



## Research Article

# Use of Information and Communication Technologies among Farming Community of Khyber Pakhtunkhwa

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**Abstract** | Through the utilization of Information and Communication Technologies (ICTs) tools, farmers can get timely, up-to-date, relevant, accurate technical information and advice and extension agents can effectively answer farmers' abundant information needs. Thus, the present study was conducted to investigate the usage of ICT tools in agricultural extension services in Khyber Pakhtunkhwa. For the study three districts (*i.e.* Swat, Haripur and Mardan) of Khyber Pakhtunkhwa were chosen and a total sample size of 400 respondents was selected. Data were collected through pre-tested and validated interview schedule and analyzed using Statistical Package for Social Sciences (SPSS). The findings of the study showed that the maximum of the respondents (34.5%) were in the age category of 36 to 45 years whereas, 25.8% of the respondents were illiterate. About 64.5% of the sampled respondents were owner cultivators and almost 40% of the sampled respondents have farming experience of 21 to 30 years. More than half of the respondents (55%) owned mobile, 22.5% of the respondents owned telephone, 52.8% of the respondents owned television and 9.8% of the sampled respondents owned radio in the study area. About, 49.8% respondents were uncertain about the favorable effects of ICTs on production while 14.2% of the respondents agreed about favorable effects of ICTs on production. Krushkal Wallis analysis showed that there was highly significant difference in respondents' perception about the effect of mobile, telephone, television and radio on production. The study suggested that extension agents are required to create awareness of the use of ICTs among the farming communities. Department of agriculture extension needs to establish an ICT based program so that innovative agricultural information might be communicated to the farming community.

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**Keywords** | Information needs, Information and communication technologies, ICT tools, Agricultural extension services, Krushkal Wallis Analysis, Production



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## Introduction

In Pakistan, many farmers are illiterate, socially excluded and unaware of the latest developments in

the agricultural sector. It is not that they are resistant to technology; the fact is that new technologies and necessary support systems were rarely provided to them. Their poverty has led them to various forms of

deprivation which has also hampered their ability to compete for scarce agricultural resources (Zakir and Zakir, 2009). In order to keep the farmers informed about every innovation regarding agriculture, it is important to equip them with the latest knowledge and advanced skills of farming. For this purpose, communication between various stakeholders in agricultural sector needs to be improved i.e. proper use of ICT could bring change in sustainable dissemination of agricultural innovation on the small and large scale (Salam and Khan, 2020).

ICT tools are an electronic interactive bridge between farmers and change agents. This will help farmers in the market to achieve a better price and also to retain the use of these mediators (Anoop *et al.*, 2015). ICTs help extension workers and researchers to adopt improved agricultural practices and disseminate them to farmers. It can help the farmers to make informed decisions to improve rural livelihoods and the quality of life. Moreover, farmers' needs timely weather forecasts which help them to prevent losses of crops and deal with crop failures as information on weather forecasts are more trustworthy at the present time due to latest innovation in technology. Among various ICTs tools used, mobiles serve as a new tool for the effective provision of knowledge and information to farmers in emergency situation (Chhachhar *et al.*, 2014).

Adhiguru *et al.* (2009) identified that only 40 percent of farming households in India seek information from any source and that public extension services only reached 5.7 per cent of the farming households. Only 4.8 percent of the small farmers have access to public extension workers when compared to 12.4 per cent of large farmers. It has also been noticed that most farmers seek information from other progressive farmers (17 percent) and input dealers (13 percent). Sulaiman and Ban (2003) mentioned that the low outreach is due to lack of sufficient staff and low operational budgets that posed constraints on the ability of extension staff to visit farmer fields. As ICTs are the modern tools used for the provision of information by extension services globally, so for this reason, the role played by ICTs in the dissemination of information by agricultural extension services in KP was address in this study. Thus, the present study was conducted to investigate the usage of ICT tools in agricultural extension services in Khyber Pakhtunkhwa. The study results will be of prime importance in providing benefits regarding information dissemination

by ICTs to farmers, stakeholders, extension agents, institutions and organizations.

#### *Objectives of the study*

1. To assess perception of the farming community about the use of ICTs in selected districts of Khyber Pakhtunkhwa.
2. To test the association of age and literacy status of the respondents with the application of information received through various information sources.
3. To examine statistical differences in farmers' perceptions regarding the effect of ICT tools on their production.

