



Research Article

Bridging the Digital Gap: Socioeconomic Impact of ICT Utilization in Rural areas of Punjab- Pakistan

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Abstract | The present study investigated the impact of farmers' demographic characteristics on using ICTs. The population for this study consisted of individuals from the Punjab province of Pakistan. A multistage sampling technique was used to select the respondents. A total of four hundred (400) respondents were selected randomly from twenty villages in Punjab. The results of this study show significant impacts of demographic variables on the use of various information and communication technology (ICTs) tools for obtaining information regarding agricultural practices. According to the correlations analysis age, education has a positive correlation with the use of radio, TV and internet while the size of landholding and area under cultivation have a negative correlation with the use of various ICT tools. Data on future preferences show that most farmers prefer modern ICT tools, such as mobile phones, to obtain agricultural information. Considering the results of this study, the government and policy institutes should concentrate on the efficient use of modern ICT tools as the source of information and uplift the educational level of the farming community.

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Keywords | Digital gap, ICTs, Rural areas, Punjab, Socio-economic Characteristics.



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Introduction

Greater production in the agriculture sector boosts the economy and has a positive impact on food security at the local level (FAO, 2019). Pakistan primarily has an agricultural-based economy shares 24% in Gross Domestic Product (GDP) and employed 37.4% of the labor force (GoP, 2024). Over the years its economy has made considerable progress but still, there is a gap between the actual

yield and possible potential yield. Therefore, it is a dire need for the use of technologies in the field of agriculture. In the development of agriculture, the use of Information and Communication Technologies (ICTs) is considered an innovative way. Over time, advisory services are going to be more dependent on the ICTs as it is a more efficient, authentic, and innovative mechanism for the dissemination of advanced agricultural technologies to the farming communities. According to FAO (2009), ICTs can

improve the farm productivity and livelihoods of poor small farmers. [Anastasion *et al.* \(2017\)](#) found that ICTs act as catalysts, enhancing rather than replacing the traditional extension methods. However, for the farming community, adopting ICTs as an alternative source of information is a very complex and critical procedure. This adoption process involves various steps and has many affecting factors. Among these factors, the demographic profile of the farmers is the prominent factor. Several studies have been conducted till now to explore the influence of demographic factors on the adoption behavior of the farming community regarding the ICTs. These factors can also be having proficiency for the acceptance and adoption of ICTs among the farming community. Studies have also found a significant association between demographic characteristics and their advancement in the agriculture sector. Information and communication technology tools are faster and interactive communication tools as compared to traditional methods of information dissemination such as face-to-face meetings, group meeting and demonstrations ([Naqvi *et al.*, 2021](#)). [Akpabio *et al.* \(2017\)](#) highlighted that poor ICT infrastructure, high cost of ICTs, electricity problems and accessibility of various ICTs as the major obstacles in the adoption of ICTs among the farmers. Accessibility to the Internet in rural areas is also influenced due to income and gender issues. With a similar perception [Gao \(2018\)](#) also reported that farmers' demographic profiles like age, education, landholding and income have a positive association with the use of technologies for getting the latest information. Likewise, results of another study also reported that low capacity and inadequate infrastructure also affect the adoption and use of ICTs for agricultural information although emerging ICT trends i.e. mobile phone, internet and web-based applications have great potential in the agricultural information & knowledge dissemination, marketing and services provision ([Strong *et al.*, 2018](#)). ICT tools such as mobile phone enable the farming community to obtain information regarding inputs, products accurate prices and analyze the difference of input prices in different markets of country. It can help the farming community as well as market person by reducing the communication cost ([Naqvi *et al.*, 2020](#)).

So, in the light of the above situation, this study was designed to investigate impact of the various demographic factors like age, education, and landholding on the adoption and use of ICTs.

