

RESEARCH PAPER

Extent of utilization of ICT tools by scientists and extension professionals of research and extension system

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Abstract: The study was conducted in Karnataka and Kerala states in India during the year 2016-18 to assess the utilization of ICT tools by personnel of research and extension system. Among ICT tools, internet and smart phone was found to have cent per cent utilization by scientists of ICAR institute, SAU, KVK and SDA. Use of personal computer was found to be high in SAU (100.00 %) followed by KVK (98.33 %), ICAR institute (96.67 %) and SDA (93.33 %). Storage devices also found to have higher utilization among personnel of ICAR institute (95.00 %) followed by SAU and KVK (91.67 % each) and SDA (88.33 %). Utilization of LCD projector was found to be higher for SAU teachers (80.00 %) followed by KVK professionals (68.33 %) and ICAR scientists (63.33 %), while none of the officials of SDA used projector. Scientists of ICAR institute found to have higher utilization of ICTs followed by scientists of KVK, scientists or teachers of SAU, whereas utilization of ICTs was lower by officials of SDA. Major purpose of utilization of computer or laptop by personnel of SAU (97.67 %), ICAR institutes (96.33 %), KVK (96.00 %) and SDA (95.67 %) was word processing. Foremost purpose of utilization of internet was information access in case of scientists or officials of SAU (100.00 %), ICAR institute (96.67 %), SDA (95.56 %) and KVK (91.67 %). Utilization indices of smartphone or mobile phone for purpose of information access was found to be 91.00 per cent for KVK personnel followed by 81.00 per cent for SAU teachers or scientists, while it was 69.00 and 65.00 per cent, respectively for SDA officials and ICAR scientists.

Key words: Internet, Personal computer, Smart phone, Utilization index

Introduction

India with over 480 million internet users and more than 450 million connected smart phone users form the second most social networking site users, it has enormous opportunity to cultivate and tap the potential of Information and Communication Technology in the field of agriculture. There is an increasing realisation that initiatives like Digital India, the flagship programme launched on July 1, 2015 has a foremost role to play in shaping India.

Mugwisi *et al.* (2015) showed that any information and communication technology (ICT) intervention that improves the livelihoods of poor rural families is likely to have a significant impact (direct and indirect) on enhancing agricultural production, marketing and post-harvest activities. Government of India has implemented National Mission on Agricultural Extension and Technology (NMAET) during twelfth five year plan under which Sub Mission on Agricultural Extension (SMAE) is being initiated with an objective to strengthen and restructure the agricultural extension mechanism. The strategy of SMAE is a judicious mix of outreach of extension man power, quality enhancement of services through experts and capacity building, Public Private Partnership (PPP), farmer groups or associations, interactive information dissemination through innovative and pervasive use of ICT or mass media and also convergence of extension programmes or schemes of central and state government. Strengthening and expansion of ongoing extension and Information Technology schemes is the prime focus of SMAE.

With focus on delivering agricultural information and technologies through digital platform, there is a prospect to

access sources of information through a global platform, providing accessibility to all actors of Agricultural Knowledge and Information System. Chhachhar *et al.* (2014) reviewed that using of information and communication technologies in different countries it was found positive results in agriculture development. There is a need to develop a targeted approach to improving agriculture and allied sectors through digitization. Agricultural research and extension system play pivotal role in technology generation and transfer. The developments in ICT have great ability to make the process speedy and accurate. It is important to know the extent of utilization of ICTs by scientist and extension personnel to identify gaps and develop strategies. Hence better to study the extent of utilization of ICT tools by scientists and extension personnel in research and extension system.

Methodology

The study was conducted in Karnataka and Kerala states in India during the year 2016-18. The study considered four important stakeholders of agriculture namely research system which encompasses Indian Council of Agricultural Research (ICAR) institute and State Agricultural University (SAU); extension system which includes Krishi Vigyan Kendra (KVK) and State Department of Agriculture (SDA). A sample of 30 each from ICAR Institute, State Agricultural University (SAU), Krishi Vigyan Kendra (KVK) and State Department of Agriculture (SDA) were chosen by simple random procedure, forming a total of 120.

