



Research Article

Constraints and obstacles perceived by extension personnel in application of information and communication technology in agriculture

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SUMMARY : In India about 760 millions of farmers are engaged in agriculture. According to an estimate more than 60 per cent of the farmers have no access to any source of modern agriculture information. Reaching to these unreached farmers is a great big challenge before the extension system. To achieve growth rate more than four per cent in agriculture, ICT revolution in India must be preceded by the next generation of technology and infrastructure development. Application of ICTs in agriculture should be increased. ICT must be used to reach small and marginal farmers, who are the vast majority of Indian farmers and often unable to access agriculture informations. Presently extension personnel of both government and non-government organisations are using various information and communication technologies for transfer of agriculture technologies among the farming community but they are facing many constraints and obstacles in ICT application. Therefore, the entire study was carried out in Udaipur district of Rajasthan state to identify the problems and obstacles perceived by extension personnel in use of information and communication technology. A total of 160 extension personnel (80 from GO and 80 from NGOs) were selected from One GO and eight NGOs. To study constraints being faced in ICT application five commonly used ICT tools namely computer, Internet, mobile phone, Kisan call centre and information kiosks were selected. Data from the respondents were collected through face to face interview technique with the help of developed instrument. The findings of the study revealed that more than two-third of the extension personnel perceived either medium or higher level of the constraints regarding ICT application in agriculture, It was also found that extension personnel of government organisation faced more constraints than NGOs personnel in the application of computer, Internet, mobile phone, Kisan call centre and information kiosk in agriculture.

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BACKGROUND AND OBJECTIVES

The present era is rightly termed as an information era. Therefore, information and wide access to it is considered as wealth. People want adequate and authentic information as early as possible. In recent years, there is visible shift from the old ways to the modern ways of information delivery system. (ICT) has become a powerful tool for improving the delivery service and enhancing local development opportunities (Gorstein, 2003). Rural Communities require information on supply

of inputs, new farming technologies, early warning of natural disasters, credit, market price and their competition. Such information knowledge, technology and service contribute to expanding and energizing agriculture (Munya, 2000). Use of information and communication technologies (ICTs) is increasing for dissemination of informations. Yet the benefits of the information revolution are still much debated, particularly in case of developing countries like India. There is a very much concern about the gap between the information “haves and have not’s”, which will

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continue to grow unless the developing countries acquire the infrastructure and resources to access these new ICTs.

Information and communications technology (ICT) is a global term that includes all technologies for the manipulation and communication of informations. ICTs are defined as electronic and digital technologies for storing, processing, transferring of information and communication. These are enabling technologies that allow quicker and more efficient exchange and processing of information. These new technologies are based on the silicon chips, the laser, fibre optics and a set of varying and diversified technologies. ICT is a set of technologies that facilitate information processing, storage, retrieval and transmission. According to Torero and Von Braun (2005) ICTs are veritable tools with which a network of interactions can be stimulated among individuals such that they overcome .

During the last two decades, remarkable developments have taken place in information and communication technology. The ICT tools like desktop and laptop computers, tablet PCs, cell phones, smart phones, satellite phone, FM radio; multimedia devices like web camera, digital camera, handy cam, data cards, blue-tooth; storage devices like pen drive, CD-ROMs and DVDs; information kiosks, touch screen systems, expert systems etc. have been popular for information exchange. Computer and Internet enabled technologies like e-mail, e-commerce, e-learning, e-conferencing, Interactive voice response services (IVRS), various type call centres, teleconferencing, video conferencing, computer assessed services, wireless application protocol (WAP) and other online services; mobile enabled services like SMS, MMS, GPRS, mass messaging, points of presence (pops); web based GIS, remote sensing etc. has been generalized among the people.

ICT adoption in agriculture in other countries over the past years is reviewed by Gelb *et al.* (1999). Within this context the Indian agricultural scene is still in the process of rationalizing production and adopting itself to the graduation of the economy from a traditional farming society to an industrialized, market oriented economy.

