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Exploring the Relationship between Socio-economic Factors and ICT Adoption among Farmers

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ABSTRACT

The study was conducted in Uttar Pradesh, India to assess the relationship between ICT tools and socio-economic variables of farmers. The *ex-post-facto* research design and multi-stage random sample technique were used. The data was collected through personal interviews with farmers. The total sample size of the study was 120 farmers. The study data were analyzed with correlation, multiple regression, and path analysis. The coefficient of determination (R^2) revealed that 79.90 per cent of the total variation in the utilization of ICT tools by the farmers was explained by the selected independent variables. The path analysis was used to assess the total effect, which was decomposed into direct, indirect, and residual effects. The variable education (0.358) exerted the highest direct effect, while the total indirect effect of extension contact (0.493) was on the utilization of ICT tools by the farmers. The residual effect was 0.201, which means that 20.10 per cent of the variance could not be explained due to exogenous variables. Overall, the study suggests that education and extension contact are crucial factors that affect the utilization of ICT tools by farmers in Uttar Pradesh for agricultural purposes.

INTRODUCTION

Agriculture information is crucial for the overall development of agriculture as well as for enhancing farmers' quality of life in a dynamic and changing agricultural environment (Mittal & Mehar, 2016). One of India's most significant industries is agriculture, which might greatly benefit from the use of ICTs. Information and communication technology plays a crucial role in changing the socio-economic circumstances of impoverished and developing countries (Bansal & Joshi, 2019). ICT education should be built into the extension delivery package of extension agents to farmers particularly the use of the mobile phone (Osondu & Ibezim, 2015). The access usage index of ICT tools indicates that it is utilized mostly for social media and video calling but less for computer, global positioning system, web camera and radio (Panda et al., 2019).

ICT use in agriculture has become a key pillar of agriculture extension, concentrating on the improvement of rural and agricultural development enhanced communication and information processes (Dhaka & Chayal, 2010). Television, radio, agriculture officer and progressive farmers were categorized into strong group of information sources usefulness (Ravikumar et al., 2015). ICT refers is a collection of technologies that support the storage, processing, or dissemination/communication of data/information, or both (Kumar et al., 2017). Thus, ICTs refer to technologies that facilitate the creation, processing, and transfer of information across space and time. Agricultural development depends on agricultural extension, which is the application of new knowledge and scientific research to agricultural practices through farmer's education (DFI, 2017). ICTs are technologies that allow people to communicate and exchange information and knowledge in new ways. Stevenson

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first time use the term "information and communication technology" in 1997 (Khare et al., 2011). The study looked into how well ICT tools are used to deliver services for agricultural extension. Social media like WhatsApp is a highly beneficial tool that saved time and money in the problem-solving process. It provided an immediate solution to farmers on a large-scale with this App, and the farming communities could have received need-based and time-based services (Mishra et al., 2020; Patel et al., 2020). Small farms typically lack the financial resources to stay up. This could change when information access and delivery become more affordable. However, even in the short run, there are creative methods for smallholder farmers with limited human and financial capital to maximize yields using digital technology like basic mobile phones (Meena et al., 2018). The content in social media platforms must be generated based on the needs of the users, and the interface in social media platforms must be simplified for ease of use. Farmers considered the information offered or obtained via social media platforms to be beneficial and valuable in helping them practice and adopt best agricultural practices (Nain et al., 2019; Sandeep et al., 2022).

METHODOLOGY

The study was conducted in the Banda district of Utter Pradesh. The district comprises eight blocks. Out of these eight blocks, two blocks namely Baberu and Kamasin were selected randomly. Banda district was selected purposively because there the maximum numbers of farmers are pulse growers. The present study employed an *ex-post-facto* research design and multistage random sample technique. Five villages from each of these blocks were selected. Hence, 10 villages in total were selected for the study as a result. Twelve pulse farmers were purposefully chosen from each of the identified villages. Hence, a total of 120 farmers in all were selected for the study. A structured interview schedule was used to collect the data. The utilization patterns of ICTs were, the dependent variable represented by Y_1. Age (X_1), Education (X_2), Caste (X_3), Landholding (X_4), Family income (X_5), Occupation (X_6), Farming experience (X_7), Information seeking behavior (X_8), Extension contact (X_9) Mass media exposure (X_{10}), Achievement motivation (X_{11}), Scientific orientation (X_{12}), Innovativeness (X_{13}) were the independent variables. The data was subjected to a correlation analysis, multiple regression, and path analysis in order to determine the strength of the association, and combine effect (direct, indirect, and residual) between the chosen dependent variable and the independent variables. The computation and statistical significance of the correlation coefficient, multiple regression analysis, and path analysis were done for the utilization of ICT tools with the socio-economic attributes of farmers.

