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Possibility of Socio-economic Attributes and ICT Application in Improving Quality of Farmers

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Abstract Evaluation on the diversified Information and Communication Technologies (ICTs) application along their association in socio-economic attributes can provide valuable insights about the trends of farmers towards improvement. Therefore, analytical research design and descriptive statistics were used to analyze the data collected from 400 respondents within different regions of Punjab Province in Pakistan. Based on the findings, it is recommended that government in collaboration with all stakeholders should launch regular, holistic and modern ICTs programs like applications of robo calls, SMS, *etc.* services at central level to ensure timely availability of agricultural information to improving the quality of young farmers. Furthermore, it is recommended to launch effective monitoring and evaluation mechanism of ICTs for agricultural development.

Key words Demography, Farmers, Information and Communication Technologies (ICTs), Information sources, Pakistan

1 Introduction

Agricultural sector has a major capacity in poverty reduction, ensuring food security, and is responsible for anticipated revolution by provision of sustainable livelihoods to the farming community and rural development through strengthening their economy^[1–3]. The dilemma of information plays a central role in firming farmer's daily decision making related to farmers initiative by enhancing their knowledge regarding latest technology and market information. In nearly every phase of the agricultural production and different situation, farmers take a number of particular decisions^[4].

Information and communication technologies (ICTs) application is a revolutionary mode for the agricultural development, and it is a dynamic part of the economy. With the enhancement in communication technologies and its appliance, extension and rural advisory services are going to be more contingent on ICTs so as to flourish in more efficient, apposite and pioneering ways for delivery of agro-based advanced technologies to the end-users. Information and technologies-based extension and advisory services perform play an energetic role in provision of agricultural information and knowledge for farming community. Keeping in sight the consequence of ICTs in overall agricultural advancement, it is crucial to stimulate ICTs based agricultural information dissemination to enrich agricultural productivity on one hand and to deliver sustainable agricultural information provision mechanism on other hand^[5–6].

ICTs are classified into three categories. (i) Very old ICTs; group of technologies which, have been used for several decades

and include human interactions, printed materials (publications, newspapers, books, pictures, poster, theatre *etc.*), markets and plays. (ii) Old ICTs: including radio, television, telephone, audio and video cassettes, films and slides. (iii) Modern/ New ICTs: including one-on-one connections, mobile phone, internet, video conference and computer satellites *etc.*^[7]. Above all, modern ICTs services and applications-based technology transfer system have conceded around a fundamental shift in form of communication^[8].

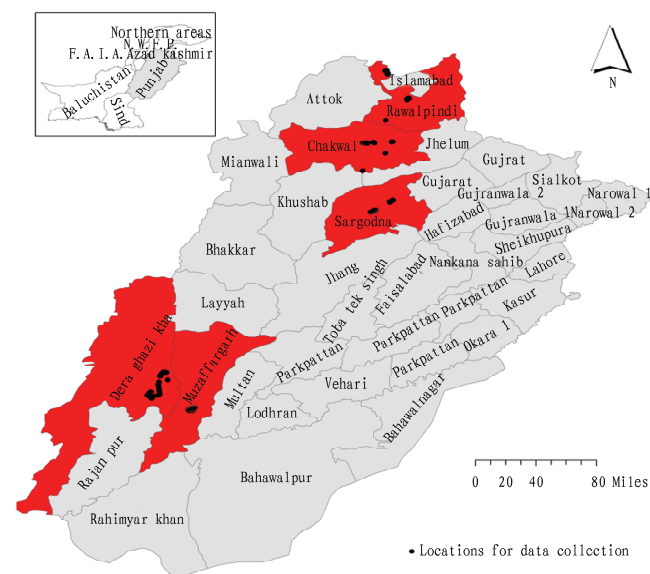
A very complex and critical procedure in sources of agricultural information is the application of information and communication technologies. It comprises numerous phases and dynamics at farmer's level. Out of these aspects, socio-economic profile of farmers played a projecting position in application process. Numerous studies have been conducted to explore socio-economic issues influencing behavior of farming community concerning ICT based agricultural extension services, approaches and further social activities. Diversified demographic attributes have been thought to be influenced by intellectual, social and economic variation linked with behavior^[9]. These aspects may furthermore be capable for different strategies to stimulate approval of ICT concerned agronomic practices between farmers for support in enhancing farm productivity and sustainability in agriculture^[10]. In this concern, the present research was directed to investigate the association between socio-demographic profile and communication characteristics of the farmers with the extent of use of ICTs.