In India about 760 millions of farmers are engaged in agriculture. According to an estimate more than 60 per cent of the farmers have no access to any source of modern agriculture information. Reaching to these unreached farmers is a great big challenge before the extension system. To achieve a higher agricultural growth rate, ICT revolution in India must be preceded by the next generation of technology and infrastructure development. Application of these ICT tools and techniques in agriculture should be increased. ICT must be used to reach small and marginal farmers, who are the vast majority of Indian farmers and often unable to access agriculture informations (Mahalingam, 2001).

The National Policy for farmers emphasizes use of information and communication technology (ICT) at village

level for reaching out to the farmers with the correct advisories and requisite information. Accordingly Indian Council of Agriculture Research (ICAR), State Agriculture Universities and State Department of Agriculture, Horticulture and Animal Husbandry are using ICTs for research, education and extension. The personnel of government and non-government organisations are using various ICT tools like computers, Internet, mobile phone, information kiosks and call centers for disseminating agriculture information among the farming community but application of these ICT is still insufficient. Therefore, an effort was made to study and identify the problem and obstacles responsible for restricting the use of information and communication technology by extension personnel.

RESOURCES AND METHODS

The present study was conducted in Udaipur district of Rajasthan. Udaipur district was selected purposively on the basis of large numbers of extension personnel are working in the department of agriculture and a large number of NGOs in the district. For the purpose of study government and non-government organisations actively involved in the transfer of agricultural technology were selected. The transfer of agricultural technology in the district is being carried out by state department of agriculture extension so the extension unit of state department of agriculture was selected purposively as Government Organisation (GO). To select the NGOs a complete list of all the NGOs using ICTs in the transfer of agriculture technology among the farming community was prepared. From the list so confirmed eight NGOs with highest use of ICTs were selected.

To select a sample of respondents from the GO, a preliminary list of all those extension personnel who are engaged in transfer of agriculture technology work and using ICTs was prepared. From the list, so prepared 80 extension personnel were selected on the basis of simple random sampling technique. Likewise, for the selection of respondents from NGOs, organisation wise list of all those field level personnel who are engaged in transfer of agriculture technology work was prepared. From the list 80 extension personnel from selected NGOs was taken on the basis of proportionate sampling procedure. Consequently, a total of 160 respondents (80 from GO and 80 from NGOs) were included in the sample of study. The nature of the entire study demanded more number of respondents whereas, availability of extension personnel using ICT for transfer of technology were limited, therefore, 160 respondents were selected. For the purpose of study five ICT tools namely computer, internet, mobile phone, Kisan call centre and information kiosks were selected. It was observed that these identified tools are commonly used by both GOs and NGOs

for transfer of technology in agriculture. Thereafter, data were collected from the selected respondents by employing personal interview technique. The interviews were conducted at extension personnel’s homes as well as office in the month of April to June 2012. About 50-60 minutes were spent to interview each respondent.

To measure the constraints responsible for hindering the use of information and communication technologies by the extension workers, a suitable interview schedule was developed. The schedule consisted of 49 statements pertaining to constraints related to ICT application. These constraints were categorized into five groups on the basis of ICT tools. To measure the degree of severity of constraints, the responses were recorded on a three point continuum *viz.*, most important, important and least important, which were assigned 3, 2 and 1 score, respectively. The recorded responses were counted and converted into mean per cent score for each constraint and were ranked accordingly. The mean per cent score for each constraint was calculated by using this formula:

$$\text{Mean per cent score} = \frac{\text{score obtained by the respondents}}{\text{Maximum obtainable score}} \times 100$$

To see the significant difference in the constraints level between the respondents GO and NGOs ‘Z’ test was used and then conclusion was drawn accordingly. Thereafter, the data were analyzed, tabulated and interpreted. The major findings of the study are as follows.

OBSERVATIONS AND ANALYSIS

In the present study, the term constraint means the barriers or obstacles which are perceived by the extension personnel in application of ICT in agriculture. It is worthwhile to mention here that pace of transfer of agriculture technologies among farmers can be augmented by overcoming the constraints being faced by extension personnel in ICT application to agriculture. So it was felt necessary to overcome the perceived constraints which restricted the respondents using information and communication technologies. In the present context, the constraints perceived by the extension personnel about ICT application to agriculture were identified and the results are presented in subsequent tables. Deshmukh *et al.* (2013) also worked on the use of ICT by medical students.