Methodology

The present study was carried out in Punjab province of Pakistan that is known as breadbasket of country. In present research activity, descriptive, survey and cross-sectional research design was utilized to obtain the required data. Previous research studies also utilized this specific design in the Pakistan ([Siddiqui, 2006](#); [Khan, 2010](#)). A multistage sampling technique was utilized for obtaining unbiased sampling. First, out of 36 districts of Punjab two districts namely Rahim Yar Khan and Muzaffargarh were selected randomly. From each district, two tehsils were selected randomly and then five villages were selected from each tehsil based on a simple random sampling technique. Finally, from each selected village 20 farmers were selected through a random sample selection technique. A total sample of 400 respondents was selected. Farmers are the key stakeholders of the current study; therefore, face-to-face interviews were conducted with the help of pretested and validated questionnaires. The questionnaire has various sections for getting convenient responses from the respondents. Data analysis was conducted using the SPSS software, with descriptive statistics and multivariate correlation applied in the current study. The use and future preference for ICTs and their demographic associations were measured by using the Pearson correlation test.

Results and Discussion

Respondents' demographic characteristics

Demographic attributes of the farming community including education, age, tenancy status land holding, and cultivated area was under consideration.

Demographic attributes of the farmers' community showed that 44.5% of the respondents belonged to the age group of upto 35 years, which was the prominent age group while 31.2% of respondents fell in the age category of 36-50 years. Only one-fourth (24.3%) of respondents were aged more than 50 years ([Table 1](#)). This implies that young age respondents were prominent constituents of the entire sample of the total respondents. This active participation of youth in agricultural sector indicates positive steps in mainstreaming agriculture nationwide. According to many studies, age has an important role to play in the adoption and diffusion of innovations. Studies reveal that adoption and diffusion process are more rapid among the young farmers as compared to the

old farmers because young farmers are less resistant to change (Habib *et al.*, 2018).

Further, the educational level of the farmers was explored, and data reveals that 55% of the respondents were literate while 45% had no formal education. Among literate respondents, more than one-tenth of farmers had the highest educational level while 12% had primary as educational level (Table 1). The involvement of youth and educated individuals in farming is a positive gesture toward sustainable agriculture. This uneven prevailing situation of education status indicates that farming communities may not be able to comprehend the difficulties of latest techniques and technologies of farming that cause low adoption of latest techniques.

Table 1: Respondents' demographic attributes

Respondents' demographic attributes	Frequency	Percentage
Age (in years)		
Up to 35	178	44.5
36-50	125	31.2
Above 50	97	24.3
Mean age	41 Years	
Educational Level		
Illiterate	180	45.0
Primary	48	12.0
Middle	62	15.5
Matric	63	15.7
Above matric	47	11.8
Landholding size (acres)		
Small (<12.5)	361	90.3
Medium (Above 12.5-25)	33	8.3
Large (>25)	06	1.5
Area under cultivation (acres)		
Up to 12.5	381	95.3
>12.5-25	13	3.3
>25	06	1.5

Data also depicted that the majority of the farmers involved in this study were small landholders (90.3%) while the share of medium and large farmers was nominal. Results of the study further depicts that clear majority (95.3%) of the farmers were small landholder with area under cultivation below 12.5 acres followed by 3.3 and 1.5% of the respondents with more than 12.5 acres of landholding (see Table 1). The obtained results indicate that farming is a

major occupation of farming community in the study area. Irrespective of age group, educational level and landholding size, farmers in the study area are involved in farming to generate income. This engagement in the farming activities highlight need for easy access to information to bridge gaps prevailing in obtaining knowledge among farming community.

Table 2: Respondents' distribution according to their major source for getting agricultural information

Source of information	f	%
Radio/ FM	146	36.5
Television	165	41.3
Internet	52	13.0
Mobile phone	241	60.3
Agri. websites	32	8.0
Agri. help line	10	2.5
News paper	46	11.5
Written literature from public sector	22	5.5
Written literature from private sector	24	6.0
Extension worker of public sector	189	47.3
Extension worker of private sector	246	61.5
Fellow farmer/relatives'/ neighbors	284	71.0
NGOs	23	5.8

Note: Number of respondents are different due to multiple responses

Respondents source of information

The data presented in Table 2 highlight that fellow farmers/relatives/neighbors were the leading information sources from which 71% respondents were acquiring farm related information. Moreover 61.5% respondents reported information acquisition from private sector extension staff, while 47.3% respondents were receiving information from public sector extension. Previous studies presented the same view that majority of respondents were inclined towards private sector like pesticide companies rather than relying on public sector. Further 60.3% respondents' narrated information obtaining through mobile phone. They argued that mobile based extension services are helping them at their door steps. Furthermore, 41.3 and 36.5% respondents obtained information from TV and radio respectively. Findings agree to those of who revealed that TV gained more interest of viewers as compared to radio. Radio still holds unique position in disseminating agricultural information among rural dwellers in a number of countries. Information receiving from other sources like agri. websites, helplines, newspapers, literature and NGOs was almost negligible.