2 Materials and methods

Research methodology is mode of systematic and logical planning for conducting a particular research^[11]. Moreover, it explicates

the association among phenomena and understanding level of the scholar in study^[12-15]. The methodology of the present research was established on descriptive survey. The "survey method" was used for data collection^[16]. This type of method plays fundamental role in social research and provides information from sundry prospective^[17]. This research is most appropriate for obtaining people's perception on socio-economic facts. This method describes the features or comportment of a certain population in an organized and precise fashion^[18].

The target population for the research was rural farming community of Pakistan. Punjab Province was selected purposively as this province has major contribution in Pakistan's agriculture also largest in population having more than 53% of country's total population, second largest area by land having multiplicity of crops and livestock in various ecological regions^[19]. There are 36 districts of Punjab Province, from which 5 districts, namely, Dera Ghazi Khan, Muzaffargarh, Sargodha, Chakwal and Rawalpindi were selected randomly for data collection (Fig. 1). From each selected district, 2 tehsils were selected by using simple random sampling technique; from each selected tehsil, 2 villages were selected randomly and from each village, 20 farmer households were selected by using simple random sampling technique. Hence a total of 400 farmer households were selected as a sample of the research study on random basis.



Note: red color area represents selected districts.

Fig. 1 Study site of Punjab Province of Pakistan

The present research was based on data collection through validated and pre-tested interview schedule. The most important step of the study was interviewing the respondents and accuracy of the data collection site. For this purpose, researcher interviewed all the respondents personally at their homes, farms or working place and took the coordinates of each data collection site (Fig. 1) by using device GPS version German eTarexR 201x. Although the interview schedule was prepared in English, considering the educational level of farmers, questions were asked in Sara-

iki, Punjabi, Potohari (local languages) and Urdu (national language) as well to get the required quality information with the maximum degree of accuracy.

Quantitative data was statistically analyzed by using computer software program Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies, percentages, Karl Pearson's coefficient of correlation were used to analyze the data for meaningful interpretation.

3 Results and discussions

3.1 Socio-economic profile of the farmers Collectively, the findings of the present study depicted that simple majority of the respondents belonged to the middle age and only 5% belonged to the young age category in Table 1. However, simple majority of farmers from four districts were middle age category except Rawalpindi where less than 50% belonged to same class in Fig. 2a. These results are in conformity with the report that majority of the respondents have its place to middle age category^[20].

The current exploration revealed that less than half of the respondents were illiterate and among literate only 8% had educational level above matriculation collectively in Table 1. Whereas, slightly more than half of the respondents were reported with lower educational level from all districts in Fig. 2a. Amongst all demographic characteristics of the farmers, the information about their ages and educational levels are most important. Because these two attributes of the farmers play a very essential role in the application or rejection of innovation and attitude change^[21].

In addition to the above attributes, other attributes obtained from the respondents included factors relating to their lands, tenancy status, farming experience, their incomes, sources of income as well as types of farming. The data auxiliary highlights that majority (85.3%) of the respondents had up to 12.5 acres land area and only five farmers (1.3%) within whole five districts showed to have > 25 acres land area in Table 1. Moreover, only within Chakwal district, 90% of the farmers have up to 12.5 acres in Figure 2a. This is contradictory with the report that 42.6% of the respondent had size of landholding up to 12.5 acres, followed by 23% of the respondents who owned above 15 acres of land^[22].