Distribution of respondents according to the level of constraints faced by them in ICT application to agriculture:

To get an overview of the level of constraints, the respondents were ramified into three strata *i.e.* low, medium and high level of constraints. These categories were formed on the basis of calculated mean and standard deviation of the scores given to the constraint items by the respondents.

The data incorporated in Table 1 reveal that 58.75 per cent respondents faced medium level of constraints in application of information and communication technologies in agriculture. Whereas, 28.75 per cent extension personnel were observed to be in high constraints group and only 12.50 per cent respondents perceived low level of constraints in ICT application to agriculture.

A close look at the data presented in Table 1 further shows that 56.25 per cent GO and 61.25 per cent NGOs extension personnel fell under the category of medium level of constraints. Likewise, 35.00 per cent GO and 22.50 per cent NGOs personnel could be placed in the category of high level of constraints. However, only 8.75 per cent GO and 16.25 per cent NGOs personnel were noticed in the category of low level of constraints in the study area. From the above matrix, it can be concluded that GO extension personnel faced more constraints than NGOs personnel in the application of ICTs in agriculture.

The present findings are supported by findings of Yadav (2011) who concluded that 55.00 per cent non-tribal respondents and 50 per cent tribal respondents fell in the category of severe level of constraints. Likewise, 25 per cent non-tribal and 33.33 per cent tribal respondents were placed in the category of highly severe level of constraints. However, only 20 per cent non-tribal respondents and 16.67 per cent tribal respondents were noticed in the category of less severe level in relation to modern communication media used in the study area.

Tool wise constraints perceived by extension personnel:

All the constraints expressed by the respondents were categorized according to concerned ICT tools like computer, internet, mobile phone, Kisan call centre and information kiosk. The results are presented under different headings as given below:

Constraints about computer application in agriculture:

A perusal of data presented in Table 2 reveal that lack of

Table 1: Distribution of respondents according to the level of constraints faced by them in ICT application to agriculture (n=160)

Sr. No.	Level of constraints	GO personnel		NGOs personnel		Total	
		F	%	F	%	f	%
1.	Low (below 78.04)	07	08.75	13	16.25	20	12.50
2.	Medium (78.05 to 108.54)	45	56.25	49	61.25	94	58.75
3.	High (above 108.54)	28	35.00	18	22.50	46	28.75
	Total	80	100.00	80	100.00	160	100.00

f = Frequency, % = Per cent

knowledge about computer application in agriculture was the most important constraint perceived by the GO and NGOs extension personnel with mean per cent score 81.66 and 70.00, respectively and it was ranked first by both the categories of respondents. The realization of this problem might be due to the fact that majority of extension personnel were unaware the various applications and uses of computer in agriculture.

The next important constraint perceived by the GO extension personnel was lack of skill in operating the computer with 71.25 MPS, whereas, the same constraint was assigned sixth rank by the NGOs respondents with 56.66 MPS. This was followed by the constraints of non-availability of computers, lack of training for effective use of computer, high cost of computer and their devices, irregular supply of electricity for using computer, inadequate departmental policy on ICT application in agriculture and problem of computer virus which can damage the data. The extent of

these constraints perceived by the GO extension personnel was 70.42, 67.08, 65.83, 62.08, 64.58 and 60.83 per cent, whereas, in case of NGOs personnel the extent of these constraints was 57.92, 54.58, 68.33, 63.33, 54.28 and 55.41 per cent, respectively.

Table 2 further shows that non-availability of CD-ROMs on agriculture technologies, lack of facilities for repair and maintenance of computers and non-availability of computer softwares at village level were also important constraints perceived by the GO respondents with 55.42, 65.82 and 66.67 per cent, respectively. While, in the case of NGOs respondents the extent of these constraints was 59.16, 47.50 and 41.66 per cent, respectively. Further analysis of table clearly reveals that lack of time for using computer to access agriculture information was regarded as the least important constraint by the GO and NGOs extension personnel with 55.00 and 42.91 MPS, respectively and ranked twelfth by GO and eleventh by NGOs personnel.