#### **Materials and Methods**

##### *Universe of the study*

Khyber Pakhtunkhwa (KP) province was the universe of the research study. The farmers of the selected research area/districts comprised the population of this research study. Khyber Pakhtunkhwa is divided into 25 districts and 9 Agencies. The selected districts were Swat, Haripur, and Mardan. District Haripur is divided in to 2 tehsils and 45 union councils (UCs). District Swat is divided in to 9 tehsils and 65 UCs of which 56 are rural and 9 are urban based. District Mardan is divided in to 6 tehsils and 52UCs.

##### *Sample selection*

Multistage Sampling Technique (MST) was used for the selection of appropriate sample. The selection of sample had five stages i.e. zones, districts, tehsils, union councils (UC) and villages. In first stage, three Zones A, B, and C were selected purposively from Khyber Pakhtunkhwa due to extensive and progressive agricultural extension activities and climatically suitable areas for agriculture. Secondly, three districts were selected (one district from each zone) purposively for this research study i.e. Swat, Haripur, and Mardan because these three districts are agriculturally rich. In third stage, one tehsil was selected from each district randomly i.e. tehsil Babuzai from district Swat, tehsil Haripur from district Haripur and tehsil Toru from district Mardan. Similarly, in fourth stage, three union councils were purposively selected from each tehsil i.e. UC Rahimabad, Odigram and Tendodag from tehsil Babuzai; UC Ali Khan, Bakka and Barkot form tehsil Haripur; and UC Toru, Mohabatabad, and Mayar from tehsil Toru. In final stage, one village was randomly selected from each selected

UC thus comprising a total of nine villages. For the selection of respondents, sample calculation formula developed by Yamane (1967) was used with 95% confidence level and confidence interval as  $P = 0.05$ . According to the list, the number of farmer families in district Swat was 70189, in Haripur were 53627 and in Mardan were 123109.

$$n = \frac{N}{1 + Ne^2} \dots \text{Yamane} \dots (1)$$

Where,  
 $N$  = Total population size;  $e = 0.05$  standard error.

The sample size for each district was drawn by using the proportional allocation technique, which is defined as follows:

$$n_i = \frac{N_i}{N} \times n \dots (2)$$

Thus, a sample size of 400 respondents was selected and distributed as 114 respondents from Swat, 87 from Haripur and 199 from Mardan district through proportional allocation technique.

*Data collection*

The interview schedule was developed for the collection of primary data from the farmers of the selected area through face-to-face interview. The data collection tool was developed accordingly to meet objectives of the study. The interview schedule was pretested and necessary amendments were made accordingly.

*Data analysis*

The data were analyzed using SPSS. Results were presented in frequency distribution tables and percentages. A 3-point and 5-point Likert scales were used to measure the effectiveness of different variables. Weights were assigned showing that high scores indicate agreement and low scores indicate disagreement (Lindner et al., 2003; Khan and Akram, 2012). A weighted score was measured through the formula;

$$F \times S = \text{weighted score} \dots (3)$$

Where;  
 $F$  = Frequency/ No. of respondents,  $S$  = Scale/ Likert scale value.

Rank order was measured on the weighted score (Raza et al., 2019; Osondu and Ibezim, 2015; Khan and Akram, 2012). Rank order was used to prioritize

usefulness of different sources of information based on their respective percentages. Rank order is a procedure employed to sort study variable from highest to lowest on a dimension of interest and numerical values are replaced by their rank to sort the data. The Chi-square test was used to investigate the significant association between categorical variables (Ali et al., 2020; Masood et al., 2012). Also Kruskal-Wallis test was used to assess statistically significant differences in farmers' perceptions regarding the effect of ICT tools on production (Ullah and Khan, 2019; Elliott and Hynan, 2011).

