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Factors encouraging ICT usage by agricultural extension scientists in North India

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The role of Information and Communication Technology (ICT) in the research institutions and universities is becoming increasingly prominent because of the potential value of such technologies. ICTs can be used to increase effectiveness and efficiency of extension system. So, in this era of information revolution, the agricultural extension Scientists should be encouraged to use ICTs for extension education. Therefore, the study on "Factors encouraging ICT usage by Agricultural Extension Scientists in North India" was conducted. Factors encouraging ICT usage were categorized under the headings of economic factors, facilitating factors, social and psychological factors and technical factors. Data for the study were collected from the agricultural extension scientists who work in State Agricultural Universities and research institutes under Indian Council of Agricultural Research (ICAR) in North India through the use of a pre-tested on-line questionnaire. Provision of grants to buy ICTs, availability of sufficient number of ICT tools, sufficient ICT familiarity and expertise and in-service training facilitation for using/producing ICTs were observed as serious factors in the effective usage of ICTs. The Duncan's Multiple Range Test (DMRT) result showed that in usage of ICT there was a significant difference between economic factors with facilitating factors and social and psychological factors. Enabling policies and plans for usage of ICTs for dissemination of agricultural information need to be developed.

Key words: Information, communication, technology, usage, agricultural extension scientist.

INTRODUCTION

Information and Communication Technology (ICT) has pervaded all walks of modern life and society so profoundly that the modern society is colloquially known as information society and has revolutionized the development process itself by influencing its manifold dimensions be it economic, social, political, cultural, environmental, ethical, behavioral, etc. (Kumar et al., 2010). In today's world, professionals with little or no knowledge of ICT have a much more difficult task before them in comparison to co-workers at the same level but with a reasonable knowledge of ICT (Madadi et al., 2011). ICT has an important role in connecting research, extension and the market toward expanding the professional and entrepreneurship abilities, capacities among the experts and the agricultural communities (Arkhi et al., 2008). To make farm information and

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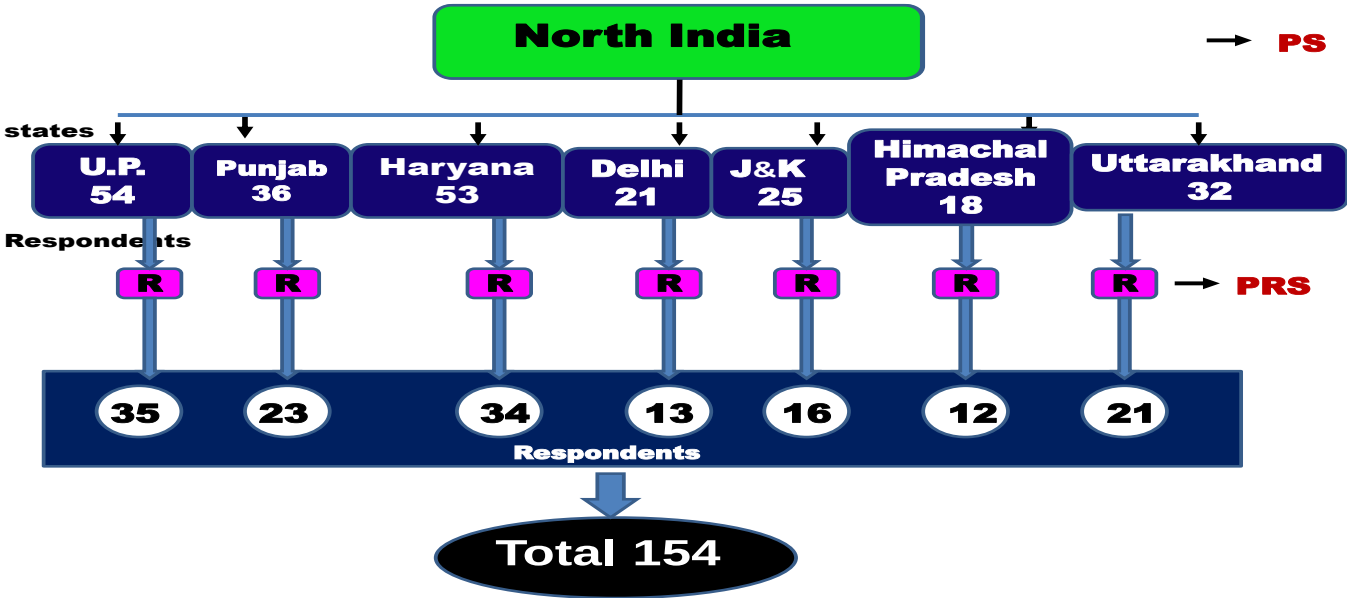

Figure 1. Sampling plan.

technology transfer more effective, greater use will need to be made of modern ICT among researchers, extension personnel, farmers and other stakeholders (Saravanan, 2010).