Table 2 : Constraints perceived by extension personnel about computer application in agriculture (n=160)

S. No.	Constraints	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of skill in operating the computer	71.25	2	56.66	6	63.95	4
2.	Lack of training for effective use of computer	67.08	4	54.58	7	60.83	6
3.	Non-availability of computer softwares at village level	66.67	5	41.66	12	54.16	11
4.	Lack of time for using computer to access agriculture information	55.00	12	42.91	11	48.95	12
5.	Problem of computer virus which can damage the data	60.83	10	55.41	8	58.12	8
6.	Non-availability of computers	70.42	3	57.92	5	64.17	3
7.	Non-availability of CD-ROMs on agriculture technologies	55.42	11	59.16	4	57.29	9
8.	High cost of computer and their devices	65.83	6	68.33	2	67.08	2
9.	Irregular supply of electricity for using computer	62.08	9	63.33	3	62.70	5
10.	Lack of knowledge about computer application in agriculture	81.66	1	70.00	1	75.83	1
11.	Inadequate departmental policy on ICT application in agriculture	64.58	8	54.28	9	59.43	7
12.	Lack of facilities for repair and maintenance of computers	65.82	7	47.50	10	56.66	10

MPS = Mean per cent score

Table 3: Constraints perceived by extension personnel in internet application in agriculture (n=160)

Sr. No.	Constraints	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Poor reliability of websites contents related to farming practices	69.16	6	44.16	10	56.66	9
2.	Lack of knowledge about applications of internet in agriculture	73.75	3	60.50	5	67.12	4
3.	Lack of updated agriculture information on internet	50.42	11	57.50	7	53.96	10
4.	Poor understanding of English language by extension workers	67.50	7	62.50	4	65.00	5
5.	Insufficient knowledge of internet uses	72.50	4	70.00	2	71.25	3
6.	Lack of time for using internet to access agriculture information	65.83	9	49.58	9	57.70	8
7.	High charges of internet use for accessing information	77.08	1	67.50	3	72.29	2
8.	Searching of appropriate information on internet is difficult	66.25	8	60.00	6	63.12	6
9.	Non-availability of online agriculture content in local language	70.00	5	50.42	8	60.21	7
10.	Poor knowledge of accessing agriculture information from websites	57.08	10	43.33	11	50.20	11
11.	Poor ICT infrastructures and network for accessing high speed internet at village level	76.67	2	87.92	1	82.30	1

MPS = Mean per cent score

From the above results it may be concluded that GO extension personnel faced more constraints than NGOs personnel in most of the aspects of computer technology. The extent of constraints perceived by the GO respondents was from 55.00 to 81.66 per cent, while it was from 41.66 to 70.00 per cent in NGOs respondents in respect to computer technology.

The present findings are supported by the findings of Selvi (2003) who stated that the problems of using computer assisted instruction (CAI) are lack of quality educational software, inability of teachers to start use of computers in school, cost of software production, the length of time needed to develop and test programmes and lack of rewards for pioneering efforts to individuals.

Constraints about internet application in agriculture:

The data presented in Table 3 reveal that poor ICT infrastructures and network for accessing high speed internet at village level was viewed as the most important constraint by GO and NGOs respondents with 76.67 and 87.92 per cent, respectively. This constraint was ranked second by GO and first by NGOs extension personnel. This was followed by constraints of high charges of internet use for accessing

information and insufficient knowledge of internet users. The MPS of these constraints was 77.08 and 72.50, respectively among GO respondents, whereas, in NGOs respondents it was 67.50 and 70.00 per cent, respectively.

Table 3 further shows that lack of knowledge about applications of internet in agriculture was also expressed as important constraint by GO and NGOs respondents with MPS 73.75 and 60.50, respectively. The realization of this problem may be due to the fact that the extension personnel of the study area did not know the various applications of internet. The next important problem perceived by the GO and NGOs extension personnel was that the extension workers poor command of English language with 67.50 and 62.50 per cent, respectively. Majority of the respondents revealed during discussion that they did not use internet because most of the information on the websites are available in English and they are not comfortable with English language.

