



Role of Information and Communication Technologies (ICTS) in Disseminating Agricultural Knowledge and Updates among Farmers of Punjab

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ABSTRACT

Information and Communication Technologies (ICTs) are an important addition to modern technology. Advancements in ICT-technologies led to significant changes in agricultural production systems. The study was conducted in the Punjab province during 2015-2016. Qualitative research method was applied for which semi-structured interviews were conducted. Participants of the study include government representatives, agri academicians, representatives of agri NGOs, media, agri associations and private agri and livestock companies. It is found that role of ICTs is very crucial in disseminating agricultural information and updates to farmers and cattlemen. Communication through ICTs is very effective and heavily practiced by the respondents for extending awareness among farming community. Queries of farming community are being answered in no time with the help of latest information and communication technologies. ICTs are also being used effectively by most of the respondents and their organizations in delivery of agricultural information and updates to the farmers and cattlemen. Respondents also revealed some barriers to the incorporation of ICTs such as lack of motivation, confidence and competence among farming community, costly equipment, poor network and infrastructure of ICTs, shortage of electricity, digital divide, lack of financial resources, mass illiteracy among farming families, language barrier, lack of training and shortage of time. Participants also suggested some enablers to overcome these barriers.

KEYWORDS: information, communication, ICTs, agriculture, extension workers, agricultural knowledge

INTRODUCTION

Information and Communication Technologies (ICTs) are considered as value addition into modern technology. According to Blurton (1999), ICTs are various resources and tools which are used to create, store, disseminate and manage information. Usage of computer, internet, geographical information systems (GIS), mobile phones, as well as electronic media such as radio and TV is included in ICTs. It is also the integration of various communication technologies and ways of communication and delivering desired information to target audiences. It is playing vital role in various fields such as health, education, entertainment and agriculture [1]. New information and communication technologies (ICTs) especially the internet and mobile phone witnessed a rapid growth during the past 15 years. Internet and mobile phone users are almost doubled every year in contrast with other ICTs like radio and television. There is tremendous growth of ICTs in both developed and developing countries. By the end of 2015, 3.2 billion people were using Internet out of which 2 billion belong to developing countries. However, 4 billion people of developing countries, i.e. 2/3 people of developing world still remain offline. Global Internet penetration grew 7 folds to reach at 43 percent in 2015 from mere 6.5 percent in 2000 [2].

Application of modern technologies has also enhanced agricultural productivity by reducing environmental pressure and use of agro-chemicals without enforcing yield penalty. Similarly, arrival of mobile phone is accelerating a revolution in connectivity of rural population especially small farmers and local producers in developing countries. Expansion in infrastructure networks is enabling prompt information exchange, communication and innovation in service delivery [3].

In recent years, services based on mobile phones are increasing rapidly which helped in provision of new ways of seeking market information and price, techniques of production, finance, transportation and logistics resources [4]. Stand-alone usage of mobile phones by farmers enables them to communicate directly to suppliers, traders, marketers, extension agents and with each other [5]. ICTs are not only boosting the agricultural sector but also accelerating innovations among urban-rural organizations as well as reducing transaction costs. For example an extension worker can better advice farmers in rural areas if he is equipped with ICTs as he can learn new technologies, get latest commodity prices, rainfall forecasts, etc. with the help of [6].

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Information and Communication Technologies (ICTs) in agriculture are capable of providing extended access to information that is capable to support and drive sharing of knowledge. In old days, radio, television and films were main broadcast technologies that were being used for dissemination of information to rural people. However, at present modern information and communication technologies such as internet and mobile phone are being used. Modern tools of communication and computer/mobile based applications are now included in ICTs. These modern technologies include online & offline digital information repositories, social media, videos, mobile phones and digital photography [7].

World Summit of the Information Society (WSIS) 2003-05 has officially recognized and backed the increasing role of ICTs. It is excessively contributing to the poverty alleviation and agricultural development despite the fact that it is a relatively new phenomenon. ICTs also help in enhancing productivity, efficiency and sustainability of small-scale farmers. ICTs are also helpful in improving market access. Timely information helps farmers in their decision making regarding future commodities and crops as well as updated prices, best suitable time and place for buying and selling goods[8].

Unfortunately, Pakistan has still not benefitted from modern ways of information and communication like developed nations including USA, Australia, Sweden, China, western and central Europe. These countries produced tremendous output by utilizing modern methods of cultivation coupled with technological based innovation disseminated through CMC (Computer Mediated communication).

