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Information and Communication Technologies (ICTs) implementation

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Information and Communication Technology (ICT) is defined as a collection of technologies that aid the storage, processing, or dissemination/communication of data/ information, or both. Thus, ICT encompasses technologies that are designed to perform information processing and communication operations. The ICTs plays an important role in agricultural development and extension for a country like India. ICTs are the most natural friends for expanding the reach of the country's agricultural extension system. India is having a very big, well-educated, trained and organized agricultural extension workforce but despite this, over 60% of Indian farmers remain un-reached with no extension agency serving them. The telephone and cell phones have just recently begun to make an appearance in this scenario. In several sections of the country, Internet-enabled information *kiosks* also serve the farming community. As a result, ICTs are crucial for agricultural extension scientists, researchers, officials and organizations. Climate change is one of the most challenging concerns that humanity will confront in the coming decades. Over the next few decades, the agricultural and food systems are likely to bear the brunt of the effects of change. Several academics have noted that climate change would diminish the availability of food due to a decrease in agricultural production. A sound adaptation strategies to current and future adjustments in the climate system are required due to the change aprocess that appears to be irreversible. Expert system is an important development in IT. It is an intelligent computer programme which advise farmers, alternative to choose from a wide range of possible alternatives by processing data from a large number of variables according to certain decision rules.

The major purpose of ICTs to disseminate the message to the end user with in short period of time. The major ICTs tools are Radio, television, Mobile phone, camera, CD/VCD; and Apps are facebook, whatsapp, twister etc. All these tools and mobile apps we can use for agriculture purpose. Hence, present study was carried out to determine the utilization pattern of information and communication technologies (ICTs) by farmers.

The present study was carried out using simple random sampling technique. At first, 4 districts of Harayana, viz. Yamunanagar, Karnal, Hisar and Fatehabad were selected randomly (2015–17). Further, 2 blocks from each district, viz. Radaur and Chhachroli from Yamunanagar; Indri and Nilokheri from Karnal; Hisar I and Hisar II from Hisar and Bhattu and Fatehabad from Fatehabad were selected. From each selected block, 4 villages were selected and from each village information from 15 farmers was collected to constitute a sample size of 240 farmers in total. The information was taken in a well-designed interview schedule. Simple statistical measures like per cent, weighted mean, coefficient of correlation, multiple regression analysis etc. were worked out to analyze the collected information. Person's formula was used to calculate the correlation coefficient and multiple regression model was fitted to find out the impact of personality traits of respondents on dependent variables.

Accessibility of ICT tools among farmers and their usage: The results showed that (Table 1) the mobile use was maximum among farmers and ranked one with weighted means score of 3.57 followed by TV (1.87), FM/Radio (0.87), Internet (0.61), WhatsApp (0.49), Facebook (0.16), Computer (0.12), E-Mail (0.095), YouTube (0.091) and E-Books (0.05). CD/DVD has been least used by farmers and ranked lowest (XI) with weighted mean score of 0.01. These findings are in close confimity with those of Sharma *et al.* (2012). The data shows the level of availability and accessibility of ICT tools among the sampled farmers. It was found that the mobiles have high availability/accessibility and ranked one with all the farmers having on an average one mobile phone. Similar results have been reported by Adejo *et al.* (2009) who emphasized that the use of ICTs boosts agricultural production and the farmers with new technologies are fared better due to more access and sharing of information.

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Table 1 Frequency, accessibility and usage of ICTs tools by the farmers (n=240)

Category	Frequency							
	Very frequently (4)	Frequently (3)	Occasionally (2)	Rarely (1)	Frequency (Mean)	Weighted means frequency	Weighted means score	Rank order
Mobile	153 (612)	72 (216)	15 (30)	0 (0)	240 (1)	858	3.57	I
TV	34 (136)	95 (285)	15 (30)	0 (0)	144 (0.60)	451	1.87	II
FM Radio/Radio	26 (104)	23 (69)	16 (32)	6 (6)	71 (0.29)	211	0.87	III
Internet	6 (24)	25 (75)	21 (42)	6 (6)	58 (0.24)	147	0.61	IV
WhatsApp	5 (20)	20 (60)	17 (34)	4 (4)	46 (0.19)	118	0.49	V
Facebook	0 (0)	9 (27)	3 (6)	7 (7)	19 (0.07)	40	0.16	VI
Computer	0 (0)	5 (15)	8 (16)	0 (0)	15 (0.06)	31	0.12	VII
E-mail	0 (0)	6 (18)	0 (0)	5 (5)	13 (0.05)	23	0.095	VIII
YouTube	0 (0)	0 (0)	7 (14)	8 (8)	11 (4.58)	22	0.091	IX
E-Books	0 (0)	3 (9)	0 (0)	3 (3)	6 (0.02)	12	0.05	X
CD/DVD	0 (0)	0 (0)	0 (0)	4 (4)	4 (0.01)	4	0.01	XI

Figures in parentheses indicate weighted means score.