Further analysis of table clearly reveals that most of the GO and NGOs extension personnel faced the constraint entitled searching of appropriate information on internet is difficult with 66.25 and 60.00 MPS, respectively. The constraints about non-availability of online agriculture content in local language and lack of time for using internet

Table 4: Constraints perceived by extension personnel in mobile phone application in agriculture (n=160)

Sr. No.	Constraints	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Inadequate budget provision for purchasing of mobile phone by the department	70.83	4	49.16	8	59.99	7
2.	Irregular supply of electricity at village level for charging mobile phone	58.33	8	45.00	9	51.66	9
3.	High cost for cell phone repairing and maintenance	52.50	9	42.08	10	47.29	10
4.	Difficult loading of data files on the mobile phone	65.42	6	57.50	5	61.46	6
5.	High cost of multimedia cell phone	68.33	5	57.92	4	63.12	5
6.	Lack of awareness of the various options available in the mobile phones	60.00	7	50.40	7	55.20	8
7.	Mobile services are paid service	73.33	3	61.66	3	67.50	4
8.	Non-availability of mobile phone network in the remote areas	78.75	2	72.50	2	75.62	1
9.	No reimbursement policy for mobile phone charges from the department	87.50	1	50.42	6	68.96	3
10.	Non-availability of cell phone supported audio-videos files on agriculture technologies	70.83	4	75.83	1	73.33	2

MPS = Mean per cent score

Table 5: Constraints perceived by extension personnel about use of kisan call center in agriculture (n=160)

Sr. No.	Constraints	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Busy network of Kissan Call Center (KCC)	84.16	1	79.58	1	81.87	1
2.	Lack of awareness regarding the services available on KCC	59.16	5	70.83	2	64.99	3
3.	Less number of kisan call centers	76.25	2	58.33	3	67.29	2
4.	Non-availability of KCC services on sundays and gazetted holidays	61.25	4	46.66	6	53.95	5
5.	Lack of knowledge about the functioning kisan call center	50.00	8	56.66	4	53.33	7
6.	Lack of availability of specialized experts at KCC	66.25	3	44.16	7	55.20	4
7.	Inaccurate advices provided by KCC experts	54.16	7	43.33	8	48.74	8
8.	More time required by experts to understand and diagnose the farmer's problem	55.42	6	51.66	5	53.54	6

MPS = Mean per cent score

to access agriculture information was perceived by 70.00 and 65.83 per cent GO extension personnel, while 50.42 and 49.58 per cent NGOs personnel, respectively.

The data also show that the constraints of poor reliability of websites contents related to farming practices and lack of updated agriculture information on internet were faced when accessing online information. These constraints were ranked sixth and eleventh by GO extension personnel with 69.16 and 50.42 MPS, respectively, whereas, the same constraints were ranked tenth and seventh by NGOs personnel with 44.16 and 57.50 MPS, respectively.

The constraint about poor knowledge of accessing agriculture information from websites was perceived as least important by the respondents and placed last in the ranking hierarchy.

From the above results it can be concluded that GO extension personnel faced more constraints than NGOs personnel about most of the aspects of internet application. The extent of constraints perceived by the GO respondents was from 50.42 to 77.08 per cent, while it was from 43.33 to 87.92 per cent in NGOs respondents in respect to internet.

The present findings are in accordance with the findings of Borthakur and Chandra (2011) who found in his study on problems faced by the internet users in CIC that all the respondents expressed electricity failure as the major problem followed by slow connectivity and downloading (80%), less number of computers (70%), Sunday closed (70%), service only available at office hours (60%), most of the time computers were busy due to ongoing training (50%) and improper services provided in CIC (30%).

Constraints about mobile phone application in agriculture:

The data included in Table 4 reveals that no reimbursement policy for mobile phone charges from the department was perceived as most important constraint by GO extension personnel with 87.50 MPS and ranked first, whereas, this constraint was ranked sixth by NGOs personnel with 50.42 MPS. Similarly, the constraint of non-availability of cell phone supported audio-videos files on agriculture

technologies was felt to be the most important constraint by NGOs extension personnel with 75.83 MPS and ranked first whereas, this constraint was ranked fourth by GO personnel with 70.83 MPS.