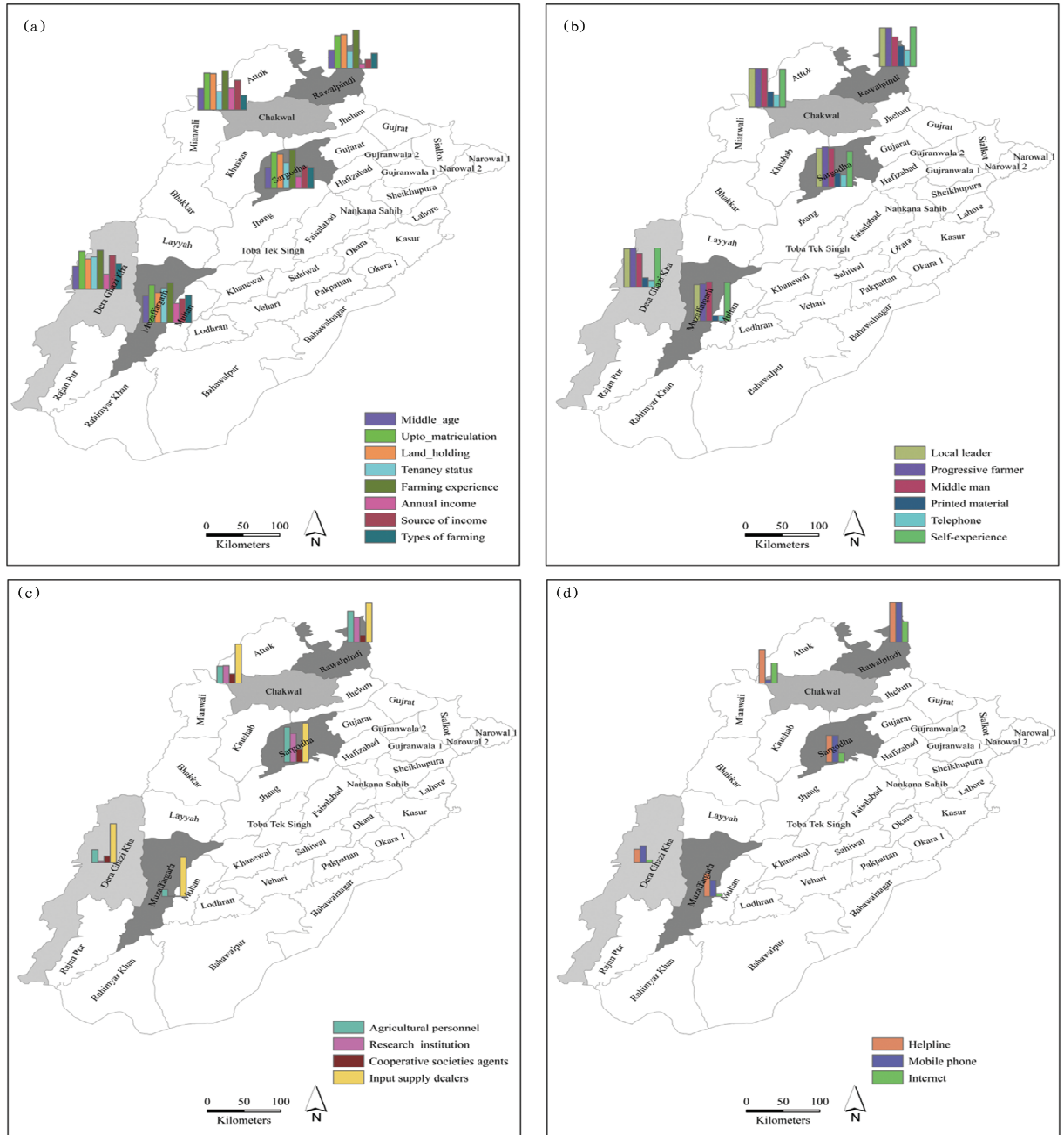
The present overall outcomes further showed that simple majority (65%) of the respondents were owner. However, owner-cum-tenant and tenant were found less than 20% respectively. From district prospective majority of the respondents reported owner except Chakwal and Rawalpindi district where less than half have same category in Fig. 2a. These results are more or less similar to the findings of the study that simple majority (58.3%) of the respondents fell in owner cultivator category followed by 22.5% and 19.2% of the respondents who fell in owner-cum-tenant and tenant categories respectively^[23].

According to research judgments as a whole very low percentage informed against farming experience up to 5 years. Whereas, overwhelming majority had vast farming experience in Table 1. Similar circumstance was shown in all 5 districts (Fig. 2a). Largely almost half (48.3%) of the respondents had low (up to 9 999 USD) annual income. From the others, nearly 10% had

high (above 20 000 USD) annual income in Table 1. Nevertheless, only 30% of the respondents had their low annual income category reported by Rawalpindi district in Fig. 2a. The findings of the study are in contrast with the study that majority of the respondents belong to medium family income^[20].