Eleven ICT tools for data / information management namely, personal computer, laptop or notebook, tablet, storage devices,

scanner, printer, photocopier, video camera, digital camera, internet and information kiosk and nine ICT tools for communication such as telephone, smart phone, radio, television, teleconferencing facilities, video conferencing facilities, fax, LCD projector and interactive white board were selected to study the utilization of ICT tools by professionals of research and extension system. Utilization of these ICT tools was measured on a three point continuum viz. regularly, occasionally and never with respective scoring of 2, 1 and 0. Maximum and minimum scores were 42 and 0, respectively. Purpose of utilization of computer, internet and smart phone/mobile phone was also studied with maximum and minimum scores of 28 and 0 respectively.

Utilization Index (UI) for each ICT tool was calculated using the following formula.

$$\text{Utilization Index (UI)} = \frac{\text{Actual score}}{\text{Maximum possible score}} \times 100$$

Actual score = $F_r \times 2 + F_o \times 1 + F_n \times 0$

Where,

F_r = Frequency of personnel used ICT tool regularly

F_o = Frequency of personnel used ICT tool occasionally

F_n = Frequency of personnel used ICT tool never

Maximum possible score = Total number of personnel \times 2 = $30 \times 2 = 60$

Results and discussion

The data on extent of utilization of ICT tools by the stakeholders of research and extension system is presented in Table 1 showed that among ICT tools for data management,

internet was used by all scientists of ICAR institute, SAU, KVK and SDA. Research and extension demands search of new information. Hence use of internet serves their purposes of retrieval of information related to research, teaching and training materials etc. for the ease of their jobs. Use of personal computer was found to be high in SAU (100.00 %) followed by KVK (98.33 %), ICAR institute (96.67 %) and SDA (93.33 %). Raksha *et al.* (2015) in their study on e-readiness in agricultural extension system revealed that majority of the extension personnel were able to use computers or laptops without any other's assistance (76.67 %) followed by internet use (70.00 %). Storage devices also found to have higher utilization among personnel of ICAR institute (95.00 %) followed by SAU and KVK (91.67 % each) and SDA (88.33 %). Personal computer, internet and storage devices were the most frequently used ICT tools by scientists, teachers and extension professionals as their job demands it. Ragul *et al.* (2016) observed that majority of extension personnel utilized computer (80.00 %) and internet (63.00 %) very frequently. Deora and Gupta (2014) also showed that subject matter specialists of KVKs were frequently used ICT tools like computer and internet.

Utilization indices of printer was found to be 93.33 per cent for personnel of ICAR institute, 91.67 per cent for SAU while it was 88.33 per cent each in case of extension personnel of KVK and SDA. Use of photocopier was found to be fair in case of ICAR institute (88.33 %) followed by KVK (81.67 %) and SAU (71.67 %) whereas it was comparatively low among officials of SDA (40.00 %), which might be due to the unavailability at institutional level. Use of laptop or note book was almost eighty per cent for personnel of ICAR institute (83.33 %) and KVK

Table 1. Extent of utilization of ICT tools by personnel of research and extension system n=90

Sl. No.	ICT Tools	Research and Extension System Institutions			
		ICAR Institute (n ₁ =30)	State Agricultural University (n ₂ =30)	Krishi Vigyan Kendra (n ₃ =30)	State Department of Agriculture (n ₄ =30)
		Utilization Index (%)	Utilization Index (%)	Utilization Index (%)	Utilization Index (%)
Data Management tools					
1	Personal Computer	96.67	100.00	98.33	93.33
2	Laptop/ Notebook	83.33	63.33	80.00	66.67
3	Tablet	23.33	16.67	10.00	0.00
4	Storage devices	95.00	91.67	91.67	88.33
5	Scanner	78.33	65.00	65.00	63.33
6	Printer	93.33	91.67	88.33	88.33
7	Photocopier	88.33	71.67	81.67	40.00
8	Video camera	40.00	31.67	26.67	0.00
9	Digital Camera	73.33	58.33	65.00	58.33
10	Internet	100.00	100.00	100.00	100.00
11	Information Kiosk	13.33	11.67	60.00	0.00
Communication tools					
1	Telephone	91.67	95.00	81.67	95.00
2	Smart phone	100.00	100.00	100.00	100.00
3	Radio	61.67	23.33	38.33	60.00
4	Television	71.67	81.67	81.67	91.67
5	Teleconferencing	43.33	21.67	30.00	0.00
6	Video conferencing	48.33	26.67	26.67	0.00
7	Fax	53.33	33.33	41.67	45.00
8	LCD Projector	63.33	80.00	68.33	0.00
9	Interactive white board	0.00	20.00	20.00	0.00