This study will be a significant endeavour in enhancing awareness about modern tools of information dissemination especially Information and Communication Technologies (ICTs) among stakeholders of agriculture and livestock sectors. The study would also explore the usability of modern information and communication tools to enhance and expedite the services utilized by the farmers. Moreover, the study will help farmers and cattlemen in selecting modern and efficient ways of communication for the fulfilment of their information needs.

The study will help policy makers of agriculture and livestock sectors to frame the ICT integration strategy for farmers since integration of ICTs in agriculture is at initial stages. Moreover, this study will provide strategies, recommendations and solutions regarding fixing of the numerous problems relating to agriculture and livestock sectors with the help of ICTs. Furthermore, the study will also explore the potential role of ICTs in agriculture sector for improving farm practices and agricultural development of the country.

MATERIALS AND METHODS

Purpose of the present study was exploring the role of Information and Communication Technologies (ICTs) in dissemination of agricultural knowledge and updates among farmers of Punjab. The study was conducted during 2015-2016 in the Punjab province. Qualitative research method was applied to answer research questions. Semi-structured interviews were conducted to get information from participants of the study. Most of the interviews were conducted face-to-face being the ideal way of conducting semi-structured interviews; however, some interviews were conducted via telephone calls and emails as per convenience of interviewees. Study population mainly include government officials, agri academicians, representatives of seed, fertilizers and pesticide companies, agri journalists and representatives of agricultural NGOs & associations. Convenience sampling technique was applied for which an official request was sent to all major departments relating to agriculture and livestock sectors for participation in the study but only a few of them ensured their participation. Numbers of distributed and responded items, sampling technique and data collection types are detailed in Table 1.

The descriptive analysis was applied for enquiring communication strategy, utilization of various means of communication especially ICTs, importance to communication and budgeting, reaction of beneficiaries towards ICT, obstacles for the integration of ICTs, plan of action and possible solutions to tackle these barriers.

Research Questions

This study is intended to answer following research questions:

- What are the attitudes and practices of public sector organizations (government) towards integration of ICTs in agriculture and livestock sectors?
- How agricultural educational institutions (agri academia) see the incorporation of ICTs in agriculture and livestock sectors?
- What are the beliefs and practices of media organizations towards integration of ICTs in agriculture and livestock sectors?
- What are the attitudes and practices of agri stakeholders (manufacturers of pesticides, fertilizers, agri unions/associations, livestock organizations & NGOs) towards incorporation of ICTs in agriculture and livestock sectors?
- What are the benefits derived by the stakeholders from the application of ICTs?
- What are the barriers to the integration of ICTs in agriculture and livestock sectors?
- Which practices would be used for enhancing integration of ICTs in agriculture and livestock sectors?

Research Hypotheses

Following are the hypotheses of the present research study:

H1: Stakeholders of agriculture and livestock are well aware of the benefits of ICTs.

H0: Stakeholders of agriculture and livestock are not well aware of the benefits of ICTs.

H2: ICTs are much effective and result oriented as compared to traditional ways of information and communication.

H0: ICTs are not much effective and result oriented as compared to traditional ways of information and communication.

H3: Overall attitude of agricultural stakeholders is positive towards ICTs.

H0: Overall attitude of agricultural stakeholders is not positive towards ICTs.

H4: ICTs are being used affectively for dissemination of agricultural information and updates.

H0: ICTs are not being used affectively for dissemination of agricultural information and updates.

Table 1: Number of Distributed and Responded Items, Sampling and data collection Type

Sr. No.	Type of Participants	No. of Distributed Items	No. of Responded Items	Sampling Technique	Data Collection Type
1	Punjab Govt. Representatives (Agri& Livestock Dept.)	6	3	Convenience	Face-to-face & Telephonic interviews
2	Agri Academicians	6	2		
3	Agri NGOs	5	3		
4	Agri Media	6	2		
5	Agricultural Associations/Unions	5	2		
6	Private Companies (manufacturers and distributors of seeds, pesticides, fertilizers and cattle items)	60	26		
Total		88	38		

RESULTS

All respondents disclosed that every available tool of information and communication is being utilized by them. Communication strategies are devised after lengthy homework and repeated consultation sessions of the stakeholders. Various ICT tools like computer, internet, social media, mobile phone, telephone, Helpline, SMS, Robo calls, etc. are successfully being used by their respective departments. Both Agriculture and Livestock departments have very proactive helpline numbers. SMS are also being sent to farmers. Segmentation of farmers is also being carried out by the departments for sending them customized information. Robo calls are also being made for the education of farmers and cattlemen. Extension workers of both agriculture and livestock departments are also being updated by the ICT tools. Feedback is also obtained from farmers by both departments through random calls. Android based monitoring is also being carried out by the agriculture department for seeking feedback from the farmers and extension workers. All respondents disclosed about their innovative projects, i.e. Mobile Apps, Robo Calls, Extension 2.0 and Virtual Governance System.