**Results and Discussion**

*Socio economic characteristics of the respondents*

The socio-economic characteristics of the farmers significantly contribute to the use of ICT tools and ultimately increasing the production of farmers. Results pertaining to the socio-economic characteristics of the respondents are shown in Table 1 which shows results about the age, literacy status, tenancy status and farming experience of the respondents. The majority of the respondents (34.5%) have their age in the age bracket of 36 to 45 years followed by 29.8% who have their age between 46 to 55 years and 18.5% have their age between 26 to 35 years. About 16.2% of the respondents have above 55 years of age while only one percent has 15 to 25 years of age. These results deducted that mostly old age respondents were involved in farming because of less education and other job opportunities available to them, thus they choose farming by profession to earn their livelihood in order to sustain routine life activities. The dominance of old farmers in the study area may also be due to rural-urban drift of younger people in search of white-collar jobs as reported earlier by Chinaka (2004) and Osondu and Ibezim (2013). These results are also in consonance with Osondu and Ibezim (2015) who found that 48% of the sampled respondents have above 45 years of age.

Education is another important characteristic as it helps to develop farmers' skills to better understand the need to make changes in agriculture and to take decisions about available alternatives (Phanhpakit, 2009). Results regarding literacy status of the respondents in Table 1 reveal that 25.8% of the respondents were illiterate in the study area. Among literate respondents, majority of the respondents (28.2%) have matric education followed by 15.5% who have middle education

**Table 1:** Socio economic characteristics of the respondents.

Socio economic characteristics	Categories	Districts			
		Swat	Haripur	Mardan	Total
Age (Years)	15-25	0 (0)	0 (0)	4 (2)	4 (1)
	26-35	23 (20.2)	33 (37.9)	18 (9)	74 (18.5)
	36-45	44 (38.6)	28 (32.2)	66 (33.2)	138 (34.5)
	46-55	30 (26.3)	16 (18.4)	73 (36.7)	119 (29.8)
	Above 55	17 (14.9)	10 (11.5)	38 (19.1)	65 (16.2)
	Total	114	87	119	400
Literacy status	Illiterate	30 (26.4)	20 (23)	53 (26.6)	103 (25.8)
	Primary	14 (12.2)	0 (0)	25 (12.6)	39 (9.8)
	Middle	30 (26.4)	0 (0)	32 (16)	62 (15.5)
	Matric	20 (17.5)	37 (42.6)	56 (28.2)	113 (28.2)
	Inter	15 (13.1)	9 (10.3)	24 (12)	48 (12)
	Graduation	5 (4.4)	16 (18.3)	0 (0)	21 (5.2)
	Post-Graduation	0 (0)	5 (5.8)	9 (4.6)	14 (3.5)
	Total	114	87	199	400
Tenancy status	Owner	24 (21.1)	87 (100)	147 (73.9)	258 (64.5)
	Owner cum tenant	36 (31.6)	0 (0)	37 (18.6)	73 (18.2)
	Tenant	54 (47.4)	0 (0)	15 (7.5)	69 (17.2)
	Total	114	87	199	400
Farming experience (years)	Up to 10	18 (15.8)	35 (40.2)	21 (10.6)	74 (18.5)
	11-20	45 (39.5)	25 (28.7)	60 (30.2)	130 (32.5)
	21-30	51 (44.7)	18 (20.7)	90 (45.2)	159 (39.8)
	Above 30	0 (0)	9 (10.3)	28 (14.1)	37 (9.2)
	Total	114	87	199	400

**Source:** Field Survey, 2019; **Note:** Values in parenthesis are percentages.

and 12% of the respondents have intermediate education. About 9.8% of the sampled respondents have primary education and 5.2% have acquired graduation whereas only 3.5% have post graduate degree. Our results are different from those of Aldosari *et al.* (2017) who reported 23.5% of the respondents having middle education while 18.6% have intermediate education.

The results pertaining to the tenancy status of the respondents presented in Table 1 reveal that out of the total sampled respondents, more than half of the respondents (64.5%) were owner cultivator in the study area followed by 18.2% of the respondents who were owner cum tenants and 17.2% were tenants. The dominancy of owner cultivators in the study area might be due to fact that lands are fertile in these district and the farmers are fond of farming, therefore they cultivate their land by themselves. The findings are in conformity with those of Ashraf (2008) and Ali and Jan (2017) who found that more than half of the sampled respondents were owner cultivators.

Greater farming experience can facilitate the individual in experimenting with new ideas in his field and also enable them to understand the rationale of many phenomena that takes place in their fields which will ultimately help them to change their farming practices (Jensen *et al.*, 2009). Results regarding the farming experience of the respondents shown in Table 1 reveal that 39.8% of the farmers have farming experience of 21 to 30 years followed by 32.5% who have 11 to 20 years of farming experience and 18.5% have one to ten years of farming experience. About 9.2% of the remaining sampled respondents have above 30 years of farming experience. Similar results were reported by Nwaru (2004) who found that 8.33% of the respondents have above 30 years of farming experience.