RESULTS AND DISCUSSION

Determinants of farmers' utilization of ICT tools

Table 1 presents the coefficient of correlation between farmers' utilization of ICT tools (Y) and socio-economic variables (X_1-X_{13}) considered as dependent and independent variables, respectively. The finding revealed that the age of the respondents has recorded a negative and significant correlation with the dependent variable. This was because young farmers were more efficient in handling ICT tools than the elder ones. Younger people accept new changes and try new technologies more rapidly (Kumar et al., 2017); Roy et al., (2018); Prasad & Pradhan (2019); Mahajan et al., (2022). Education was positively and significantly correlated with the utilization of ICT tools. Because people gain knowledge through the formal education system (Anand et al., 2022). This may be the possible reason that the variable 'education' has shown a significant association with the dependent variable utilization of ICT tools. The findings are in conformity with the findings of Roy et al., (2018); Prasad & Pradhan (2019); Naik et al., (2020). Likewise, caste, land holding, and farming experience had a non-significant relationship with the dependent variable, indicating that

Table 1. Summarizes the correlation coefficients, regression coefficient, and Path analysis for the attributes of farmers and their utilization of ICT tools. (n=120)

S.No.	Variables	Correlation coefficient (r)	Regression analysis			Path analysis		
			Regression coefficient	Std. error	t-value	Direct effect	Total effect	Indirect effect
1	Age (X_1)	-0.353**	-0.200	0.020	-3.749**	-0.148	-0.205	0.017(X_3)
2	Education (X_2)	0.617**	0.354	0.126	6.149**	0.358	0.259	0.119(X_{12})
3	Caste (X_3)	0.145NS	0.000	0.384	-0.007	-0.053	0.198	0.080(X_5)
4	Land holding (X_4)	0.132NS	0.082	0.062	1.490	-0.021	0.153	0.091(X_5)
5	Family income (X_5)	0.493**	-0.101	0.026	-1.764	0.234	0.259	0.102(X_{12})
6	Occupation (X_6)	0.203*	0.189	0.431	3.478**	0.096	0.107	0.077(X_5)
7	Farming experience (X_7)	0.071NS	0.078	0.026	1.122	0.113	-0.042	0.051(X_2)
8	Information seeking (X_8)	0.332**	0.091	0.100	1.716	0.101	0.231	0.077(X_2)
9	Extension contact (X_9)	0.409**	-0.080	0.064	-1.230	-0.084	0.493	0.172(X_{12})
10	Mass media exposure (X_{10})	0.273**	0.041	0.112	0.698	0.039	0.234	0.079(X_{12})
11	Achievement motivation (X_{11})	0.270**	-0.117	0.109	-1.968*	-0.071	0.341	0.128(X_{12})
12	Scientific orientation (X_{12})	0.683**	0.340	0.120	4.099**	0.309	0.374	0.195(X_{13})
13	Innovativeness (X_{13})	0.727**	0.264	0.091	2.963**	0.264	0.463	0.229(X_{12})

R^2= 0.799, Adjusted R^2=0.744 S.E.E.=1.761, F= 32.364

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; NS: Non-significant

all farmers irrespective of their caste, land holding size, and farming experience, were using them. The farming experience of the respondents neither contributes to the factor of accessing different ICT tools nor influences the capability to use the ICT tools efficiently. The results in this study that the land holding had a non-significant relationship with the usage of ICTs are supported by the study done by Dhaka & Chayal (2010); Prasad & Pradhan (2019) & Tomar et al., (2016). Likewise, occupation and annual income with the utilization of ICT tools show a positive and significant relationship. The motive would possibly be that the annual income of the farmers directly affects the economic viability, stability, and rational behavior of an individual. The usage of ICT tools increases with the increase in family income, supported by the findings of Tomar et al., (2016). Occupation was a significant relationship with the utilization of ICT tools supported by the study done by Mahajan et al., (2022). Information-seeking behavior positively correlated with the utilization of ICT tools. If the person is motivated by any means to look forward to gaining knowledge and information, his willpower, attitude, and curiosity will drive him toward seeking different information from different sources. The findings are in conformity with the findings of Tomar et al., (2016). It was observed that extension contact and mass media exposure of farmers were found conducive to the utilization of ICT tools by farmers. They receive market information and a fair price for their produce, and ICT plays an important part in this (Anand et al., 2022). Farmers, who attended a greater number of pieces of training, had more extension contact and mass media exposure and tend to use more ICT tools (Roy et al., 2018). It might be the reason why mass media exposure and extension contacts are significantly and positively associated with ICT uses. The findings are in line with the findings of Tomar et al., (2016) & Roy et al., (2018). The attributes like scientific orientation and achievement motivation were also found to be positively and significantly correlated with the utilization of ICT tools by farmers. The favorable attitude towards the scientific method of usage of ICT tools might be the reason why scientific orientation was significantly and positively associated with ICT use (Naik et al., 2020). Innovativeness is one of the major key instruments in society for economic development; especially, when it comes to agricultural innovations for increasing production and productivity through advanced technology like ICTs. The innovativeness is found to be significantly associated with the dependent variable 'utilization of ICT tools' in a positive direction (Prasad & Pradhan, 2019).

