, the majority belonged to the medium-income category. This finding is supported by Patidar (2007) [7].

The findings reveal that 54.18% of respondents had medium material possession, followed by low (39.16%) and high (6.66%) levels. Thus, the majority possessed a medium level

of material assets.

The data indicate that 53.33% of respondents had medium innovativeness, followed by low (25.00%) and high (21.67%) levels. Thus, most respondents had moderate innovativeness. This finding is supported by Chauhan (2009) ^[1].

The findings show that 34.16% of respondents had medium mass media exposure, followed by high (33.34%) and low (32.50%) exposure. Thus, medium exposure was predominant. This finding is in accordance with Kiradiya (2008) ^[3].

The data reveal that 45.00% of respondents had medium extension participation, followed by low (30.00%) and high (25.00%) participation. Thus, the majority had moderate extension participation. This finding is supported by Kiradiya

(2008) ^[3].

The findings indicate that 46.66% of respondents had medium social participation, followed by high (28.34%) and low (25.00%) participation. Thus, medium social participation was predominant. This finding is supported by Shivhare (2008) ^[9].

The data show that 65.83% of respondents had medium economic motivation, followed by high (20.83%) and low (13.33%) levels. Thus, the majority had a medium level of economic motivation.

The findings reveal that 57.50% of respondents had medium risk orientation, followed by low (24.16%) and high (18.33%) levels. Thus, the majority showed a moderate level of risk orientation.

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

S. No.	Independent Variable	Category	Frequency	Percentage
1	Age	Young age (up to 35 years)	32	26.66
		Middle age (36–55 years)	49	40.84
		Old age (56 years and above)	39	32.50
		Total	120	100.00
2	Gender	Male	73	60.83
		Female	47	39.16
		Total	120	100.00
3	Caste	General	25	20.83
		OBC	53	44.16
		SC/ST	42	35.00
		Total	120	100.00
4	Education	Illiterate	23	19.16
		Primary school	38	31.66
		Middle school	44	36.68
		High school and above	15	12.50
		Total	120	100.00
5	Family Size	Small (up to 4 members)	34	28.34
		Medium (5–8 members)	39	32.50
		Large (more than 8 members)	47	39.16
		Total	120	100.00
6	Land Holding	Marginal	38	31.66
		Small	23	19.18
		Medium	29	24.16
		Large	30	25.00
		Total	120	100.00
7	Occupation	Exclusively agriculture	57	47.50
		Agriculture & wage work	29	24.16
		Agriculture & business	18	15.00
		Agriculture & service	16	13.33
		Total	120	100.00
8	Annual Income	Low (up to ₹80,000)	40	33.34
		Medium (₹80,001–₹1,60,000)	56	46.66
		High (above ₹1,60,000)	30	25.00
		Total	120	100.00
9	Material Possession	Low (up to 10 scores)	47	39.16
		Medium (11–20 scores)	65	54.18
		High (above 21 scores)	8	6.66
		Total	120	100.00
10	Innovativeness	Low (up to 12 scores)	30	25.00
		Medium (13–20 scores)	64	53.33
		High (above 21 scores)	26	21.67
		Total	120	100.00
11	Mass Media Exposure	Low (up to 8 scores)	39	32.50
		Medium (9–16 scores)	41	34.16
		High (17–24 scores)	40	33.34
		Total	120	100.00
12	Extension Participation	Low (up to 9 scores)	36	30.00

		Medium (10–18 scores)	54	45.00
		High (19–27 scores)	30	25.00
		Total	120	100.00
13	Social Participation	Low (up to 12 scores)	30	25.00
		Medium (13–20 scores)	56	46.66
		High (more than 20 scores)	34	28.34
		Total	120	100.00
14	Economic Motivation	Low (up to 20 scores)	16	13.33
		Medium (21–24 scores)	79	65.83
		High (25 and above)	25	20.83
		Total	120	100.00
15	Risk Orientation	Low (up to 19 scores)	29	24.16
		Medium (20–24 scores)	69	57.50
		High (25 and above)	22	18.33
		Total	120	100.00

Extent of Adoption of ICT

The data presented in Table 2 and Fig. 1 reveal that the highest proportion of farmers (41.66%) had a medium extent of adoption of ICT tools, followed by 30.00% with a low extent and 28.34% with a high extent of adoption. Thus, it can be concluded that the majority of farmers had a medium level of adoption of ICT tools.