*Respondents stating ownership of ICT tools*

In developing countries, the use of ICTs has played an effective role in agricultural development and the decision-making power of the farmers (Opara, 2008; Taragola and Van Lierde, 2010). It also brought signif-

icant improvement in agriculture and communication of information and knowledge to farming communities by utilizing different techniques (Birkhaeuser *et al.*, 1991; Chhachhar *et al.*, 2014). Table 2 shows results regarding respondents' ownership of ICT tools which reveals that 55% of the respondents possessed mobile whereas 45% of the respondents did not possess mobile. Observations during the study showed that mostly older and illiterate respondents did not keep mobile with themselves in the study area because they did not know how to use it and therefore, they have mobile at their homes or with their elder sons. The mobile phone has multipurpose uses for farmers, as some are using it for getting price and market information, while others are directly in contact with customers of their produce for selling, some use it for getting updates about weather and obtain information on the use of pesticides in their fields (Murthy, 2009; Chhachhar *et al.*, 2014). These results differ from those of Mudombi (2014) who conducted research in two districts (i.e. Murewa and Seke) of Zimbabwe and found that 71% of the respondents in Murewa and 85% of the respondents in Seke possessed mobiles.

**Table 2:** *Distribution of respondents regarding ownership of ICT tools.*

ICT tools		Districts			Total
		Swat	Haripur	Mardan	
Mobile	Yes	73 (64)	73(83.9)	74 (37.2)	220 (55)
	No	41(36)	14 (16.1)	125 (62.8)	180 (45)
Telephone	Yes	42 (36.8)	36 (41.4)	12 (6)	90 (22.5)
	No	72 (63.2)	51 (58.6)	187 (94)	310 (77.5)
Television	Yes	90 (78.9)	57 (65.5)	64 (32.2)	211 (52.8)
	No	24 (21.1)	30 (34.5)	135 (67.8)	189 (47.2)
Radio	Yes	0 (0)	30 (34.5)	9 (4.4)	39 (9.8)
	No	114 (100)	57 (65.5)	190 (95.5)	361 (90.2)

**Source:** *Field Survey, 2019.*

**Note:** *Values in parenthesis are percentages*

Results in Table 2 indicate that 22.5% of the total sampled respondents possessed telephone while 77.5% of the total respondents did not possess telephone in the study area. Quite less number of respondents in the study area owned telephone because in most of the rural areas telephone services were not available and also some of the farmers highlighted that they cannot afford its expenses. Armstrong and Gandhi (2012) reported that only 12% of the respondents owned home telephone. Similarly, data in Table 2 also shows that

52.8% of the total respondents possessed television sets while 47.2% of the respondents do not possess television. However, television is one of the good sources and effective medium of communication in developing countries for the transfer of agriculture information among farmers speedily (FARA, 2009). By television, the latest programs are introduced to create awareness among farmers in rural areas where farmers can watch and get information about the use of new techniques in a short time (Age *et al.*, 2012). Armstrong and Gandhi (2012) found that 31% of the respondents owned television.

The role played by radio in socio, economic, cultural and agricultural information communication is very important in rural areas, especially for illiterate farmers to obtain information on different aspects to keep their knowledge up to date (Murty and Albino, 2012). The results also showed that 9.8% of the total respondents possessed radio sets while the respondents who did not possess radio sets comprised 90.2% of the total sampled respondents. The reasons were people of district Swat is using new communication tools like mobile and TV and due to lack of effective programs on radio people have no more interest in using radio sets. Most of the farmers in districts Swat were old aged and illiterate so they do not have knowledge about how to use advanced mobile sets, thus were also unaware of mobile-based radio applications. Syiem and Raj (2015) got contrasting results and reported that 32.50% of the farmers mentioned the availability of radio with them.