In poverty reduction and improving the living standard of the farming community, source of income plays a more significant role than farming contribution^[24]. Non-farm sources have a significant relation with the effect of media information on the application of latest agricultural innovation concluded by the study^[25]. Whereas, the present research generally indicates that the majority

(60.3%) of the respondents had farming only as a source of income and the remaining 5.3% had farming (job + work) category in Table 1. However, from the district point of view only 22.5% reported farming category from all in Fig. 2a. These results are more or less similar to that the findings of the study^[26] that 48.6% of the respondents earn income from private-public services other than farming. Moreover, the present findings illuminate that more than half of the respondents had crop + livestock type of farming respectively on their land in general in Table 1 and more than 70% reported in Muzaffargarh district with the same type of farming in Fig. 2a.



Note: (a) demographic characteristics, (b) application of very old ICTs, (c) application of old ICTs, (d) application of modern ICTs.

Fig. 2 Socio-economic profile of the farmers in the study area of Pakistan

Table 1 Socio-economic attributes of the respondents

No.	Variables	Respondents response (<i>n</i> = 400)	
		Frequency	Percentage//%
1	Age// years		
	Young (up to 34)	18	4.50
	Middle (35 to 52)	237	59.30
	Old (above 52)	145	36.30
2	Educational level (year of schooling)		
	Illiterate (0)	181	45.30
	Primary (1 to 5)	71	17.80
	Middle (6 to 8)	57	14.30
	Matriculation (9 to 10)	59	14.80
	Above matriculation (11 to 16)	32	8.00
3	Size of landholding// acre		
	Small land area (up to 12.5)	341	85.30
	Medium land area (12.6 to 25)	54	13.50
	Large land area (above 25)	5	1.30
4	Tenancy status		
	Owner	260	65.00
	Owner-Cum-Tenant	59	14.75
	Tenant	81	20.25
5	Farming experience// years		
	Less (up to 5)	9	2.30
	Medium (6 to 12)	117	29.30
	High (13 to 20)	151	37.80
	Very High (above 20)	123	30.80
6	Annual income//USD		
	Low (up to 9 999)	193	48.30
	Average (10 000 – 20 000)	158	39.50
	High (above 20 000)	49	12.30
7	Source of income		
	Farming only	241	60.30
	Farming + Business	138	34.50
	Others (Job + Work)	21	5.30
8	Type of farming		
	Crops only	186	46.70
	Crops + Livestock	214	53.30

Source: field survey, 2017.

3.2 ICTs characteristics of the respondents The findings showed that generally overwhelming majority obtained information from very old ICTs of which only 32.5% and 26.5% of the respondent are printed material and telephone respectively in Table 2. However, less than 13% reported against printed materi-

al, wall chalking and telephone from Muzaffargarh district respectively and remaining districts shows overwhelming majority by the use of very old ICTs in Fig. 2b. The general outcomes regarding old ICTs reveal that overwhelming majority of the respondents were in link with the categories of input supplier/ dealer (private company) fertilizer/ pesticide / insecticide/ seed companies whereas only 2% from audio/video cassettes / DVDs (documentary/ programs) respectively. Furthermore, almost half reported against agricultural personnel from old ICTs in general in Table 2. Similar effects also reported in all district against input supplier/ dealer. However, negligible percentages reported against audio/video cassettes from all districts and same percentage in case of radio specifically in Dera Ghazi Khan and Muzaffargarh districts respectively in Fig. 2c.

Data shows collectively from modern ICTs 26.7% , 25.3% and 11% of the respondents reported as agricultural/ livestock helpline, mobile phone (connection + service) robo call/ voice or text message / SMS helpline, and internet / computer (Website/ E-mail) respectively in Table 2. Whereas, no respondent gave their response regarding agricultural float and any other categories. The highest percentage reported less than 40% of helpline and mobile phone from only Rawalpindi district respectively and negligible percentage informed against internet in Dera Ghazi Khan and Muzaffargarh districts in Fig. 2d.

3.3 Relationship between socio-demographic profile and communication characteristics of farmers with the extent of ICTs application Karl Pearson's coefficient of correlation is a bivariate measure of association (strength and weakness) of the relationship among two variables^[14, 16, 27]. The relationship assessing between dependent and independent variables with the help of Kendall's tau-b correlation^[28–29]. This section focuses on one of the specific objectives of the research regarding the relationship between the demographic characteristics and use of (i) very old ICTs, (ii) old ICTs and (iii) modern ICTs respectively. The data collected as discussed in the present section regarding the demographic attributes and use of ICTs to determine the relationship between independent and dependent variables. The demographic attributes (like age, education, landholding, tenancy status, experience, annual income and sources of income) were regarded as independent variables. However, the dependent variables are divided into three categories as mentioned in Table 3.