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(80.00 %), while it was 66.67 per cent and 63.33 per cent in case of officials of SDA and scientists or teachers of SAU, respectively. Utilization of scanner was fair for scientists of ICAR institute (78.33 %), while it was more than sixty per cent in case of personnel of SAU and KVK (65.00 % each) and officials of SDA (63.33 %). Higher utilization of these ICT tools depended on official work of scientists or their research, extension and training or teaching requirements and availability and accessibility to them. Digital camera utilization was found to be high for personnel of ICAR institute (73.33 %) followed by KVK (65.00 %), whereas SAU scientists and SDA officials showed 58.33 per cent utilization index for digital camera. Considerable utilization of kiosks (60.00 %) was found for KVK specialists because of availability of infrastructure at institutional level, while use of kiosks was found to be very low in case of scientists of ICAR institute (13.33 %) and SAU (11.67 %).

Utilization indices of video camera among personnel of ICAR institute (40.00 %), SAU (31.67 %) and KVK (26.67 %) was found to be low. Utilization indices of tablet in case of research and extension personnel was found to be very low *i.e.* 23.33 per cent, 16.67 per cent and 10.00 per cent, respectively for ICAR institute, SAU and KVK. Unavailability at institutional or individual level and low requirement for job might be the reason for lesser utilization of these ICT tools among researchers and extension personnel in ICAR institute, SAU and KVK. None of the officials of SDA used information kiosks, video camera and tablet which might be due to unavailability at institution, lack of interest to use these or these devices may not require frequently to fulfill job related aspects of officials unlike computer and internet. Lack of time to use these ICT tools more frequently due to field oriented job responsibilities might be the reason for slightly less utilization of ICT tools by officials of SDA as compared to personnel of ICAR institute, SAU and KVK.

Smaranika (2010) assessed the utilization of ICT tools by staff of UAS Dharwad and reported high extent of utilization of ICT tools by staff of university. Among ICT tools internet was found to have higher usage by university teachers. Raksha (2014) also reported that personnel of agricultural extension system widely utilized computer and internet.

Data on utilization of ICT tools for communication by researchers and extension system revealed that all scientists or extension personnel of ICAR institute, SAU, KVK and SDA utilized smart phone. Telephone had utilization index of 95.00 per cent in case of teachers of SAU and officials of SDA, while it was 91.67 per cent and 81.67 per cent for ICAR scientists and KVK personnel, respectively. This can be attributed to possession of smartphone and availability of telephone at individual or institutional level. The findings are in confirmation with study results of Samansiri and Wanigasundera (2014) who reported that all extension officers owned mobile phones while, 95.00 per cent had the access to fixed telephones. Ragul *et al.* (2016) also revealed that majority of extension personnel utilized mobile phone (90.00 %) very frequently and also telephone and mobile phones were used by almost 80.00 per cent of extension workers for sharing information with other organization and input agencies.

Utilization indices of television was found to be high for officials of SDA (91.67 %) followed by personnel of SAU and KVK (81.67 % each) and scientists of ICAR institute (71.67 %). Utilization of LCD projector was found to be higher for SAU teachers (80.00 %) followed by KVK professionals (68.33 %) and ICAR scientists (63.33 %), while none of the officials of SDA used projector. Teaching in most of SAUs takes place in classrooms where they use LCD projectors regularly and scientists of KVK used projector for extension and training activities, while unavailability of the LCD projector at organizational level was the reason for zero utilization of it by officials of SDA. Utilization of radio was found to be almost sixty per cent by ICAR scientists (61.67 %) and SDA officials (60.00 %), whereas it was 38.33 per cent and 23.33 per cent by KVK professionals and SAU teachers, respectively. Utilization indices for fax were 53.33, 45.00, 41.67 and 33.33 per cent for personnel of ICAR institute, SDA, KVK and SAU, respectively. Deora and Gupta (2014) also revealed that subject matter specialists of KVKs were frequently used ICT tools like mobile phone and e-mail for communication.