*Application of information received through various sources*

Results in Table 3 show respondents' perception about the utilization of agricultural information acquired through various sources, which shows that 17.5% of the farmers applied the farming recommendations acquired from mobile. About 82.5% of the respondents reported that they do not apply farming recommendations acquired through mobile in their fields as they do not utilize mobile for acquiring agricultural information because they either do not possess mobile or do not know how to use mobile for acquiring latest agricultural information using internet services. Similarly, 84.5% of the sampled respondents mentioned that they do not apply agricultural information acquired from television while 15.5% of the respondents applied the farming recommendations acquired through television. The majority of the respondents

**Table 3:** Distribution of respondents regarding application of information received through various source.

Information sources regarding agriculture		Application of Information Received			Total
		Swat	Haripur	Mardan	
Mobile	Yes	15 (13.2)	19 (21.8)	36 (18.1)	70 (17.5)
	No	99 (86.8)	68 (78.2)	163 (81.9)	330 (82.5)
Television	Yes	0 (0)	44 (50.6)	18 (9)	62 (15.5)
	No	114 (100)	43 (49.4)	181 (91)	338 (84.5)
Internet	Yes	13 (11.4)	37 (42.5)	29 (14.6)	79 (19.8)
	No	101 (88.6)	50 (57.5)	170 (85.4)	321 (80.2)
Radio	Yes	0 (0)	18 (20.7)	0 (0)	18 (4.5)
	No	114 (100)	69 (79.3)	199 (100)	382 (95.5)
Extension agents	Yes	95 (83.3)	43 (49.4)	135 (67.8)	273 (68.3)
	No	19 (16.7)	44 (50.6)	64 (32.2)	127 (31.8)
Private companies	Yes	0 (0)	11 (12.6)	52 (26.1)	63 (15.8)
	No	114 (100)	76 (87.4)	147 (73.9)	337 (84.3)
Fellow farmers	Yes	95 (83.3)	40 (46)	102 (51.3)	237 (59.3)
	No	19 (16.7)	47 (54)	97 (48.7)	163 (40.8)

**Source:** Field Survey, 2019; **Note:** Values in parenthesis are percentages.

mentioned that they do not utilize the information acquired through television because they were of the view that there is no agricultural related program on television that can satisfy their needs.

Results in Table 3 further indicate that 80.2% of the sampled respondents reported they did not apply the agricultural information acquired from internet while 19.8% of the respondents reported that they applied the recommendations acquired from internet. A large number of the respondents were not using information received through internet because they said those recommendations are not suitable for their fields. Moreover, the results in Table 3 shows that 95.5% of the sampled respondents indicated they did not apply agricultural recommendations received through radio while only 4.5% of the respondents reported that they applied the farming recommendation broadcasted through radio. About 68.3% of the sampled respondents revealed that they applied the recommendations of extension agents while 31.8% of the total sampled respondents did not apply the recommendations of extension agents. The respondents who reported not applying the recommendations of extension agents were highly experienced farmers and were familiar with local farming better than extension agents.

Table 3 depicts that the overwhelming majority (84.3%) of the respondents reported that they do not apply the recommendations of private companies while 15.8% of the total respondents applied

the recommendations of private companies in their field. The respondents who do not apply the recommendations of private companies further emphasized that their recommendations are very costly and hence they cannot afford to utilize them because of limited resources. Furthermore, results in Table 3 reveal that 59.3% of the sampled respondents reported that they apply the recommendation of fellow farmers whereas the remaining 40.8% of the sampled respondents do not apply the recommendations of fellow farmers in their fields. During the field survey, it was found that the majority of respondents were those who valued the recommendations of fellow farmers due to their acquaintance with the local situations.

#### ICTs effect on production

Information and communication technologies are helpful in providing information to farmers so that they can be informed of the latest innovation and their use helps in enhancing production, minimizing expenses, improving commodity prices, and optimize the use of agricultural inputs. Thus, ICTs proved helpful in fulfilling needs of the farmers in today's modern agriculture (Islam and Islam, 2008). Thus, results regarding effect of ICTs use on production are provided in Table 4 which depict that 49.8% of the respondents strongly agreed followed by 29.2% who disagreed and 14.2% agreed while 6.8% strongly disagreed with ICTs use has a favorable effect on production. These results conclude that most farmers were aware of the importance of ICTs in enhancing

**Table 4:** Distribution of respondents' perception regarding ICT effect on production.

Districts	Respondents' perception towards ICT effect on production					Total
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly agree	
Swat	0 (0)	0 (0)	102 (89.5)	12 (10.5)	0 (0)	114
Haripur	18 (20.7)	18 (20.7)	51 (58.6)	0 (0)	0 (0)	87
Mardan	9 (4.5)	99 (49.7)	46 (23.1)	45 (22.6)	0 (0)	199
Total	27 (6.8)	117 (29.2)	199 (49.8)	57 (14.2)	0 (0)	400

Source: Field Survey, 2019; Note: Values in parenthesis are percentages.