Table 2 Characteristics of respondents' application of ICTs

No.	Variables	Respondents response (<i>n</i> = 400)	
		Frequency	Percentage//%
1	Very old ICTs		
	Family member (family head/ grandfather/mother)	381	95.3
	Friend/ colleague/ relative/ neighbor	397	99.3
	Local leader (key informant)	386	96.5
	Progressive farmer / grower	391	97.7
	Middle men	365	91.3
	Printed material/ publication (newspaper/ magazine/ journal/handout/picture/diagram/Pena flex/chart)	130	32.5
	Walk chackling	237	59.3
	Telephone (Government + Private)	106	26.5
	Self-experience	393	98.3

(To be continued)

(Continued)

No.	Variables	Respondents response (n = 400)	
		Frequency	Percentage//%
2	Old ICTs		
	Agricultural personnel (government department) / FA/ AO/ DDO/ DO/ EDO	204	51.0
	College, university, research center/institutions	144	36.0
	Cooperative societies agent (non-government organization) NRSP/ PRSP and others	72	18.0
	Input supplier/ dealer (private company) fertilizer/ pesticide / insecticide/ seed	373	93.3
	Television	112	28.0
	Radio (frequency + program) talk/news/ message/ jingle/ feature/ interview/ discussion (Panel/ Expert)	76	19.0
Audio/ video cassettes/ CDs/ DVDs (documentary/ programs)	8	2.0	
3	Modern ICTs		
	Agricultural /livestock helpline	107	26.7
	Mobile phone (Connection + Service) Robo Call/ Voice or Text Message/ SMS Helpline	101	25.3
	Internet/ computer (Website/ E-mail)	44	11.0
	Agriculture float	0	0
	Others	0	0

Source: Field Survey, 2017.

The present study found 100% significant positive relationship between all demographic attributes with modern ICTs whereas similar results in age and experience from very old ICTs of every category. From very old ICT, middle man, printed material, wall chackling, and telephone found also significant positive correlation with same percentages in demographic characteristics. The data reveal 57% non-significant relationship between very old and old ICTs with landholding. The results also depicted not different relationship of 72% and 86% from audio/video/CD/DVDs and cooperative societies/NGOs with demographic characteristics

of old ICTs. However, 57% negative significant correlation reported in input supply dealers of old ICTs with demographic characteristics.

It may be inferred that middle age farmers were more inclined towards modern ICTs and radio as compared to younger people. On the other hand, the use of television decreased with the increase in age. The data also highlights that with the increase in education, use of TV also showed increasing trend. Same was reported in case of landholding and farmers' annual income. Likewise, the use of modern ICTs appeared more in respondents where income sources were more.

Table 3 Association between demographic attributes and ICTs

Demographic attributes	Very old ICTs								Old ICTs					Modern ICTs					
	Family member	Friend/relative/neighbor	Local leader/key informant	Progressive Farmer/ Grower	Middle man	Printed material	Walk Chackling	Telephone (Govt + Pvt.)	Self-experience	Agri. personnel	Research center/institution	Cooperative societies/ NGOs	Input supply dealers	Television	Radio	Audio/Video/CD/DVDs	Agri. Helpline	Mobile phone	Internet/ computer
Age	0.510 **	0.207 **	0.453 **	0.361 **	0.465 **	0.855 **	0.641 **	0.740 **	0.381 **	0.110 *	0.228 **	0.025	-0.170 **	0.055	0.160 **	0.079	0.133 **	0.145 **	0.174 **
Education	0.201 **	0.078	0.171 **	0.136 **	0.279 **	0.877 **	0.746 **	0.853 **	0.120 *	0.235 **	0.385 **	0.071	-0.182 **	0.134 **	0.219 **	0.094	0.166 **	0.191 **	0.182 **
Landholding	0.089	0.035	0.076	0.061	0.124 *	0.578 **	0.332 **	0.667 **	0.053	1.42 **	0.339 **	0.073	0.033	0.196 **	0.093	0.077	0.182 **	0.199 **	0.179 **
Tenancy status	0.153 **	0.059	0.130 **	0.104 *	0.212 **	0.920 **	0.567 **	0.901 **	0.091	0.175 **	0.229 **	-0.03	-0.235 **	0.125 *	0.126 *	0.101 *	0.125 *	0.144 **	0.165 **
Experience	0.388 **	0.206 **	0.370 **	0.360 **	0.458 **	0.816 **	0.797 **	0.745 **	0.317 **	0.236 **	0.385 **	0.064	-0.178 **	0.103 *	0.263 **	0.091	0.178 **	0.180 **	0.176 **
Annual income	0.207 **	0.081	0.177 **	0.141 **	0.287 **	0.742 **	0.770 **	0.716 **	0.124 *	0.272 **	0.460 **	0.112 *	-0.068	0.132 **	0.253 **	0.075	0.160 **	0.178 **	0.195 **
Income sources	0.149 **	0.058	0.127 *	0.101 *	0.207 **	0.758 **	0.554 **	0.714 **	0.089	0.096	0.344 **	0.094	-0.072	0.109 *	0.176 **	0.071	0.220 **	0.232 **	0.201 **

