P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 10; October 2024; Page No. 32-40

Received: 23-08-2024
Accepted: 26-09-2024

Indexed Journal
Peer Reviewed Journal

Exploring digital gender divide and its implication for rural women participation in agriculture

[1]Faisal Nadeem, [2]Yasir and [3]Muhammad Usman Abbas Jalvi

[1]Assistant Professor, Institute of Law, Kurukshetra University, Kurukshetra, Haryana, India

[1, 2, 3] University of Agriculture, Faisalabad, Haryana, India

DOI: https://doi.org/10.33545/26180723.2024.v7.i10a.1183

Corresponding Author: Faisal Nadeem

Abstract

Digital gender divide considers as division that differentiated those have access to computer and internet and from those beyond with this access. Despite the revolutionary potential of digital technology in agriculture, here are still gaps in the access and utilization of these equipment's, particularly for rural women's. The aim of this study was to investigate the different aspects of digital gender divide, exposing how it impacts rural women's engagement in agriculture and purposing methods to implement it to develop the women society. Multistage sampling technique was used in this study. At first stage, district Bhakkar was selected purposively, because in this area women were highly engaged in agriculture but had less access to the digital devices. Out of 4 tehsils of Bhakkar, one tehsil Kallurkot was chosen conveniently, at second stage. At 3rd stage, three rural union councils were selected randomly out of 14 union councils. At 4th stage, from each selected union council, 2 villages and from each village 20 respondents of pulse growers and cattle breeders (10 males and 10 females) were selected by using snowball sampling. The data was collected through an Interview schedule and collected data was analyzed using SPSS. Data depicted that most of the females had less access to the ICT's as compared to males. Females had prominent access to the TV among all the ICT's (88.3%). There were several constraints being faced by the women regarding the use of ICT'S. The most prominent that were reported by the respondents are lack of education, lack of infrastructure, gender discrimination, lack of governmental policies, lack of training, male dominancy, cultural norms, etc. Government should intensify its effort on the policies of liberalization and deregulation of the economy to incorporate ICT infrastructure.

Keywords: Digital gender divide, gender discrimination, e-agricultural technology, women participation, agriculture

Introduction

With a population of 229 million, Pakistan is a developing country in South Asia. Despite having the sixth-highest population, its GDP places at 43rd rank in the world. Pakistan's economy is fueled by agriculture, which also makes a substantial development contribution to the nation. However, traditional farming practices and outdated technologies have impeded growth. This industry is vital for a number of reasons, including the fact that it generates raw materials for other industry and supports our trade with other countries. Forty-five percent of Pakistan's total foreign exchange exports are made up of items. About 24% of Pakistan's GDP comes from agriculture, which also generates a significant amount of foreign cash through exports. Approximately 37.4% of the labor force was employed in the agricultural sector. For around 64% of Pakistan's population, agriculture serves as their major or secondary source of income. The food and dairy industries also contribute to the cottage industry (Govt. of Pakistan, 2023).

The agricultural community's ways of working, getting information, and interacting with one another have changed as a result of the digital revolution. These days, digital platforms are diverse and not just used to spread agricultural information; farmers may also get comprehensive knowledge about the evolution of agriculture as a whole (Meena and Singh, 2013) [20]. Farmers benefit from this digital innovation in that it makes them more affluent, aware, and socially and economically, which helps them make better decisions and stay connected and informed (Azam and Shafique, 2017) [3]. A few decades ago, the flow of knowledge on agriculture was restricted by newspapers, television, and magazines. But in this new digital era, the value of technology and computer literacy has been acknowledged (Balamurugan *et al*., 2016) [4]. Agriculture using technology may boost output, forge closer relationships with the market, and open up new avenues.

Using digital technologies to connect Producing agriculture from the paddock to the customer is known as "digital agriculture." By providing additional tools and information to help farmers take improved judgment and boost productivity, agricultural sectors can profit from these technologies (Agriculture Victoria, 2021).

Gender is a global issue that affects all aspect of life. The roles and obligations of men and women, as well as their interactions with one another, are referred to as gender. Gender refers not only to men and women, but also to the ways in which socialization shapes their identities, traits, and behaviors (Saghir *et al*., 2009) [33].

The income that is accessible to men and women is

impacted directly and indirectly by modern technology, which also enhance their standard of living by increasing productivity and production. In contrast to males, women continue to adopt agricultural technologies at lower rates than men, despite the fast advancement of technology. What prevents women from accessing and use of agricultural technologies are time constraints, gender role views, socioeconomic limitations, and a lack of information and skills. The process of adopting technology is also significantly impacted by varying preferences for technologies resulting from varying duties and responsibilities (Rola-Rubzen *et al*., 2020) [31].

Although the farming community is starting to adopt digital technologies, there are still many obstacles to overcome. Rural communities continue to be significantly impacted by the gender and digital divides, which hinder them from utilizing technical skills. Approximately 33% of cultivators and 47% of agricultural laborers are women in the period of feminization of agriculture (Rijswijk *et al*., 2021) [30]. They fall behind male farmers in learning technical knowledge, despite their significant contribution to farming. For rural women, digital platforms can provide a direct line of communication to the outside world. However, individuals still encounter obstacles when attempting to use technology because they lack the necessary skills, don't have access to it or control over it, or can't afford it (Patel, 2016) [27].

