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### Examining the relationship and predictors of farmer's awareness on ICT tools in agriculture: A correlation and regression analysis

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#### Abstract

Agriculture in India holds promise for leveraging Information and Communication Technology (ICT) to propel socio-economic development in rural farming communities. Information and communication have always been crucial in agriculture, guiding timely decision-making. However, farmers, particularly smallholders in developing countries, encounter obstacles in accessing, efficiently utilizing, and affording agricultural information. In this connection, a study was conducted in Karnataka to examine the relationship and predictors of farmers' awareness on ICT tools in agriculture. In total 120 samples were considered for the study. The results reveal that, predictors like, Educational status, Information seeking behavior, Extension agency contact, Mass media exposure, Innovativeness, Possession of modern electronic gadgets, Internet usage, and Attitude towards e-media demonstrated a notable positive association with awareness at a one percent level of significance. Maximum R squared value is obtained when three independent variables *viz.*, internet usage, information seeking behaviour and Perception of mobile phone in farming were included in the model (i.e., model 3). These variables together contributed to 60.10 percent.

**Keywords:** Agriculture, ICT, relationship, predictors

#### Introduction

Agriculture in India can be viewed as a promising sector for the effective application of Information and Communication Technology (ICT), to harness the socio-economic development of India's rural farming community. Information and communication have always been vital components in agriculture for taking appropriate timely decisions. ICTs explicitly include the field of electronic communication, in addition to IT. The term IT is defined as "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. (Insha *et al.*, 2020) <sup>[2]</sup>.

Farmers face daily decisions amidst numerous risky and uncertain situations. These decisions must be made based on the information accessible to them at that moment. However, the accessibility, efficiency, and affordability of agricultural information remain significant obstacles in enhancing agricultural productivity, especially among smallholders in developing countries. (Nagesh, N.S. and Saravanan, R. 2019) <sup>[6]</sup>.

It was recorded (Manjuprakash *et al.*, 2020) <sup>[5]</sup> that, majority of the respondents faced lack of adequate skills in using ICT tools as a major constraint. More than three-fourths of the respondents faced lack of awareness about ICT tools as a

second most constraint followed by lack of trainings on usage of ICT tools. Less than half of them felt that, high cost of ICT tools as major constraint followed by high cost of internet charges were the economic factors contributing as constraints in using ICT tools and services. One-fourth of the farmers feared to use modern electronic gadgets or internet. Experiences of integration of ICTs in the agricultural institutes have been showing encouraging results and also complementing conventional communication methods (Bisht *et al.*, 2010; Kale *et al.*, 2015) <sup>[1, 3]</sup>.

Though there are number of ICT initiatives available to cater various solutions to the agricultural problems, farmers are not aware of several existing services. (Manjuprakash *et al.*, 2017) <sup>[4]</sup>. This study examines the relationship and predictors of farmers' awareness on ICT schemes and projects in Karnataka

#### Research Methodology

Koppal district in Karnataka was deliberately chosen as the focal point of this study due to its noticeable integration of Information and Communication Technology (ICT) tools into everyday communication practices. The study encompassed four blocks: Koppal, Gangavathi, Kustahi, and Yalaburga. A total of 120 respondents were selected, with 15 individuals chosen from two villages in each of the four blocks using a multi-stage random sampling technique. An

ex-post facto design was adopted to fulfill the research objectives.

To gather primary data, a pre-tested and comprehensive interview schedule was utilized. Subsequently, computer-based statistical software, particularly the Statistical Package for Social Sciences (SPSS), was employed for data analysis and interpretation. Statistical techniques including correlation analysis, multiple regression analysis, and stepwise multiple regression analysis were utilized to analyze and interpret the data.

**Correlation Analysis**

Table 1 reveals that out of the fourteen variables examined, eight showed a significant positive correlation with awareness. Specifically, factors such as Educational status

(X<sub>2</sub>), Information seeking behavior (X<sub>5</sub>), Extension agency contact (X<sub>6</sub>), Mass media exposure (X<sub>8</sub>), Innovativeness (X<sub>9</sub>), Possession of modern electronic gadgets (X<sub>11</sub>), Internet usage (X<sub>12</sub>), and Attitude towards e-media (X<sub>13</sub>) demonstrated a notable positive association with awareness at a one percent level of significance. Additionally, Computer training undergone (X<sub>10</sub>) displayed positive significance at a five percent level. Conversely, Farming experience (X<sub>4</sub>) exhibited a negative significant association with awareness at a five percent level.

On the contrary, Age (X<sub>1</sub>), Occupational status (X<sub>3</sub>), Social participation (X<sub>7</sub>), and Perception of mobile phone in farming (X<sub>14</sub>) were found to lack a significant relationship with awareness.