Asemi (2005) did a case study of Medical sciences University of Isfahan (MUI), Iran. The results of the study showed that all the respondents used the internet frequently because all faculties had an internet connection. Baldwin and Sabourin (2001) found that there was a positive relationship between ICT use and superior performance by Canadian manufacturing sector. A study conducted by Drueckhammer et al. (1986) found a large majority of agricultural education teachers in Louisiana who had computers failed to use them. One reason was a lack of training and another reason was computer anxiety. Martin (1998) has studied computer anxiety levels of Virginia cooperative extension field personnel. He found that computer experiences were associated with self-efficacy. A person with a high self-efficacy level will be less anxious working with computers than a person with a low level. Mashhadi et al. (2007) concluded in his research that a meaningful relationship exists between ages, work experience, computer and the internet related skills, and peoples' perspective towards ICT with the amount of usage of ICT. Yaghoobi and Chizari (2005) found in their research that the usage of ICT was directly related to factors such as age, gender, computer literacy, specialization, knowledge of and access to the internet, their perspective of the internet, and the level of relationship with coworkers. According to Zhang (2005), the efficient usage of the internet was proportional to age, gender, and amount of education. Baliram (2009) concluded that younger scientists having more expertise and high use of ICT than old and middle age group scientists. Wema (2010) concluded that most livestock researchers were not aware of most of the e-resources available hence they could not access and use them effectively in their research work.

MATERIALS AND METHODS

The National Agricultural Research System (NARS) in India comprises essentially two main streams, *viz.* the Indian Council of Agricultural Research (ICAR) at the national level and the State Agricultural Universities (SAUs) at the state level. In India, there are 65 state agricultural universities and 99 research institutes under ICAR (47 Institutions, 4 Deemed Universities, 17 National Research Centers, 6 National Bureaus and 25 Directorates). The study included all agricultural extension scientists working in state agricultural universities and research institutes under ICAR (Institutions, Deemed Universities, National Research Centers, National Bureaus and Directorates) in North India. North India comprises of seven states: Uttar Pradesh, Haryana Uttrakhand, Himachal Pradesh, Jammu, Kashmir, Punjab and New Delhi and the number of agricultural extension scientists in State Agricultural Universities and ICAR institutes in each state respectively are 54, 53, 32, 18, 25, 36 and 21 (Figure 1).

A complete list of agricultural extension scientists who work in State Agricultural Universities and Research Institutes under ICAR (institutions, deemed universities, national research centers, national bureaus and directorates) in North India was prepared. Scientists in this study are those who have positions of Assistant Professor, Associated Professor and Professor in universities and who have positions of Scientist, Senior Scientist and Principal Scientist in institutions. Information about number of agricultural extension scientists in State Agricultural Universities and ICAR institutes in each state was gathered through relevant websites and confirmed from the respective offices of the university/institute through telephonic conversation. Respondents were selected from the population by using Proportionate Random Sampling (PRS)

Table 1. Distribution of respondents based on their perception about economic factors encouraging ICT usage (n = 154).

S/No	Items	Most important	Important	Less important	Not important	Mean score	Rank
1	Provision of grants to buy ICTs	96(62.4)	51(33.1)	7(4.5)	0	3.58	I
2	Financial inputs for training on ICT production and usage	97(63.0)	49(31.8)	8(5.2)	0	3.57	II
3	Economic support for software purchases	87(56.6)	59(38.3)	7(4.5)	1(0.6)	3.51	III
4	Availability of exclusive budget for ICT projects	86(55.9)	59(38.3)	6(3.9)	3(1.9)	3.48	IV

Figures in parenthesis indicate percentage.

Table 2. Classification of respondents based on their perception about economic factors encouraging ICT usage (n = 154).