**Table 5:** Association of Age and Literacy Status of the Respondents with Application of information received through various Sources.

Respondents' Characteristics	Categories	Mobile		TV		Internet		Radio		Ext. Agents		Private Companies		Fellow Farmers	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Age (In Years)	15-25	4	0	0	4	4	0	0	4	0	4	4	0	0	4
	26-35	19	55	25	49	64	10	18	56	53	21	29	45	23	51
	36-45	47	91	35	103	11	127	0	138	81	57	30	108	69	69
	46-55	0	119	2	117	0	119	0	119	101	18	0	119	116	3
	Above 55	0	65	0	65	0	65	0	65	38	27	0	65	29	36
	Total	70	330	62	338	79	321	18	382	273	127	63	337	237	163
Test Statistic	$\chi^2= 87.519,$ p-value= .000		$\chi^2= 59.144,$ p-value= .000		$\chi^2= 281.561,$ p-value= .000		$\chi^2= 83.034,$ p-value= .000		$\chi^2= 32.851,$ p-value= .000		$\chi^2= 90.163,$ p-value= .000		$\chi^2= 112.822,$ p-value= .000		
Literacy Status	Illiterate	0	103	0	103	0	103	0	103	64	39	0	103	64	39
	Primary	15	24	14	25	38	1	0	39	14	25	25	14	14	25
	Middle	36	26	4	58	4	58	0	62	30	32	27	35	30	32
	Matric	9	104	18	95	37	76	18	95	103	10	11	102	46	67
	FSC	9	39	9	39	0	48	0	48	48	0	0	48	48	0
	Graduate	1	20	16	5	0	21	0	21	5	16	0	21	21	0
	Higher	0	14	1	13	0	14	0	14	9	5	0	14	14	0
	Total	70	330	62	338	79	321	18	382	273	127	63	337	237	163
Test Statistic	$\chi^2= 116.879,$ p-value= .000		$\chi^2= 95.365,$ p-value= .000		$\chi^2= 213.234,$ p-value= .000		$\chi^2= 47.871,$ p-value= .000		$\chi^2= 100.822,$ p-value= .000		$\chi^2= 142.674,$ p-value= .000		$\chi^2= 85.369,$ p-value= .000		

Source: Calculated by Author.

agricultural production but they did not use them and hence they have responded negatively about the role of ICTs in improving production. However, Das et al. (2016) found that ICTs play a substantial role in increasing the production of rice, maize, wheat, potato and lentil. Similarly, Wereh (2012) and Aziz (2020) also stated that the utilization of ICTs for obtaining agricultural information has improved the agricultural production of the farmers.

*Association of age and literacy status of the respondents with application of information received through various sources*

Results regarding the Chi-Square test in Table 5 shows that there existed a highly significant associ-

ation between age of the respondents with the application of information received through mobile, television, internet, radio, extension agents, private companies and fellow farmers. The results further indicated that mostly younger respondents applied the information of these sources while mostly of old age respondents did not apply the information of these sources. Aldosari et al. (2017) also reported highly significant association of age with the utilization of information obtained from radio and TV while Muhammad et al. (2012) revealed that age has no significant association with the application of information obtained from radio and TV.

Similarly, there existed highly significant association

**Table 6:** Mean ranks of the respondents' perception regarding ICTs effect on production.

Respondents information regarding ICT tool	Respondents agreements towards ICTs effect on production	Mean Rank	$\chi^2$ Value	P-value
Mobile	Strongly disagree	113.00	138.498	0.000
	Disagree	142.06		
	Uncertain	214.51		
	Agree	313.00		
Telephone	Strongly disagree	45.50	110.882	0.000
	Disagree	209.60		
	Uncertain	203.29		
	Agree	245.50		
Television	Strongly disagree	106.00	92.685	0.000
	Disagree	181.21		
	Uncertain	194.44		
	Agree	306.00		
Radio	Strongly disagree	20.00	276.920	0.000
	Disagree	199.49		
	Uncertain	220.00		
	Agree	220.00		