Table further shows that non-availability of mobile phone network in the remote areas was also expressed as the most important constraint faced by the GO and NGOs respondents with 78.75 and 72.50 per cent, respectively. This aspect was ranked second by both GO and NGOs extension personnel. This was followed by the constraints of mobile services are paid service and high cost of multimedia cell phones for the extension personnel. The MPS of these constraints were 73.33 and 68.33, respectively among GO respondents, whereas, in NGOs respondents it was 61.66 and 57.92 per cent, respectively.

The next important problem cited by the GO and NGOs respondents was difficulty in loading of data files on the mobile phone with 65.42 and 57.50 per cent, respectively. This problem may be due to the fact that extension personnel do not have sufficient knowledge of data transfer from computer to mobile phone and *vice-versa*.

Further analysis of table clearly reveals that most of the GO and NGOs respondents faced the constraint entitled inadequate budget provision for use of mobile phone by extension functionaries with 70.83 and 49.16 MPS, respectively. The constraint lack of awareness about the various options available in the cell phones with the extent of 60.00 and 50.40 per cent was also perceived by GO and NGOs respondents, respectively. The constraint namely irregular supply of electricity at village level for charging mobile phone was treated as important with 58.33 and 45.00 per cent by GO and NGOs extension personnel, respectively.

The constraint high cost for cell phone repairing and maintenance was perceived as least important, therefore, ranked last in the list of constraints with MPS 52.50 and 42.08 by GO and NGOs, respectively.

From the above results it can be concluded that GO personnel faced more constraints related to mobile phone than NGOs personnel. The extent of mobile phone constraints

Table 6: Constraints perceived by respondents regarding use of information kiosks in agriculture

(n=160)

Sr. No.	Constraints	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of awareness of services available at information kiosk	78.33	4	74.58	3	76.45	4
2.	Lack of knowledge about the location of information kiosk	70.00	7	62.08	6	66.04	7
3.	Information kiosks are located at distant places	75.00	5	61.66	7	68.33	6
4.	Inadequate number of information kiosks	83.75	3	76.25	2	80.00	2
5.	Lack of agriculture information provided by the information kiosks	86.66	1	84.16	1	85.41	1
6.	Non-availability of accurate and sufficient agriculture information on information kiosk	85.42	2	68.75	5	77.08	3
7.	Irregular supply of power for operating information kiosks	72.92	6	69.58	4	71.25	5
8.	Unsuitable official timings of information kiosk	51.66	8	54.58	8	53.12	8

MPS = Mean per cent score

perceived by GO respondents was from 52.50 to 87.50 per cent, while it was from 42.08 to 75.83 per cent in NGOs respondents. The present findings are supported by the findings of Akpabio *et al.* (2007) and Hosseini *et al.* (2009).

Constraints about use of Kisan call centre in agriculture:

An observation of Table 5 indicates that busy network of Kisan call centre was regarded as the most important constraint and ranked first by both GO and NGOs respondents with 84.16 and 79.58 MPS, respectively. This problem might be due to the fact that there are more numbers of callers and less numbers of KCC lines in Rajasthan.

The next important constraint faced by the GO and NGOs respondents was less number of Kisan call centre with MPS 76.25 and 58.33, respectively. This was followed by the constraint lack of awareness regarding the services available on KCC with MPS 59.16 and 70.83, respectively. It was further observed that lack of availability of specialized experts at KCC was also perceived an important constraint by GO and NGOs respondents with MPS 66.25 and 44.16, respectively.

Further analysis of data indicates that constraint about lack of knowledge about the functioning of Kisan call centre was treated as least important by GO personnel with 50.00 MPS. While, the constraint inaccurate advices provided by KCC expert was perceived least by the NGOs respondents with 43.33 MPS.

From the above results it can be concluded that GO respondents possessed higher MPS than NGOs respondents about most of the KCC constraints. The extent of KCC constraints perceived by the GO respondents was from 50.00 to 84.16 per cent whereas, it was from 48.74 to 81.87 per cent in NGOs respondents.