Further, utilization of video conferencing facilities and teleconferencing facilities were 48.33 and 43.33 per cent, respectively for ICAR scientists. Lack of infrastructure and network problems resulted in lower use of these technologies. Alternatively scientists might be using their mobile or video talk. Lack of infrastructure and less accessibility or non-requirement might be the reason for the less utilization of video conferencing (26.67 %) and teleconferencing (21.67 %) by scientists or teachers of SAU. Virtual classes or distance learning are not in practice. Hence video conferencing was not utilized. Moreover, video conferencing and teleconferencing can be used by organizing inter-campus and inter university discussion sessions, which would help students to share their knowledge and insights with each other.

Teleconferencing (30.00 %) and video conferencing (26.67 %) utilization was low among communication tools by extension personnel of KVK, while utilization of these technologies was zero by officials of SDA. This may be due to the fact that extension personnel are devoting much of the time for input distribution and educational activities. There is need to encourage extension workers to make use of ICT devices for efficient connection to farmers. Utilization of interactive white board was 20.00 per cent for SAU scientists followed by 15.00 per cent for KVK personnel, whereas none of ICAR scientists and SDA officials used interactive board. Ragul *et al.* (2016) in a study on utility pattern of ICT tools for transfer of technology revealed that video conferencing was used by only one fifth of extension personnel to train their subordinate staff.

The results of the investigation are in confirmation with the research findings of Salau and Saingbe (2008) who explored seventy to ninety per cent utilization of ICT facilities for agricultural communication by the researchers and extension workers. The reason of gap in utilization of ICT tools like kiosks, video camera, teleconferencing and video conferencing, interactive boards, tablets etc. may be due to unavailability of the infrastructure at organizational level, lack of time to use,

lack of skills required to use these technologies and lack of promotion of the latest ICTs tools in working condition. So, the focus should be given on the inadequate facilities which are inhibiting the use of the ICT tools.

ICT utilization as indicated in Table 2 showed that difference in utilization of ICT tools by staff of ICAR institute, SAU, KVK and SDA belonged to research and extension system was significant. Scientists of ICAR institute found to have higher utilization of ICTs followed by scientists of KVK, scientists or teachers of SAU, whereas utilization of ICTs was lower by officials of SDA.

Utilization of ICT tools for data management and communication was found to be comparatively low in SDA as weighed against ICAR institute, SAU and KVK among stakeholders under research and extension system. This may be due to lower ICT infrastructure in SDA in comparison to other stakeholders of research and extension system. The results are in line with findings of Raksha (2014) who showed lacuna in ICT infrastructure in SDA compared to organizations of Research and Development. The Department of Agriculture has responsibility of providing extension service to farmer. The ratio of extension worker to farmers has increased over a period of time. On an average one public extensionist caters 1200 farmers (Sulaiman, 2015).

Data in Table 3 depict the purpose wise utilization of major ICT tools by stakeholders in research and extension system.

Major purpose of utilization of computer or laptop by personnel of SAU (97.67 %), ICAR institutes (96.33 %), KVK (96.00 %) and SDA (95.67 %) was word processing. Computer or laptop was used for presentations by scientists of ICAR institute (87.78 %), SAU (85.56 %) and KVK (66.67 %), while 85.00, 72.78 and 71.67 per cent of ICAR scientists, KVK personnel and SAU teachers, respectively used it for data analysis. Department officials had extension and training activities which is mainly field oriented and none of them involved in research and teaching. This might be reason for negligible use of computer for data analysis (26.67 %) or presentation (12.22 %) purpose unlike scientists of ICAR institute, SAU and KVK who involved in research, extension and teaching job.

Foremost purpose of utilization of internet was information access in case of scientists or officials of SAU (100.00 %), ICAR institute (96.67 %), SDA (95.56 %) and KVK (91.67 %). Seventy to eighty per cent use of internet for research purpose was expressed by scientist of ICAR institute (80.83 %), SAU (73.75 %) and KVK (70.00 %). Internet was utilized for social media or entertainment by 72.22 per cent of SAU teachers, 66.67 per cent of extension personnel of KVK and 60.56 per cent of ICAR scientists. Considerable numbers of personnel of ICAR institute (61.25 %), SAU (55.83 %) and KVK (40.00 %) used internet for online services. Utilization indices of internet for purpose of correspondence or sharing were found to be 68.33, 61.67 and 52.50 per cent for personnel of ICAR institute, SAU and KVK, respectively. Use of internet for purposes such