Representatives of universities told that almost all tools of ICTs are being utilized by the universities. There is helpful stuff for farmers and cattlemen at the websites of both UAF and UVAS. Zarai Baithak is example of such initiatives taken by UAF where farmers can find helpful stuff round the clock. Village Information Centres (VICs) are also established at selected villages where farmers can communicate with extension workers and agricultural experts for finding solutions to their problems. Helpline and extension services are also being offered by the universities for fulfilling information needs of farming community. UVAS 24/7 Extension Service helps cattlemen to combat various problems related to health of their animals. Many helpful services are accessible to farmers and cattlemen through call/SMS. There is also a dedicated FM Radio station 100.4 where agricultural programs are broadcasted from 10:00 a.m. to 2:00 p.m six days a week (Monday to Saturday). Documentaries are also being made by the students of both universities which are available at the website for the perusal of farmers and general public. Similarly, AV Aids are primarily used for teaching; however, they are also used to disseminate information among farming community on farmers’ days. Lack of motivation and interest of rural youth in agriculture, slow connectivity, load shedding, costly equipments and security issues are some of the barriers revealed by them. Both representatives emphasised that ICTs should be focused much by the government and suggested that favourable policies may be drafted to promote ICTs culture among rural communities for the progress of agriculture and livestock in Pakistan

Major of communication strategy of all organizations is the utilization of all means of communication in order to reach maximum farmers and cattlemen. Computer and internet are extensively used by all organizations; however

use of internet for farming community was less. All respondents stated that use of social media for awareness of common farmers and cattlemen is very common practice. Mobile phones are also used for communicating with farming community. There are also complaint centres accessible through telephone / mobile phones. SMS about latest technology and innovative agriculture practices are also being sent to trained farmers. All three organizations are excessively benefitting from mass media channels. Local television stations like Rohi and Waseeb are preferred over national stations. Short documentaries are also made for farmers which are also broadcasted through various means of communication. Use of documentaries for information of farming community is also a common practice by other two organizations. Many e-initiatives (Blogs, Forums, e-pages, etc.) are also taken by all three organizations for betterment of farming community especially in meeting their information needs. Lack of motivation and interest, poor network and infrastructure, shortage of electricity, weakness of commitment and accountability of the policy-makers, ineffectiveness and inefficiency of prevalent organizational structure and limited market information emerged as big problems for effective integration of ICTs in agricultural practices. Some of enablers include investment, promotion of policy related initiatives, finding partners in developing world and using ICTs for exchanging information and cooperation among farming communities.

Representatives of agri unions/associations were convinced with the role of ICTs and they were trying to influence farming community for adoption of modern agricultural practices. Almost all channels of communication are being utilized by them to fill the information needs of farmers and cattlemen. Radio is used but at limited level by which technological assistance is provided to farming community. Television (TV) is used to provide agricultural information and updates to farming community. Representatives of associations participate in TV programs to provide advisory services and necessary guidance to farmers and cattlemen. Mobile phones have been used excessively by them and advisory messages in Roman Urdu language are also being sent to farming community. Telephonic helpline service is also launched by the FAP for the guidance of farming community. Sometimes calls are also being made to disperse messages of emergency nature. Internet and social media are also being used but on limited basis. ICTs are generally being adopted by the younger and innovative farmers and they are not very popular among traditional and older farmers. For getting maximum benefit from ICTs, all stakeholders should be proactive and updated with modern agricultural practices. It is also suggested that information should be channelized through a proper network.

Representatives of media stated that queries of farmers are answered via mobile phone as well as printed matter. Information needs of farmers are fulfilled through a monthly magazine which is subscribed by almost one thousand farmers. A database of almost twelve thousand farmers and cattlemen is being developed by the magazine and agricultural information and updates are sent to them primarily through SMS. Mobile number of the representative is also available with farmers for advisory services on which approximately 30 calls per day are received from farmers and cattlemen. Facebook page of the representative is also very much informative and a large number of farmers and cattlemen visit the page for seeking information and guidance. According to the representatives of media, there is lack of awareness which can be fulfilled by the proactive approach of media. It was suggested by media professionals that information needs of farmers and cattlemen must be fulfilled by the government and media. There should be mobile based toll free numbers for the guidance of farming community. Mass media especially broadcast media should focus agriculture and livestock sectors. There should be proper check and balance over the information delivery to farming community by the stakeholders.