Table 3: Relationship between demographic characteristics and usage of ICTs for obtaining agricultural information (n = 400)

		Radio/ FM	TV	Internet	Com- puter	Mobile phone	Social media	Fixed phone/ landline phone	Agri. helplines	Agri. websites
Age	Pearson correlation	.227**	-.086	-.131**	-.129**	.009	-.213**	-.199**	-.215**	-.253**
	Sig. (2-tailed)	.000	.085	.009	.010	.857	.000	.000	.000	.000
Education	Pearson correlation	-.043	.172**	.381**	.145**	.165**	.252**	.227**	.206**	.343**
	Sig. (2-tailed)	.386	.001	.000	.004	.001	.000	.000	.000	.000
Landhold- ing	Pearson correlation	-.161**	-.066	.168**	-.089	.194**	-.036	-.058	-.032	.051
	Sig. (2-tailed)	.001	.186	.001	.074	.000	.469	.247	.529	.305
Area under cul- tivation	Pearson correlation	-.157**	-.074	.151**	-.103*	.214**	-.047	-.079	-.052	.037
	Sig. (2-tailed)	.002	.137	.002	.040	.000	.344	.115	.301	.456

Discussion with EFS also confirmed that getting information from fellow farmers and friends was the preference of farmers. While, among ICTs, mobile phone was the prominent source facilitating farmers in accessing information.

Multivariate Correlation analysis of various independent (demographics) and dependent variables (usage of ICT tools)

Multivariate Correlation analysis was employed to check the relationship among various independent variables (demographics) and dependent variables (usage of ICT tools). Age landholding, area under cultivation and education were considered as the independent variables. The dependent variable was usage of different ICT tools for obtaining agricultural information. Results of the Pearson correlation statistical test presented in Table 3 which shows association between demographics and usage of ICT tools for gaining agricultural information.

Correlation coefficient identified a positive and strongly significant relationship between use of FM/radio and the age for gaining agricultural information. Which indicates that the older farming community had more use of FM/radio for gaining information regarding agricultural practices as compared to youth/young farming community. Furthermore, results of the study showed significant but negative association of farmer's age with social media, computers, landline phones, agri. Helplines, internet and agricultural websites. That indicates young farming community had more usage of social media, computers, landline

phones, agri. Helplines, internet and agricultural websites for obtaining information regarding agricultural practices. Moreover, usage of Television and mobile phones had non-significant relationship with the age of farming community which shows that age group does not affect the usage of Television and mobile phone for obtaining information regarding agricultural practices.

Pearson correlation coefficient identifies a positive and significant relationship between education of the farmers and usage of ICT tools for obtaining information regarding agricultural practices. It indicates that farmers having higher education were more motivated towards usage of internet, social media, mobile phone, agricultural helpline, landline phones, Television and agricultural websites for gaining agricultural information as compared to uneducated farming community.

Moreover, Pearson correlation coefficient identifies as significant but negative relationship between usage of radio/FM and size of the landholding. While usage of mobile phone had positive significant relationship with size of landholding which shows farming community having large landholding used mobile phone technology for gaining information regarding agricultural practices while small size farming community used radio for this purpose. Furthermore, study found significant but negative relationship of area under cultivation with Television, computer, social media, radio, agricultural helplines, and landline phones while a positive significant

Table 4: Relationship between demographic characteristics of respondents and their future preference for ICTs for obtaining agricultural information