The present findings are in line with findings Hanumankar (2011) who found that common reasons of dissatisfaction of farmers were impracticality of advice provided by Kisan call centres agent at level - I, their obsolete knowledge and inability

to comprehend local agents and dialects. Delayed access to level - 2 experts was also found to be an irritant by the farmers. As regards the reasons for farmers not calling the KCCs, the study unambiguously established that nothing short of a professionally planned and promoted publicity blitz can crack the lack of awareness about the KCCs among the farming community.

Constraints regarding use of information kiosks in agriculture:

The data presented in Table 6 show that lack of agriculture information provided by the information kiosks was the top most constraint perceived by the GO and NGOs respondents with MPS 86.66 and 84.16 per cent, respectively. The cause of this problem might be the fact that most of the information kiosks are unable to provide agriculture services because it does not provide income to kiosk owners.

The next most important constraint perceived by the extension personnel was inadequate number of information kiosks. This problem was ranked third by GO personnel with 83.75 MPS and second by NGOs personnel with 76.25 MPS. This was followed by the constraint non-availability of accurate and sufficient agriculture information on information kiosk which was also considered as one of the important constraint by the GO and NGOs respondents with 85.42 and 68.75 MPS, respectively.

Further analysis of table clearly indicates that lack of awareness of services available at information kiosks was considered another important constraint as perceived by extension personnel with MPS 78.33 and 74.58, respectively. This was followed by the constraint irregular supply of power for operating information kiosks, information kiosks are located at distant places and lack of knowledge about the location of information kiosk. The extent of these constraints perceived by the GO respondents was 72.92, 75.00 and 70.00 per cent, respectively, whereas, among the NGOs respondents it was 69.58, 61.66 and 62.08 per cent, respectively. It was further

Table 7: Overall constraints perceived by the extension personnel about selected ICT tools (n=160)

Sr. No.	ICT Tools	GO personnel		NGOs personnel		Total	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Computer	67.55	III	56.00	V	61.77	III
2.	Internet	68.84	II	59.35	II	64.09	II
3.	Mobile phone	64.55	IV	56.25	IV	60.40	IV
4.	Kishan call center	63.33	V	56.40	III	59.86	V
5.	Information kiosk	75.46	I	68.95	I	72.20	I

MPS = Mean per cent score

Table 8 : Comparison between extension personnel of GO and NGOs about constraints faced in ICT application in agriculture

Sr. No.	Category of respondents	Mean	S.D.	'Z' value
1.	GO personnel	99.87	15.94	6.039**
2.	NGOs personnel	86.71	11.24	

** indicate significance of value at P=0.01

noted that unsuitable official timings of information kiosk was expressed as least important constraint by the respondents and was placed last *i.e.* eighth.

From the above discussion it could be inferred that the extent of information kiosk constraints perceived by GO extension personnel was from 51.66 to 86.66 per cent, while it was from 53.12 to 85.41 per cent in NGOs extension personnel. Further it was noted that GO respondents perceived more constraints than NGOs respondents in almost all the constraints.

The present findings are in consonance with the findings of Senthilkumar and Chandra (2011) who reported that among the constraints perceived by dairy farmers in accessing information kiosks (VICs) the general problem was considered as foremost constraint with highest mean score of 5.11 and was ranked first. General problem includes power failure, connectivity problem, inadequacy of computers etc. This may be due to the fact that in rural areas most of the time there was no power especially in summer days and respondents perceived it a serious constraint. This was followed by socio-personal constraint (4.12), content problem (3.15), physical facilities (0.93) and socio-cultural constraint (0.05) and these were ranked second, third, fourth and fifth, respectively.

Overall constraints perceived by the extension personnel about selected ICT tools:

To find out extent of constraints perceived by GO and NGOs extension personnel in ICT application in agriculture individual ICT tool wise mean per cent score was calculated and rank was assigned accordingly. The findings about the same have been presented in the Table 7.

Table 7 reveals that GO and NGOs respondents perceived highest constraints about information kiosk with mean per cent score 75.46 and 68.95, respectively and ranked first by both the categories of respondents. The realization of constraints about information kiosk scored highest may be due to lack of agriculture information provided by the information kiosks, inadequate number of information kiosks, lack of awareness of services available at information kiosks, information kiosks are located at distant places and irregular supply of power for operating information kiosks.