**Table 1:** Relationship of Independent Variables towards Awareness

(n = 120)

Variable No.	Variables	'r' value
X <sub>1</sub>	Age	-0.104
X <sub>2</sub>	Educational status	0.608**
X <sub>3</sub>	Occupational status	-0.095
X <sub>4</sub>	Farming experience	-0.199*
X <sub>5</sub>	Information seeking behavior	0.708**
X <sub>6</sub>	Extension agency contact	0.334**
X <sub>7</sub>	Social participation	0.079
X <sub>8</sub>	Mass media exposure	0.413**
X <sub>9</sub>	Innovativeness	0.304**
X <sub>10</sub>	Computer training undergone	0.200*
X <sub>11</sub>	Possession of modern electronic gadgets	0.324**
X <sub>12</sub>	Internet usage	0.722**
X <sub>13</sub>	Attitude towards e-media	0.451**
X <sub>14</sub>	Perception of mobile phone in farming	0.041

Table 1 illustrates that educational status was positively and significantly associated with awareness level. This can be attributed to over 50.00 percent of the respondents being educated, thus having a heightened awareness of the scheme and ICT-enabled services.

Conversely, occupational status exhibited a negative and significant association with awareness level. This trend stems from the majority of respondents relying on agriculture for their livelihood over an extended period. Older farmers, with considerable experience, tend to prefer traditional information sources, leading to lower awareness of ICT tools in agriculture.

Farming experience also demonstrated a negative significant association at the five percent level. This could be attributed to veteran farmers relying on traditional wisdom and interpersonal networks for information, whereas less experienced farmers exhibit a greater inclination towards seeking information from various sources, including ICT tools.

Information-seeking behavior displayed a positive significant association at the five percent level. This can be attributed to farmers' curiosity in exploring new methods to access farming-related information, leading to their engagement with modern ICT tools and services.

Likewise, extension agency contact exhibited a positive significant association at the five percent level with awareness level. Farmers with moderate to high levels of contact with extension agencies were likely informed about the availability and utility of various ICT tools, thereby

enhancing their awareness towards these technologies.

Mass media exposure has shown a positive significance with awareness. Mass media encompasses newspapers, magazines, radio, television, and the internet. Exposure to these mediums enhances farmers' awareness of ICT tools and services.

Innovativeness demonstrated a positive significance at the five percent level towards awareness. Innovativeness reflects the degree to which individuals are early adopters of innovation. Farmers with a high level of innovativeness are inclined towards novelty and experimentation, contributing to their positive association with awareness.

Possession of modern electronic gadgets also exhibited a positive significance at the five percent level. Owning modern ICT gadgets such as mobile phones, laptops, and computers encourages farmers to explore new tools and services available online and through ICT-enabled platforms.

Similarly, internet usage displayed a positive significance at the five percent level towards awareness. The internet serves as a crucial medium for accessing ICT-enabled extension services, thereby positively influencing awareness levels.

Attitude towards e-media has shown positively significant at five percent towards awareness level. Attitude is a positive or negative feeling one has, positive attitude of the farmers towards e-media might have shown the result of positive significant

**Multiple Regression Analysis**

In order to identify the relative influence of each independent variable towards awareness, multiple

regression analysis was performed and the results are presented in Table 2.

**Table 2:** Multiple Regression Analysis of Independent Variables with Awareness

Variable No.	Variables	Partial regression coefficient	Standard error	't' value
X <sub>1</sub>	Age	-0.557	0.703	-0.793
X <sub>2</sub>	Educational status	0.113	0.359	0.314
X <sub>3</sub>	Occupational status	-0.973	0.855	-1.139
X <sub>4</sub>	Farming experience	0.096	0.049	1.945
X <sub>5</sub>	Information seeking behavior	0.457	0.137	3.329
X <sub>6</sub>	Extension agency contact	-0.288	0.185	-1.552
X <sub>7</sub>	Social participation	0.238	0.328	0.724
X <sub>8</sub>	Mass media exposure	0.127	0.071	1.785
X <sub>9</sub>	Innovativeness	0.200	0.672	0.297
X <sub>10</sub>	Computer training undergone	1.556	1.335	1.165
X <sub>11</sub>	Possession of modern electronic gadgets	0.879	0.837	1.051
X <sub>12</sub>	Internet usage	6.066	1.306	4.645**
X <sub>13</sub>	Attitude towards e-media	-0.161	0.152	-1.058
X <sub>14</sub>	Perception of mobile phone in farming	-0.309	0.252	-1.229