Source: Calculation by Author.

between literacy status of the respondents with application of information acquired from mobile, television, internet, radio, extension agents, private companies and fellow farmers. The results further depicted that mostly illiterate respondents and those having graduation and higher education do not apply the information acquired from these sources and these were the respondents who utilized recommendations of the research department instead of these sources. Present findings are in line with [Yahaya \(2002\)](#); [Boz and Ozcatalbas \(2010\)](#) and [Aldosari et al. \(2017\)](#), who expressed that significant relationship, existed between literacy status and use of emergency information acquired from radio and TV. However, [Muhammad et al. \(2012\)](#) reported substantial relationship between education and the application of useful information obtained from radio where as non-significant relationship was found for use of information received from TV.

*Kruskal Wallis analysis for respondent's perception regarding ICTs effect on production*

Kruskal Wallis test was used in order to assess significant differences in farmers' perceptions regarding the effect of ICT tools on their production and the results are shown in [Table 6](#). The results in [Table 6](#) depict that Krushkal Wallis analysis showed highly significant differences in respondents' perception about the effect of mobile on production, with a mean rank of 313 for

agree, 214.51 for uncertain, 142.06 for disagree and 113 for strongly disagree. During the formal interview, it was assessed that farmers in the study area used mobile phones to acquire emergency information that includes seed varieties selection, current market prices, advance cultural practice, weather forecasts, and inputs availability. Accessibility of these agriculture related information caused change in the behavior of traditional farmers. The results also show that there were highly significant differences in respondents' perception about effect of telephone on production, with a mean rank of 245.50 for agree, 203.29 for uncertain, 209.60 for disagree and 45.50 for strongly disagree ([Table 6](#)). Quite less number of respondents in the study area owned telephone because in most of the rural areas telephone services were not available and also some of the farmers highlighted that they cannot afford its expenses. Moreover, highly significant difference was observed in respondents' perception about effect of television on production, with a mean rank of 306 for agree, 194.44 for uncertain, 181.21 for disagree and 106 for strongly disagree. Television being an important source can be used to show new programs in order to create awareness among farmers in rural areas so that they can watch and acquired information regarding usage of latest methodologies in where farmers can watch and get information about use of new techniques in little time Furthermore, data in [Table 6](#) also show highly significant difference in

respondents' perception about effect of radio on production, with mean rank of 220 for both agree and uncertain, 199.49 for disagree and 20 for the strongly disagree. Radio was an important information tool in the study areas, especially for illiterate farmers to obtain information on different aspects to keep their knowledge up to date.

## Conclusions and Recommendations

These results concluded that older individuals in the study area were involved in farming due to the migration of younger to cities in search of jobs and education. The majority of them were either illiterate or have low educational level due to lack of resources and unawareness about its importance and majority of them were cultivating their lands. Most of them were involved in farming for the last 20 years and have enough practical experience in farming. A higher number of the sampled respondents owned mobile and television among ICT tools while a smaller number of the respondents owned telephone and radio. Maximum respondents implemented the recommendations of extension agents and fellow farmers in their fields. The majority of the respondents disagrees and was uncertain about the increase in production after use of ICTs. Moreover, younger and literate farmers have applied the information acquired through ICT tools. After, ICT tools usage including telephone, mobile, television and radio had a significant positive difference on crop production. Thus, it is suggested that Agriculture Extension Department needs to create awareness about use of ICTs in farming system and to establish ICTs based programs so that innovative agricultural information can be communicated among farmers. Also, Agriculture Extension Department needs to initiate ICTs based program on mobile as a source of awareness regarding agricultural innovation on a daily or weekly basis so that the farming community can avail agricultural information. The farmers need to be provided with free/subsidized mobile phone handsets with enhanced capabilities of internet, FM radio and Bluetooth for information sharing.

## Novelty Statement

This study is based on the importance of ICT tools in agriculture which is focusing on the enhancement of agricultural and rural development. This paper will help the policy makers in formulation of strategies so

that essential information about the emerging challenges in agriculture can be disseminated among the farming community based on their need at a right time.

## Authors Contribution

**Shandana:** Designed the study, collected the data and wrote the first draft of the manuscript.

**Ayesha Khan:** Major supervisor, Developed the main theme and oversees the entire research study.

## Conflict of interest

The authors have declared no conflict of interest.

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