Category	Frequency	Percentage
Low (<11)	9	5.85
Medium (11-13)	44	28.57
High (>13)	101	65.58

method. For the study, 154 respondents were selected by Proportionate Random Sampling method. Primary data were elicited using a well-structured questionnaire. Factors encouraging ICT usage were categorized under the headings of economic factors, facilitating factors, social and psychological factors and technical factors. Factors were assessed by using a four point continuum *viz.*, Most Important, Important, Less Important and Not Important with the weightage of 4, 3, 2 and 1, respectively. Total score with respect to this variable for a respondent was the sum of the scores obtained by him/her on three factors and the respondents were classified into three groups as low, medium and high based on cumulative square root frequency method. The mean score for a particular item was worked out by dividing the weighted score of the item with the total number of respondents. To compare differences of the factors, data were analyzed by ANOVA, and then Duncan's multiple range test was used to determine the difference between means ($P < 0.05$). Data were analyzed with a statistical software program (SPSS 11.5, 2004).

RESULTS AND DISCUSSION

Factors encouraging ICT usage

Economic factors

An attempt was made to know the economic factors encouraging ICT usage. According to Table 1, among economic factors, provision of grants to buy ICTs, with 3.58 MS, obtained first rank as it was perceived most important by 62.3% of respondents. Financial inputs for training on ICT production and usage was on second rank with 3.57 MS, whereas, economic support for software purchases obtained third rank with 3.51 MS. The fourth rank was occupied by availability of exclusive budget for ICT projects, with 3.48 MS. According to the results of Karimi et al. (2011), among economic factors given loans or grants to buy ICT equipments was the most important factor encouraging educators to use ICTs. Table 2 revealed that majority of the respondents belonged to high category (65.58%) followed by 28.57% and 5.85% who belonged to medium and low category, respectively based on economic factors encouraging ICT usage.

Facilitating factors

According to Table 3, among facilitating factors, availability of sufficient number of ICT tools, with 3.43 MS, was on first rank. Investments of the institution/ university on infrastructure for ICTs got second rank, with 3.41 MS. Whereas, availability of software on third rank with 3.40 MS. 'Developing the policies and plans for usage of ICTs for dissemination of agricultural information', with 3.34 MS, obtained the fourth rank. Hyesung (2004) showed that facilitating conditions had a significant direct effect on the intention to use information technology. Karimi et al. (2011) among facilities variables, availability of computer and Internet was the most important factor influencing educators to use ICTs, and good light and temperature of computer center was the least important factor. They showed that when computer and Internet connection is provided and handy, individuals feel more comfortable to use them.

Table 4 revealed that majority of the respondents were in high category (52.60%) followed by 38.31% and 9.09% who belonged to medium and low category, respectively.

Table 3. Distribution of respondents based on their perception about facilitating factors encouraging ICT usage (n = 154).

S/N	Items	Most important	Important	Less important	Not important	Mean	Rank
1	Availability of sufficient number of ICT tools	84(54.5)	57(37.0)	9(5.8)	4(2.6)	3.43	I
2	Investments of the institution/ university on infrastructure for ICTs	78(50.6)	64(41.5)	10(6.5)	2(1.3)	3.41	II
3	Availability of software	74(48.1)	68(44.2)	11(7.1)	1(0.6)	3.40	III
4	Developing the policies and plans for usage of ICTs for dissemination of agricultural information	69(44.8)	69(44.8)	15(9.7)	1(0.6)	3.34	IV

Figures in parenthesis indicate percentage.

Table 4. Classification of respondents based on their perception about facilitating factors encouraging ICT usage (n = 154).

Category	Frequency	Percentage
Low (<11)	14	9.09
Medium (11-13)	59	38.31
High (>13)	81	52.60

Table 5. Distribution of respondents based on their perception about social and psychological factors encouraging ICT usage (n = 154).

S/N	Items	Most important	Important	Less important	Not important	Mean	Rank
1	Sufficient ICT familiarity and expertise	93 (60.4)	51 (33.2)	9 (5.8)	1 (0.6)	3.53	I
2	ICT improves self-efficacy	77 (50.0)	69 (44.8)	8 (5.2)	0	3.45	II
3	Feeling the need to use a technology	73 (47.5)	67 (43.5)	13 (8.4)	1 (0.6)	3.38	III
4	Rewarding the ICT usage efforts of scientists in research, teaching and extension activities	72 (46.8)	63 (40.9)	13 (8.4)	6 (3.9)	3.30	IV

Figures in parenthesis indicate percentage.