All respondents of private companies were well aware of the benefits of ICTs and they were willing to help farming community by using ICTs. Both types of communication, i.e. below the line and above the line are used with major focus on below the line communication. Various tools of ICTs like computer, internet, social media, blogs, forums, etc. are being used successfully by the majority of companies. However, representative of a company stated that they believe in interpersonal communication only and don't use social media for communicating with farming community. Mobile phones are also being used by the majority of companies for communicating with farming community. SMS are effective medium of communication for educated farmers and cattlemen so majority of companies are sending information to them via SMS. Robo calls are also being made by many companies for raising awareness and providing latest information to farming community. Some companies are using caller back tones for brand recognition among farmers and cattlemen. There are some companies which provide helpline services to farming community. Their helpline numbers are propagated to farmers and cattlemen, who call and seek advice whenever required. Many companies were engaged in documentary making and its release to farming community through broadcast media or on farmers' days. Some of the companies disseminate agricultural information through documentaries which are readily available on internet. Films, which are very popular medium of communication, were totally neglected by the private companies. Some of the companies were using cable TV to disseminate agricultural information to farming community. All representatives are of the view that national TV channels like GEO, ARY, Dunya News, Express, DAWN News, Samaa TV and Aaj TV are badly ignoring agriculture and livestock sectors. However, local TV channels like Waseeb, Royal News, Rohi, Punjab TV and Channel 5 are broadcasting some programs on various issues relating to agriculture and livestock. Usage of other ICT tools like AV Aids, CDs, DVDs, etc. is also very popular. Almost all companies were using AV Aids to spread their messages to farming community. Mass communication is mainly used for awareness purposes and image building; whereas,

interpersonal communication is utilized for influencing farming community to adopt communication messages and decision making. Major obstacles revealed by the respondents include limited access to ICT resources, digital divide, lack of financial resources, mass illiteracy among farming families, priority to traditional approaches of communication, unavailability of ICT infrastructure, shortage of skilled staff, bad internet connections, limited coverage and poor signals, fear of technology, unreliable connectivity, shortage of electricity, lack of motivation, confidence and competence in farming community, language barrier, lack of training and shortage of time by the stakeholders. Majority of recommendations, suggested by the representatives of participating companies include enhancing motivation level of farmers and cattlemen, creating technology plan, provision of incentives upon practicing ICTs, enhancing coverage of mobiles and internet, revision of communication strategy, reducing digital divide, extending ICT infrastructure in rural areas, enhancing literacy among farming families, provision of financial aid, provision of electricity in remote areas, enhancing motivation and confidence level of farming community, increasing training opportunities and provision of trained staff to agricultural institutions.

DISCUSSION

The communication through ICTs is very effective and heavily practiced for extending awareness among farming community. Since, extension workers cannot reach a very large and heterogeneous farming community, so mass media channels are must for delivery of information in an effective manner. Mobile Apps, Robo Calls, Extension 2.0 and Virtual Governance System are some of the prospective applications of ICTs by the government organizations. [4,9] also pointed out similar findings in their research studies.

All tools of ICTs were utilized by the universities to some extent. For example, computer and internet were primarily utilized for communication among university officials. However, internet was used to some extent for the betterment of farming community. Village Information Centres were also established at selected villages, where farmers can communicate with extension workers and agricultural experts for finding solutions to their problems. The Helpline and extension services were also being offered by the universities for facilitating farming community. There is also a dedicated FM Radio station 100.4, where agricultural programs are broadcasted from 10:00 AM to 2:00 PM, six days a week. Some documentaries were made by the students of both universities, which are also available on website for the perusal of farmers and general public. Similarly, AV Aids were primarily used for teaching; however, they were also used to spread awareness among farming community on farmers' days and *Kissan Melas*.

Media claims to be the fourth pillar of state, but it is not playing its due role for the development of agriculture and livestock sectors of the country. There is very limited coverage of agriculture and livestock in mainstream newspapers and TV channels. Only local TV channels are carrying some programs to highlight issues and concerns of agriculture and livestock sectors. Agriculture and livestock is not on agendas of majority of newspapers and TV channels. The results found in this study are contradictory to the findings of [10, 11 & 12]. The overall role of media as an industry is very disappointed and discouraging. .