The problem related to internet application in agriculture was ranked second by both GO and NGOs of respondents with 68.84 and 59.35 MPS, respectively. It was observed that most of the respondents faced problems like poor ICT infrastructures and network for accessing high speed internet at village level, high charges of internet use for accessing information, poor understanding of English language, lack of awareness of various applications of internet in agriculture and searching of appropriate information on internet.

Further analysis of table shows that constraints about application of computer in agriculture was ranked third by GO respondents with 67.55 MPS whereas, NGOs respondents placed Kisan call centre at the same rank with MPS 56.40. It was noted that majority of extension personnel were using mobile phone comfortably but its application in agriculture was a problem to some extent, therefore, both GO and NGOs personnel ranked mobile phone fourth with 64.55 and 56.25 MPS, respectively. Further, it was found that GO extension personnel regarded the problems about application of KCC in agriculture last priority, whereas, problems related to computer application were perceived least important by NGOs respondents.

Comparison between extension personnel of GO and NGOs about constraints perceived in ICT application in agriculture:

In addition to study the extent of constraints perceived by GO and NGOs personnel about ICTs application in agriculture, further efforts were made to study the difference between GO and NGOs regarding constraints perceived in ICT application in agriculture. To find out the variation in the constraints faced by the respondents 'Z' test was applied. The results are presented in Table 8. Following hypotheses were framed and tested.

Hypotheses:

- NH_{01} : There is no significant difference between GO and NGOs personnel with respect to constraints perceived in application of information and communication technologies in agriculture.
- RH_1 : There is significant difference between GO and NGOs personnel with respect to constraints perceived in application of information and communication technologies in agriculture.

Table 8 shows that the calculated 'Z' value was found to be greater than its tabulated value at 1 per cent level of significance. Thus, the Null hypothesis (NH_{01}) was rejected and alternate hypothesis (RH_1) was accepted. It reveals that there was significant difference in constraints perceived by GO and NGOs extension personnel about information and communication technology application in agriculture. Further analysis of the table reveals that the mean value further indicates that GO personnel faced more problems than NGOs personnel about application of information and communication technologies in agriculture. This difference may be due to the reason that GO personnel have less access to ICTs than NGOs personnel. The present findings are supported by the findings of Arokoya (2005) and Hosseini *et al.* (2009).

Conclusion:

From the above findings it can be concluded that more

than two-third of the extension personnel perceived either medium or higher level of the constraints regarding ICT application in agriculture, which indicates severity of the problems being faced by extension personnel. It was also found that extension personnel of government organisation faced more constraints than NGOs personnel in the application of computer, Internet, mobile phone, Kisan call centre and information kiosk in agriculture. It may be due to poor knowledge of GO personnel about these ICTs, therefore, it is recommended that skill oriented trainings on various aspects of ICTs should be provided to the extension personnel of government and non-government organizations by special experts. The trained extension functionaries of GO and NGOs will certainly revitalize the extension system of the Udaipur district. The study indicated that lack of knowledge about computer application in agriculture, high cost of computer and devices, high charges of internet use for accessing information, poor ICT infrastructure and poor network for accessing internet at village level, non-availability of mobile phone network in the remote area, busy network of Kisan call centre, less number of Kisan call centres, lack of agriculture information provided by information kiosk and inadequate number of information kiosks were important constraints perceived by GO and NGOs respondents in application of ICTs in agriculture. To resolve these obstacles it is recommended that computer or laptop should be provided to the extension personnel so that they can use it for wellbeing of farming community. It is recommended that internet services should be made accessible to the extension functionaries so that they can directly access latest agriculture technologies from the websites of KVKs, SAUs, ICAR, department of agriculture and other national research centres to deliver latest information among the farmers. To increase application of mobile phone in agriculture it is recommended that mobile charges of extension personnel be made reimbursed for frequent contact with farmers. To improve use of KCC among extension workers it is advised that at least one KCC line should be provided for extension personnel where subject matter specialists should address the queries of extension personnel. Further to increase the application of information kiosks it is recommended that agriculture technological information should be made available at information kiosks on priority basis.

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