Table 2. ANOVA of ICT utilization by personnel of research and extension system

Research and Extension System	Mean score of Utilization	f value	SEM	CD value
ICAR Institutes	26.83	10.72*	0.15	0.43
State Agricultural University	24.03			
Krishi Vigyan Kendra	25.40			
State Department of Agriculture	20.37			

* Significant at 5 per cent level

Table 3. Purpose wise utilization of major ICT tools by personnel of research and extension system

Sl. No.	Purpose of utilization	Utilization index (%)			
		ICAR institute (n ₁ =30)	SAU (n ₂ =30)	KVK (n ₃ =30)	SDA (n ₄ =30)
Computer/Laptop					
1	Word processing	96.33	97.67	96.00	95.67
2	Data analysis	85.00	71.67	72.78	26.67
3	Presentations	87.78	85.56	66.67	12.22
4	Entertainment	36.67	45.00	40.83	38.33
Internet					
1	Information access	96.67	100.00	91.67	95.56
2	Research purpose	80.83	73.75	70.00	16.25
3	Correspondence/ Sharing	68.33	61.67	52.50	42.92
4	Online services	61.25	55.83	40.00	32.92
5	Social media/ Entertainment	60.56	72.22	66.67	43.89
Mobile phone/ Smart phone					
1	Phone calls	100.00	100.00	100.00	100.00
2	Information access	65.00	81.00	91.00	69.00
3	Correspondence/ Sharing	67.08	71.25	75.42	71.25
4	Online services	72.22	70.56	61.67	59.44
5	Social media/ Entertainment	65.00	69.17	59.17	62.92

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as social media or entertainment (43.89 %), correspondence or sharing (42.92 %) and online services (32.92 %) was comparatively low in case of officials of SDA when compared to other stakeholders of research and extension system.

In case of utilization of mobile phone or smart phone, cent per cent utilization was recorded for phone calls by all research and extension professionals. Utilization indices of smartphone or mobile phone for purpose of information access was found to be 91.00 per cent for KVK personnel followed by 81.00 per cent for SAU teachers or scientists, while it was 69.00 and 65.00 per cent, respectively for SDA officials and ICAR scientists. Nearly three fourth (75.42 %) of KVK professionals followed by an equal proportion (71.25 %) of SAU scientists and SDA officials and almost seventy per cent of ICAR scientists (67.08 %) used mobile phone or smart phone for the purpose of correspondence or sharing. Utilization indices for online services using smartphone were found to be 72.22, 70.56, 61.67 and 59.44 per cent for personnel of ICAR institute, SAU, KVK and SDA, respectively. Majority of personnel of SAU (69.17 %), ICAR institute (65.00 %), SDA (62.92 %) and KVK (59.17 %) were found to make use of smartphone for social media or entertainment.

Electronic technologies are increasingly being seen as cost-effective and as practical tools to facilitate information delivery and knowledge sharing among farmers, extension agents and other stakeholders (Frempong *et al.*, 2006). Also, there will be increased impact by the available extension agents in service delivery as better information will be obtained and more farmers reached by these agents. Study results emphasized a need to

know about the reason why the research and extension personnel are still lagging behind in use of certain latest ICTs such as video conferencing, teleconferencing etc. It was observed that though SDA have computers, their use was limited to data storage and retrieval. There is need for orienting staff to use ICT for extension services. ICT provides wider scope to communicate to farmers on various products, technology, post-harvest management as well as market information. Jirli *et al.* (2013) noted that the efforts of knowledge economy can develop e-ready extension professionals in the shortest possible time and concluded that e-ready extension professional can deliver better services with accountability to the target communities and could wipe out the differences between the reached and unreached. With a wider gap of extension worker to farmer ratio, ICT would best fit to keep farmers informed about developments, schemes etc.

All institutions under research and extension system had internet connectivity and it was made accessible to all of the officials. All scientists or officials of ICAR institute, SAU, KVK and SDA owned smartphone. The investigation also showed the higher utilization of personal computer, storage devices, printer and laptop in case of research and extension system personnel. Majority of the personnel of research and extension system accessed ICTs tools for accessing, storing, processing and analysis, sharing and disseminating information and networking with other organizations. Use of social media in research and extension is not so much visible among scientists. The institutes need to develop modules to train staff and assist them in using social media for various purposes. Hands on training are also essential to increase the utilization of social media.

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