Note: ** denotes significant correlation at the level of 0.01 (2-tailed); * denotes significant correlation at the level of 0.05 (2-tailed).

The results are contradictory to the study that^[30] a negative significant correlation between age and use of radio, also concluded that no significant relationship among income and use of radio^[31] was found a significant positive correlation between demographic characteristics with the use of electronic media as agricultural information sources. The results also contradictory to the study that^[32] depicted that age showed negative correlation with the use of multiple sources of ICTs. While, inline results in case of education and income highlight positive association with use of multiple sources.

4 Conclusions and recommendations

The study concluded that socio-demographic attributes and use of modern ICTs having strong positive relationship. Similar associa-

tion subjected in the case of age, experience, education and annual income in very old ICTs. However, agricultural personnel and research center/institutions having positive significant relationship with demographic attributes in old ICTs. This showed that the clear-cut impact of socio-demographic profile with the extent of use of ICTs. It also seems that farmers due to educational status, experience, landholding, income, exposure and extension contact had acquired knowledge on various agricultural and other aspects.

Based on the findings of the study, government should launch regular ICTs program like applications robo calls, SMS etc. and modern ICTs services at central level to ensure timely availability of agricultural information to farmers. Moreover, all stakeholders should launch effective monitoring and evaluation

mechanism of ICTs related agricultural technology transfer for effective agricultural development.