The results (Table 2) showed that except age all other personal variables were significantly and positively related with availability and accessibility of ICTs tools, number of ICTs tools usage by farmers and usages pattern of ICTs in farming system. Age has significantly negative relationship. Further, the regression coefficient of education, socio-economic status, extension contact, mass media exposure and risk orientation revealed that one unit increase in these variables will improve the availability/accessibility of ICTs tools to the farmers by 0.225, 0.342, 0.564, 0.327 and 0.252, respectively whereas one unit increase in age, land holdings, irrigation facilities, scientific orientation and economic

Table 2 Relationship between respondent's personal variables with availability and accessibility of ICTs tools, number of ICTs tools usage by farmers and usages pattern of ICTs in farming system

Variable	Availability and accessibility of ICTs tools		Number of ICTs tools usage		Usages pattern of ICTs in farming system	
	Correlation coefficient (r)	Regression coefficient	Correlation coefficient (r)	Regression coefficient	Correlation coefficient (r)	Regression coefficient
Age	-0.584*	-0.071* (-1.404)	-0.897*	-0.004* (-0.329)	-0.597*	-0.004* (-0.229)
Education	0.559**	0.225* (0.549)	0.903**	0.181* (1.931)	0.803**	0.181* (2.932)
Socio-economic status	0.575**	0.342 (2.237)	0.405*	0.107* (3.067)	0.305*	0.107* (2.067)
Landholding	0.036*	-0.017* (-0.171)	0.017NS	-0.018* (-0.804)	0.027NS	-0.018* (-0.714)
Irrigation facilities	0.070NS	-0.117* (-0.665)	0.141NS	-0.068* (-1.690)	0.242NS	-0.068* (-1.430)
Extension contacts	0.601**	0.564** (2.401)	0.929**	0.256** (4.785)	0.902**	0.256** (4.381)
Mass media exposure	0.581**	0.327* (1.030)	0.926**	0.230** (3.183)	0.916**	0.230** (2.181)
Scientific orientation	0.532**	-0.198* (1.227)	0.403*	0.074* (2.004)	0.413*	0.074* (1.012)
Economic motivation	0.536**	-0.759** (2.827)	0.905**	0.090* (1.470)	0.955**	0.090* (1.372)
Risk orientation	0.571**	0.252* (1.376)	0.316*	0.150* (0.590)	0.311*	0.150* (0.391)
R^2	0.4044		0.9030		0.8012	

*Significant at 5% level of significance; ** Significant at 1% level of significance. Figures in parenthesis are the respective t-values.

motivation will significantly decrease the availability/ accessibility of ICTs tools to the farmers by 0.071, 0.017, 0.117, 0.198 and 0.252 units, respectively. Similar results have been reported by Osondu *et al.* (2015) who revealed that ICT education should be built for extension agents so that the wasteful travel can be avoided and information can be provided to farmers with help of mobile phones (Wyche and Steinfield 2015). Similarly, regression coefficient of education, socio-economic status, extension contact, mass media exposure, scientific orientation, economic motivation, and risk orientation revealed that one unit increase in these variables would increase the number of ICTs tools usage by 1.931, 3.067, 4.785, 3.183, 2.004, 1.470 and 0.590 units, respectively whereas age (0.329), land holding (0.804) and irrigation facilities (1.690) has significantly negative regression coeffieicint. Similar findings were also reported by Meera *et al.* (2004), Dhaka *et al.* (2010), Singh *et al.* (2015a), Yimer (2015) and Singh *et al.* (2015b).

Further, the impact of education, socio-economic status, extension contact, mass media exposure, scientific orientation, economic motivation and risk orientation was significantly positive with usages pattern of ICTs in farming system having regression coefficients of 0.181, 0.107, 0.256, 0.230, 0.074, 0.090 and 0.150, respectively whereas age (0.229), land holding (0.714) and irrigation facilities (1.430) were significantly negative. Similar findings were reported by Meera *et al.* (2004) and Dhaka *et al.* (2010).

SUMMARY

The availability and per cent frequency usage of mobiles among the sampled farmers was found to be high in the study area. High the use of ICTs boosts agricultural production and the farmers with new technologies are fared better due to more access and sharing of information. The relationship between education, socio-economic status, extension contact, mass media exposure, scientific orientation, economic motivation and risk orientation was significantly positive with availability/accessibility, number of ICTs tool usage and usage pattern of ICTs by the farmers, whereas relationship of age was found to be negative. Similarly, the regression coefficient showed the impact of age, land holding and irrigation facilities with availability/ accessibility, number of ICTs tool usage and usage pattern of ICTs by the farmers is negative whereas education, socio-economic status, extension contacts, mass media exposure, scientific orientation, economic motivation and risk orientation positively affect availability/accessibility, number of ICTs tool usage and ICTs' usage pattern by the farmers in the study area. All other personal variables were significantly and positively related with availability and accessibility of ICTs tools, number of ICTs tools usage by farmers and usages pattern of ICTs in farming system. Regression coefficient of education, socio-economic status, extension contact, mass media exposure, scientific orientation, economic motivation, and risk orientation revealed that one unit increase in these variables would increase the number of ICTs tools usage by the farmers respectively whereas age land holding and irrigation facilities has significantly negative regression coeffieicint

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