Media organizations have failed to address the communication needs of the farming community. Most of the representatives of private organizations are well aware of the benefits of modern sources of communication. However, some of them are not convinced about the potential of ICTs and one of such representative stated about mobile phones that mobiles are not beneficial as farmers usually drop calls; however, telephone is beneficial to some extent. Similarly, SMS are not useful, because people do not read, so it is not an effective medium of communication.

The Universal Access Numbers (UAN) also being offered by some organizations for farmers and cattlemen. The queries of farming community are being answered in no time with the help of latest communication technologies. Radio is also being utilized by some organizations to disperse agricultural information and updates. Furthermore, Television is also being used effectively by most of the organizations in delivery of agricultural information and updates to the farmers and cattlemen. One organization is even planning to launch its own web TV Channel for the guidance of farmers and cattlemen. Cable TV channels are also being utilized by these organizations to send agricultural news and updates to farming community. Mobile phones are increasingly becoming popular among all citizens of the country and farmers & cattlemen are also not left behind. Usage of other ICT tools like AV Aids, CDs and DVDs are also very popular among these organizations. The results of the study indicate that there are considerable similarities with the findings of [14] who found that USAID Market Information Systems and Trader's Organizations (MISTOWA) in collaboration with Busy Lab developed a platform in West Africa for the exchange of real-time market information.

The stakeholders of agriculture and livestock sectors revealed many barriers. Obstructive behaviour of media professionals is the major obstacle for almost all participants of the study. Other barriers include lack of technology and internet awareness in rural areas, lack of motivation and interest of rural youth in agriculture, slow connectivity, load shedding, costly equipments, poor network and infrastructure of ICTs, shortage of electricity, weakness of commitment and accountability of the policy-makers, ineffectiveness and inefficiency of prevalent organizational structure, market information and farmer decision, security issues, discouraging role of government, limited access

to ICT resources, digital divide, lack of financial resources, mass illiteracy among farming families, priority to traditional approaches of communication, unavailability of ICT infrastructure, shortage of skilled staff, poor/bad internet connections, limited coverage and poor signals, fear of technology among aged practitioners, unreliable connectivity, shortage of electricity, lack of motivation, confidence and competence among farming community, language barrier, lack of training and shortage of time by the stakeholders. The results are consistent with the findings of [15, 16, 17, 18, 19, 20 & 21].

Some of the enablers suggested by the respondents include focusing ICTs by devising favourable policies, increasing investment, finding international partners in developing and using ICTs, exchanging ideas and enhancing cooperation, updating stakeholders with modern agricultural practices, channelizing information, fulfilling information needs of farmers and cattlemen by the government and media, creating technology plan, provision of incentives upon practicing ICTs, enhancing the coverage of mobiles and internet revision of communication strategy, reducing digital divide, extending ICT infrastructure in rural areas, enhancing literacy among farming families, provision of financial, provision of electricity in remote areas, increasing training opportunities and provision of trained staff to agricultural institutions. The similar kind of enablers are revealed by [22 & 23].

Conclusion

Information and Communication Technologies (ICTs) had great impact on the stakeholders of agriculture and livestock sectors. ICTs are quite successful in fulfilling information needs of farmers and cattlemen. Farmers or their family members consult many information sources for fulfilling their information needs about farming. ICTs especially websites, blogs, e-pages, forums, online discussions, social media pages, etc. are being conferred with by a large number of farmers and cattlemen. Latest information and updates are being obtained by them from these channels in no time from anywhere. Very detailed and comprehensive information about farming and livestock is readily available for farming community. There is also great impact of ICTs over the performance of extension workers, which are another key information source for the farming community. Various ICT tools like computer, internet, social media, mobile phone, telephone, Helpline, SMS, Robo calls, etc. are successfully being used by the government departments, private companies, NGOs and international organisations. Hence role of ICTs is very encouraging for dissemination of agricultural knowledge and updates among farming community.

Recommendations

- Budget of communication departments may be enhanced so that they may serve in a better way.
- Highly qualified professionals for communication departments may be hired for providing information to farming community.
- Farmer friendly policies may be formulated wherein representation of farmers and cattlemen may also be ensured.
- Education of ICTs must be made compulsory for both on campus and off campus activities.
- Social media may be used for disseminating information to farming community.

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