\*\* - Significant at one percent level, R<sup>2</sup> = 0.646

\* - Significant at five percent level, F = 13.67\*\*

NS- Non-significant

It could be discerned from Table 2 that the R<sup>2</sup> value was 0.646 which indicated that 64.60 percent variation in the awareness was explained by the given fourteen independent variables and remaining 35.40 percent of the variation in dependent variables unexplained. The 'F' value was significant at one percent level probability. Thus, the cause & effect relationship between the dependent and independent variables are fitted at one percent level of significance. The fitted regression equation is given below,

$$Y_1 = 29.338 - 0.557X_1 + 0.113 X_2 - 0.973 X_3 + 0.096 X_4 + 0.457 X_5 - 0.288 X_6 + 0.238 X_7 + 0.127 X_8 + 0.200 X_9 + 1.556X_{10} + 0.879 X_{11} + 6.066**X_{12} - 0.161 X_{13} - 0.309 X_{14}.$$

From the equation it is clear that intercept Internet usage behaviour (X<sub>12</sub>) is significant at one percent level. Thus, if Internet usage (X<sub>12</sub>) increases one unit from the mean level then the awareness will increase 6.06 unit from

the mean level. The use of majority of the ICT tools requires internet. Which provide all kind of information from all over the world. This might be the reason for internet usage has positively correlated.

Stepwise analysis was carried out to eliminate the independent values whose contribution to the dependent variable was considered minimum and to select those variables to be used in the prediction equation. The results of the stepwise regression are presented in the Table 3. the results of stepwise analysis show that the maximum R squared value is obtained when three independent variables viz., internet usage (X<sub>12</sub>), information seeking behaviour (X<sub>4</sub>) and Perception of mobile phone in farming (X<sub>14</sub>) were included in the model (i.e., model 3). These variables together contributed to 60.10 percent, which shows that the contribution by the eliminated variables was only to the tune of 4.50 percent. Hence, the unstandardized B coefficients of model 3 are to be used to predict the awareness. (Table 4).

**Table 3:** Stepwise Multiple Regression Analysis of Independent Variables with Awareness

Model No.	Variables	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1.	(Constant), Internet usage (X <sub>12</sub> )	0.722(a)	0.521	0.517	3.91618
2.	(Constant), Internet usage (X <sub>12</sub> ), Information seeking behaviour (X <sub>5</sub> )	0.766(b)	0.586	0.579	3.65738
3.	(Constant), Internet usage (X <sub>12</sub> ), Information seeking behaviour (X <sub>5</sub> ), Perception of mobile phone in farming (X <sub>14</sub> )	0.776(c)	0.601	0.591	3.60481

**Table 4:** Standardised Coefficient Beta Values for Model 3

Model	Unstandardized Co-efficient B	Standardised Coefficient Beta	't' values
(Constant)	31.600		
Internet usage (X <sub>12</sub> )	5.440	0.480	5.322
Information seeking behaviour (X <sub>5</sub> ),	0.472	0.367	4.164
Perception of mobile phone in farming (X <sub>14</sub> )	-0.510	-0.128	-2.107

\*\* Significant at 0.01 percent level

\* Significant at 0.05 percent level

The standardized coefficient beta values of the independent variables in model (Table 4) indicate that a unit increase in internet usage, *ceteris paribus*, would result in increase in awareness by 5.44 units and *vice versa*.

A unit increase in Information seeking behavior *ceteris paribus*, would result in an increase of 0.472 units of awareness and *vice versa*. Respondent who have more information seeking behaviour would have the tendency to increase awareness about ICT tools.

A unit increase in perception of mobile phone in farming *ceteris paribus*, would result in a decrease in 0.51 units of awareness and *vice versa*. This might be due to the mobile based advisory services still not reached to the farmers very effectively. Through majority of them have mobile phones.

The fitted equation, therefore, is as follows:

$$Y = 31.600 + 5.44 X_{12} + 0.472 X_5 - 0.51X_{14}$$

### Conclusion

Among the 14 independent variables analyzed for ICT usage, eight variables, including Educational status, Information seeking behavior, Extension agency contact, Mass media exposure, Innovativeness, Possession of modern electronic gadgets, Internet usage, and Attitude towards e-media, exhibited a positive and significant association with awareness level at the five percent level. However, Occupational status and Farming experience showed a negative and significant association with awareness level at the same level. Notably, only Internet usage behavior demonstrated a significant association with awareness level at the one percent level. Maximum R squared value is obtained when three independent variables *viz.*, internet usage, information seeking behaviour and Perception of mobile phone in farming were included in the model (i.e., model 3). These variables together contributed to 60.10 percent.

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