Multiple regression analysis was employed to access the combined effect of (X_1-X_{13}) independent variables in explaining the dependent variable. The coefficient of determination (R^2) of the independent variables was 0.799. It means that 79.90 per cent of the total variation in the utilization of ICT tools by the respondents was explained by the selected 13 independent variables. The value of 't' showed that utilization of ICT tools was significantly related to age, education, occupation, achievement motivation, scientific orientation, and innovativeness. As indicated by the t-test, these factors contribute to the majority of the prediction of the attitude of the respondents. The findings revealed that if one unit change in age, education, occupation, achievement motivation, scientific orientation, and innovativeness, utilization of ICT tools was changed by -0.200, 0.354, 0.189, -0.117, 0.340, and 0.264 units, respectively. The regression coefficients on the remaining 7 variables were, however, not significant. This indicates that these attributes although desirable for the utilization of ICT tools did not contribute significantly when they were considered for study in the regression analysis.

Path analysis of the dependent variable, the farmer's utilization of ICT tools (Y), wherein the total effect has been decomposed into direct, indirect, and residual effects. It has been recorded that the variable education (0.358) has exerted the highest direct effect on farmers' utilization of ICT tools (Y). It implies that the utilization of different ICT tools has got a collateral impact exerted by educational status. This is because education status is the backbone of cognitive enlargement. The person acquires their knowledge from the formal education system and that makes the individual more receptive towards sources of information like ICT tools which in turn makes the person more capable to access different ICT tools and it creates a positive attitude towards utilization of ICT tools (Panda et al., 2019). The variable scientific orientation (0.309) and innovativeness (0.264) represent the second and third ranks in terms of direct effect. The total indirect effect of extension contact (0.493) on the utilization of ICT tools by the respondents was found to be high. It might be due to the bet that extension contact exposes farmers to new areas of farming strategies with knowledge and achievement. Frequent contact with extension agencies provides the chance for gaining knowledge about agricultural innovation. This exploration and influence imposed by the extension contact enhance the ICT tools usage by the people (Naik et al., 2020). Innovativeness (0.463) and scientific orientation (0.374) occupied the second and third place in total indirect effect on the utilization of ICT tools. Further, it was observed that 6 out of 13 selected independent variables had their largest indirect effect on the utilization of ICT tools through scientific orientation. The scientific orientation has been a strong determinant in deciding the extent of utilization of ICT tools by the farmers. This is because scientific orientation leads to knowledge acquisition which in turn may lead to the adoption of new technology (Madhuri et al., 2020). The scientific orientation had an indirect effect on utilization of ICT tools through innovativeness. The residual effect being 0.201 means 20.10 per cent of the variance could not be explained by the present set of socio-economic variables (exogenous).

CONCLUSION

India's agriculture is transitioning from subsistence farming to a means of improving the quality of life and livelihoods. To accomplish this, there is a critical need for a comprehensive Knowledge Management System that integrates all available knowledge from public and private domains. In this ICT is play a crucial role in organizing and modernizing communication and information. Society's quality of life depends on its ability to apply scientific knowledge in everyday life, and this necessitates to speedy dissemination of information to agri-stakeholders. A cost-effective and strong research-extension-user system linkage is required. In addition, the farming community requires user-friendly technology that maximizes the potential of ICT gadgets. The

finding suggested that attributes such as education, occupation, scientific orientation, and innovativeness play a significant role in influencing the utilization of ICT tools among farms. It also guides policy interventions for promoting ICT adoption & innovative agricultural practices.

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