References

- [1] ARFAN M, ALI S, SAFDAR U, *et al.* Study of association between demographic characteristics and increase in knowledge of farmers through Punjab agricultural helpline[J]. *Journal of Agricultural Research*, 2015, 53 (1): 287 –295.
- [2] BUTT TM. Influence of information communication technology (icts) on agricultural development in the farming community of Punjab, Pakistan [D]. Beijing: China Agriculture University, 2017.
- [3] Government of Pakistan. Pakistan Economic Survey, Economic Advisor's Wing Finance Division Islamabad[Z]. 2018.
- [4] MITTAL S, GANDHI S, TRIPATHI G. Socio-economic impact of mobile phones on Indian agriculture surabhi mittal sanjay gandhi gaurav tripathi [D]. New Delhi: Indian Council for Research on International Economic Relations, 2010.
- [5] ATIBIOKE OA, *et al.* Effects of farmers ' demographic factors on the adoption of grain storage technologies developed by Nigerian Stored Products Research Institute (NSPRI): A case study of selected villages in Ilorin West LGA of Kwara state[J]. *Research on Humanities and Social Science*, 2012(2): 56 –64.
- [6] TOMAR A, BHARDWAJ N, VERMA AP, *et al.* Association between socio-demographic profile and extent of use of ICT among farmers[J]. *International Journal of Agricultural Science and Research*, 2016, 5(6): 163 –168.
- [7] LASHGARARA F, MOHAMMADI R, NAJAFABADI MO. Identifying appropriate information and communication technology (ICT) in improving marketing of agricultural products in Garmsar City , Iran[J]. *African Journal of Biotechnology*, 2011,10 (10): 11537 –11540.
- [8] ASOGWA FO, KELECHI K. The impact of telecommunication expenditure on economic growth in Nigeria[J]. *Journal of Economy and Sustainable Development*, 2013, 25(4): 40 –45.
- [9] AZILAH MA, FOZILAH J, HO CS. The effects of socio-economic influences on households recycling behaviour in Iskandar Malaysia[J]. *Procedia-Social and Behavioral Sciences*, 2015, 202(3): 124 –134.
- [10] BURTON RJF. The influence of farmer demographic characteristics on environmental behaviour: A review[J]. *Journal of Environmental Management*, 2014, 135(5): 19 –26.
- [11] BUCKLEY J, ARCHIBALD T, HARGRAVES M, *et al.* Defining and teaching evaluative thinking: Insights from research on critical thinking [J]. *American Journal of Evaluation*, 2015, 36(2): 375 –388.
- [12] TROCHIM W. The research methods knowledge fase (2nd ed) [M]. Atomicdog Publishing, 2001.
- [13] JONASSEN D, *et al.* Educational communications and technology: A project of the Association for Educational Communications and Technology[M]. Routledge, 2008.
- [14] SCOTT D, MORRISON M. Key ideas in educational research [M]. A&C Black, 2006.
- [15] BUTT TM, QIJIE G, LUQMAN M, *et al.* Mode of ICTs applications in plant production and protection technology in rural Punjab-Pakistan[J]. *Transylvanian Review*, 2017, XXV(13): 21 –25.
- [16] CANADA M. Responsible for statistics[Z]. Introduction to Statsdirect, 2017.
- [17] KNUFFER NN, MCLELLAN H. An outline of chapter 41: Descriptive research methodologies[Z]. *Descriptive Research Methodologies*, EME, 2001.
- [18] LEARY MR. Introduction to behavioral research methods[M]. Pearson Education New Zealand, 2004.
- [19] Government of Punjab. Punjab Portal. Government of Punjab [DB/OL]. http://www.punjab.gov.pk/about_punjab_geography, 2018.
- [20] VERMA AP, *et al.* Farmers' attitude towards E-Chopal: A critical investigation in Gonda District of Uttar Pradesh[J]. *International Journal of Agricultural Science*, 2016 (8): 2076 –2078.
- [21] HABIB M. Role of farmer field schools on sugarcane productivity in Malakand , Pakistan[J]. *African Crop Science*, 2007, (8): 1443 –1446.
- [22] ALDOSARI F, AL SHUNAIFI MS, ULLAH MA, *et al.* Farmers' perceptions regarding the use of Information and Communication Technology (ICT) in Khyber Pakhtunkhwa, Northern Pakistan[J]. *Journal of Saudi Society of Agriculture Science*, 2017 (5):4 –10.
- [23] MUHAMMAD L. Rural development vision and practices of culturally rooted social movement organizations in North West Pakistan Implications for Agri. Extension [D]. University of Agriculture, Faisalabad, Pakistan, 2014.
- [24] IFAD. International fund for agricultural development[M]. Assessment of Rural Poverty in Asia and the Pacific, 2002.
- [25] MUHAMMAD S, LODHI TE, KHAN GA. Farmers' awareness of agri. radio and tv broadcasts and their preferences for different formats in the Punjab, Pakistan[J]. *Bulgarian Journal of Agricultural Science*, 2016, (22): 513 –516.
- [26] ISRAR M, KHAN H. An analysis of livelihood sources in hilly areas of northern Pakistan[J]. *Sarhad Journal of Agriculture*, 2010 (26):665 –672.
- [27] ALI G. Present and prospective role of electronic media in the dissemination of agricultural technologies among the farmers of the Punjab, Pakistan [D]. University of Agriculture, Faisalabad, Pakistan, 2010.
- [28] BROWN SP. Adoption of environmental landscape practices——Characteristics of extension clientele[J]. *Journal of Extension*, 2009, 47 (5): 29 –35.
- [29] HOMAN, G. Exploration of parent, 4-H volunteer advisor, and sports coach support and pressure on youth involved in 4-H and/or school sports[J]. *Journal of Extension*, 2006, 44.
- [30] ASHRAF I. Analysis of communication interventions of extension field staff with farmers under decentralized extension in the Punjab Pakistan [D]. University of Agriculture, Faisalabad, Pakistan, 2008.
- [31] ANI AO, BABA SA. Utilization of selected electronic mass media as sources of agricultural information by farmers in Northern Taraba state, Nigeria[J]. *Tropical Agriculture Research and Extension*, 2009 (12): 17 –22.
- [32] JENSEN KL, English BC, MENARD RJ. Livestock farmers' use of animal or herd health information sources[J]. *Journal of Extension*, 2009 (47): 1 –10.