Table 2: Overall Extent of Adoption of ICT Tools by Farmers (N = 120)

S. No.	Extent of Adoption of ICT Tools	No. of Respondents	Percentage
1	Low	36	30.00
2	Medium	50	41.66
3	High	34	28.34
Total		120	100.00

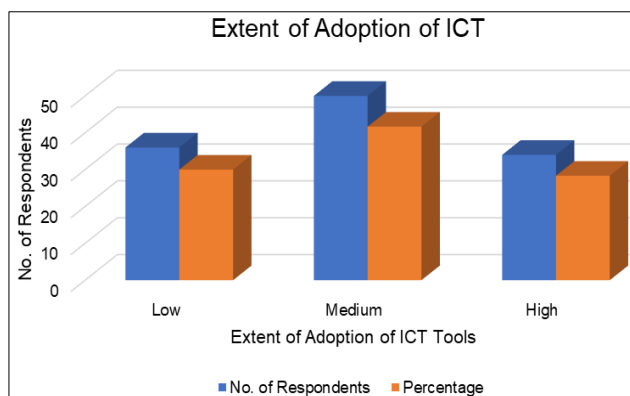


Fig. 1: Overall Extent of Adoption of ICT Tools by Farmers (N = 120)

Correlation between the independent variables and extent of adoption

The data presented in Table 3 reveal that caste ($r = 0.861$), risk orientation ($r = 0.999$) and economic motivation ($r = 0.969$) had a strong positive and significant relationship with ICT adoption at the 1% level. A positive and significant relationship was also observed with gender ($r = 0.275$), education ($r = 0.2645$), family size ($r = 0.1527$), landholding ($r = 0.2816$), material possession ($r = 0.3679$), innovativeness ($r = 0.2839$), mass media exposure ($r = 0.2615$), extension participation ($r = 0.2501$) and social participation ($r = 0.2324$). Occupation ($r = -0.384$) showed a negative and significant relationship. However, age ($r = -0.0302$) and annual income ($r = 0.0648$) had non-significant relationships

with ICT adoption.

Table 3: Correlation between the independent variables and extent of adoption of ICT tools (N = 120)

S. No.	Independent Variables	Correlation Coefficient (r)	Significance
1	Age	-0.0302	ns
2	Gender	0.275	*
3	Caste	0.861	**
4	Education	0.2645	*
5	Family size	0.1527	*
6	Size of land holding	0.2816	*
7	Occupation	-0.384	**
8	Annual income	0.0648	ns
9	Material possession	0.3679	*
10	Innovativeness	0.2839	*
11	Mass media exposure	0.2615	*
12	Extension participation	0.2501	*
13	Social participation	0.2324	*
14	Risk orientation	0.999	**
15	Economic motivation	0.969	**

Note: *Significant at 5% level; **Significant at 1% level; ns = Non-significant.

Conclusion

In conclusion, the study revealed that the majority of farmers (41.66%) had a medium extent of adoption of ICT tools, followed by low (30.00%) and high (28.34%) adoption. Most farmers were middle-aged (40.84%), male (60.83%), belonged to the OBC category (44.16%) and had middle school education (36.68%). Caste ($r = 0.861$), risk orientation ($r = 0.999$) and economic motivation ($r = 0.969$) showed strong positive and significant relationships with ICT adoption. Other variables such as gender, education, landholding, innovativeness, mass media exposure, extension participation and social participation also showed significant positive relationships, whereas occupation had a negative significant relationship. Age ($r = -0.0302$) and annual income ($r = 0.0648$) were found to be non-significant. Overall, the findings indicate that farmers' socio-economic and psychological characteristics played an important role in determining their extent of ICT adoption.

Acknowledgment

The author expresses sincere and heartfelt gratitude to the Associate Professor, Department of Technology Transfer, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.), India, for providing valuable

guidance, constructive suggestions, continuous encouragement and unwavering support throughout the research work. The author is deeply thankful for the valuable academic advice and assistance extended during the planning, execution, data collection, analysis and completion of the study. Sincere appreciation is also extended to all colleagues, field assistants and laborers for their cooperation, dedicated efforts and valuable assistance during various stages of the research. Their support and contribution greatly facilitated the smooth and successful completion of this research work, for which the author remains genuinely grateful.

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