		Radio/FM	TV	Mobile	Internet	Com-puter	Land line phone	Agri. helplines	Agri. web-sites
Age	Pearson correlation	-.106	-.318**	.033	.177	-.039	-.152	-.378**	.081
	Sig. (2-tailed)	.166	.000	.557	.093	.758	.240	.001	.473
	N	172	268	315	91	64	62	77	80
Education	Pearson correlation	.401**	.367**	.332**	.538**	.457**	.416**	.422**	.656**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.001	.000	.000
	N	172	268	315	91	64	62	77	80
Landhold- ing	Pearson correlation	.383**	.171**	.324**	.286**	-.152	-.183	.163	.579**
	Sig. (2-tailed)	.000	.005	.000	.006	.232	.155	.157	.000
	N	172	268	315	91	64	62	77	80
Area under cultivation	Pearson correlation	.378**	.235**	.340**	.297**	-.180	-.191	.171	.615**
	Sig. (2-tailed)	.000	.000	.000	.004	.154	.136	.137	.000
	N	172	268	315	91	64	62	77	80

Note: Number of respondents are different due to Multiple response of the respondents.

relationship found between area under cultivation with agricultural websites, mobile phones and internet. It indicates that farming community with more area under cultivation make more use of mobile phone and internet as compared to other ICT tools for obtaining information regarding agricultural practices.

Multivariate correlation analysis of independent variables (demographics) and dependent variables (future preference for ICTs usage)

Multivariate Correlation analysis was employed to check the relationship among various independent variables (demographics) and dependent variables (future preference of ICT tools usage). Age and landholding, area under cultivation and education were measured as the independent variables. The dependent variable was future preference of using different ICTs tools for gaining agricultural information. Results of the Pearson correlation statistical test presented in Table 4 which shows association between demographics and future preference of ICTs tools for gaining agricultural information.

Results of the study reveals a significant but negative relationship between age of the farming community and future preference for the usage of Television for gaining information regarding agricultural practices. While results further shows a significant and positive relationship between education of the farming community and the future preferences of ICT tools usage like Television, radio, internet mobile, computer, landline phone, agricultural websites

and agricultural helpline for gaining information regarding agricultural practices. It indicates that educated farming community was more likely for usage of mobile phone, radio, television, agricultural websites, agricultural helpline, internet, and landline phone in future for gaining information regarding agricultural practices as compared to illiterate farmers. Furthermore, Pearson correlation coefficient identifies a significant and positive relationship of landholding size with mobile phone, radio, Television, agricultural websites and internet. A significant and positive relationship is also found between the size of the cultivated area with Television, radio, internet, agricultural websites and mobile phone. It indicated that farmers having more area under cultivation were intended to use Television, mobile phone, radio, agricultural website and internet for gaining information regarding agricultural practices in future than those farming persons having relatively less area under cultivation.

Conclusions and Recommendations

The study observed that mean age of farmers was 41 years while most of the respondents did not attend school (45%). The majority (90.2%) of farmers in the study area were small farmers, having 12.5 acres' area under cultivation. Pearson correlation coefficient shows that the older farming community had more use of FM/radio for gaining information regarding agricultural practices as compared to youth/young farming community. Furthermore, farmers having

higher education were more motivated towards usage of internet, social media, mobile phone, agricultural helpline, landline phones, Television and agricultural websites for gaining agricultural information as compared to uneducated farming community. Moreover, educated farming community was more likely for usage of mobile phone, radio, television, agricultural websites, agricultural helpline, internet, and landline phone in future for gaining information regarding agricultural practices as compared to illiterate farmers. Based on the above results, it is highly recommended to the policy institutes and the government to increase the level of education of the farmers because education is a very important indicator of development and the education level of farmers is not up to the required level. Moreover, most of the farmers are inclined towards the use of mobile phones for getting information currently and also show preference for future use, the government should innovatively use ICTs for agricultural development.

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Novelty Statement

This study advances the literature by uncovering how ICT utilization transforms socioeconomic conditions in rural Punjab, a region where digital inequality remains largely understudied. Its novel insights reveal actionable entry points for policymakers to strengthen digital inclusion and rural development. The research provides a fresh, localized evidence base for bridging Pakistan's rural digital divide.

Author's Contribution

Muhammad Hammad Raza: Conceptualize and conducted overall study.

Ghazanfar Ali Khan: Supervised overall work.

Raheel Saqib and Babar Shahbaz: Provides expert opinion.

Syed Mufeed Hadi Naqvi: Helped in manuscript preparation.

Abdus Salam: Helped in data analysis

Generative AI or AI assisted technology statement

The authors have not used any Generative AI tools and AI-assisted technologies in this research work

Conflict of interest

The authors declare no conflict of interest regarding the publication of this manuscript.

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