Social and psychological factors

According to Table 5, among social and psychological factors, sufficient ICT familiarity and expertise, with 3.53 MS, was on first rank. ICTs contribution in improving self-efficacy with 3.45 MS was on second rank. The third rank was occupied by 'Feeling the need to use a technology', with 3.38 MS. 'Rewarding the ICT usage efforts of scientists in research, teaching and extension activities', with 3.30 MS was on fourth rank. The result in Table 5 revealed that though sufficient ICT familiarity and expertise ranked first among the social and psychological factors encouraging ICT usage among the respondents, the other factors such as its contribution towards self-efficacy, feeling the need to use the technology and appropriate rewards for ICT usage also were found almost equally important factors encouraging ICT usage. Hence, policy makers and administrators have to pay special attention to all the above four factors to encourage ICT usage. According to Hyesung (2004), computer self-efficacy had a significant direct effect on the intention to use information technology.

Table 6 revealed that majority of the respondents were in medium category (51.95%) followed by 38.31% and 9.74% who belonged to high and low category, respectively.

Technical factors

A close look at Table 7 indicates that in-service training facilitation for using/producing ICTs was on first rank and it was perceived by 90 scientists as most important technical factor, only one scientist perceived it as not important. On the second rank, access to a specialized person who can solve technical difficulties faced in institute/ university' was perceived as most important technical factor by 57.8% scientists, followed by

Table 6. Classification of respondents based on their perception about social and psychological factors encouraging ICT usage (n = 154).

Category	Frequency	Percentage
Low (<12)	15	9.74
Medium (12-14)	80	51.95
High (>14)	59	38.31

Table 7. Distribution of respondents based on their perception about technical factors encouraging ICT usage (n = 154).

S/N	Items	Most important	Important	Less important	Not important	Mean	Rank
1	Sufficient ICT familiarity and expertise	90 (58.4)	60 (39.0)	3 (1.9)	1 (0.6)	3.55	I
2	ICT improves self-efficacy	89 (57.8)	52 (33.8)	12 (7.8)	1 (0.6)	3.49	II
3	Feeling the need to use a technology	77 (50.0)	69 (44.9)	7 (4.5)	1 (0.6)	3.44	III
4	Rewarding the ICT usage efforts of scientists in research, teaching and extension activities	77 (50.0)	65 (42.2)	9 (5.8)	3 (1.9)	3.40	IV

Figures in parenthesis indicate percentage.

Table 8. Classification of respondents based on their perception about facilitating factors encouraging ICT usage (n = 154).

Category	Frequency	Percentage
Low (<11)	5	3.25
Medium (11-13)	53	34.41
High (>13)	96	62.34

Table 9. Duncan's Multiple Range Test (DMRT) to compare differences of factors encouraging ICT usage.

Factors encouraging ICT usage	Mean±SEM	Critical difference
Economic factors	14.14±0.16[a]	0.44
Facilitating factors	13.56±0.16[b]	
Social and Psychological factors	13.66±0.15 [b]	
Technical factors	13.87±0.15[ab]	

[a,b] different words with in colons for each of A, B, C and D factors show significant difference at the level of $P < 0.05$.

important (33.8%), less important (7.8%) and only one scientist perceived it as not important. Investments of the institution/university on the support services of ICTs, was on third rank with 3.44 MS. The fourth rank was occupied by provision of supportive services to facilitate ICT usage with 3.40 MS. These findings clearly indicate the need to organize specialized training programs for AESs for production of ICTs, enhanced budget allotments for ICT, and provision of supportive services as well as technical help to AESs who are interested in production of ICTs. This result was in conformity with Karimi et al. (2011) who showed that among technical factors encouraging ICT usage, access to a specialized person who can solve technical difficulties when facing, got second rank by vocational agricultural educators in Iran.

Table 8 revealed that majority of the respondents were belonging to high category (62.34%) followed by medium (34.41%) and low (3.25%) categories, respectively. Table 9 shows that economic factors have a significant effect ($p < 0.05$) on encouraging ICT usage in comparison to faci-

lities factors and social and psychological factors. However, there is no significant difference between economic factors and technical factors. Hence, care has to be taken to ensure availability of ICT tools in institutes/universities along with latest softwares. Apart from developing infrastructure for ICTs, attention has to be given on formulation of policies and plans for usage of ICTs for dissemination of information.

Conclusion

Provision of grants to buy ICTs, availability of sufficient number of ICT tools, sufficient ICT familiarity and expertise and in-service training facilitation for using/producing ICTs were observed as serious factors in the effective usage of ICTs by Agricultural Extension Scientists which needs attention of planners and policy makers in Agricultural extension.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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