The digital world exhibits the same gender inequality as the real world. Approximately 52% of women and 44% of men are offline worldwide. But in underdeveloped nations, where female are 18% less probable to buy a smartphone and 7% less probably to own a cell phone, the gender digital divide is more noticeable. In developing nations, only 17% of households have access to computers in rural areas, compared to 54% of families in metropolitan areas. The gender digital divide has discernible regional variations. According to the Global System for Mobile Communication (2022), South Asia has the greatest gender digital divide, with the greatest differences in owning a mobile phone and using the Internet on it.

The gender gap in the participation in the labor force and the gender digital divide are similar. In terms of mobile phone ownership, South Asia has the biggest disparities across all regions, with Pakistan having the biggest inequalities, according to GSMA (2022). Households have greater access to mobile devices and cellphones than to PCs, laptops, tablets, and the Internet when it comes to digital tools. Moreover, there exist discernible gender disparities in terms of Internet usage and smartphone ownership. However, compared to metropolitan regions, rural areas have a more noticeable gender digital divide. In terms of gender differences, the Pakistan Telecommunication Authority (2021) states that Out of the 182 million cellphone subscribers, women own only 38 million of them.

Rural women across the world are vital for agricultural production, food security, the growth and stability of rural communities. However, female face different hurdles for accessing agriculture advisory supplies, particularly in underdeveloped nations. The rural female together with male, contributing significant role in agricultural sector's for crop production, livestock, and household products but they have incomplete access to digital technologies (Butt *et al.*, 2010) [5]. Like in other underdeveloping nations, Pakistan's rural female participate enormously to the economic growth by their crucial roles in agriculture field. With motherhood and caring duties reduce the opportunities for women to engage with work place. Women thus often have lack to access to justice, employment, education and health. Gender gap must be taken into consideration in order to increase the potential of women and their autonomy, as well as to ensure social and personal growth (Jabeen *et al.*, 2020). Regarding to the significance of women in the agricultural industry, their role in rural area is often underestimated. Due to difficulties of working in agricultural production, a rural woman also plays the role of housewife. In spite the fact that they work both at occasional and permanent farm positions that are significant to the household budget, the rural women are claimed to be unemployed (Jabeen *et al.*, 2020) [12].

These arguments take many various forms, but in general, it is continues to argue that increasing the productivity of women in agriculture is crucial to empower the agricultural productivity, and to decrease poverty of nation (Butt *et al.*, 2010) [5]. Women farmers could experience a 20-30% increase in agriculture output if they use same resources on their farms as males do. This might outcome in a 2.5-4% rise in developing nations overall agricultural output, which could decrease the global hunger rate by 12-17% (Gebre *et al.*, 2021) [9].

Live can be altered by emerging and better agriculture technologies, particularly of Asian smallholder farmers who extensively depends on agriculture. But women cannot access these smart technologies due to huge gender imbalance. Even small farming households are adopting modern agriculture technologies due to factors such as ageing farmer, relocation to cities and other countries, growing labor scarcity in rural areas, and rising agricultural wages rates (Rola-Rubzen *et al.*, 2020) [31].

For accessing Agricultural information through rural advisory services there is strong discrimination that exists between male farmer's and female farmers and due to this adoption of new technologies is less in female farmers. Typically, male farmers have easier access to advisory services and due to this they apply better fertilizer in the field, used better verities and adoption of new technologies is better in male farmers as compared to female farmers (Lari *et al*., 2023) [19]. In Pakistan women's often have access to advisory services this may be due to the fact that in Pakistan mostly households are headed by males and cultural and social norms are not suitable for women's.

Information and communication technologies (ICTs) have been incorporated into numerous projects in an attempt to distribute localized and timely information. ICT is an all-encompassing word that covers a wide range of various communication tools or apps. This could include satellite systems, radios, TVs, cell phones, and the numerous applications that go along with them, such video conferences and distance learning. Recent advances in technology have raised hopes that the effectiveness of development and humanitarian efforts will increase as a result of faster information dissemination (Sandvik *et al*., 2014) [35].

With 24.6% of rural women and 48.7% of rural men having access to the internet, the gender digital divide exposes the disparity in technology access between sexes. Financial,

social, cultural, mobility, access, control, and mobility restrictions prevent rural women from being fully empowered by technology (Saha *et al*., 2024) [34]. The digital gender gap has become a major and constant issue with the growth of digital economy. Through qualitative study, Jamil (2021) [13] pinpoints the contextual elements that are accountable for the growing digital gap in Pakistan. These variables include the difference between rural and urban locations, gender inequality, religious and cultural obstacles, and disparities in education and income. Additionally, the growing gender-based development disparities in Pakistan are caused by unequal access to the internet and mobile devices, which calls for the combined efforts of all stakeholders (Shahid and Arfeen, 2021) [36].

Gender disparities in agricultural information access are easily perpetuated in patriarchal nations due to sociocultural factors (FAO 2015). The availability of sufficient resources, particularly agricultural knowledge, is restricted for female farmers in Pakistan. It is extremely difficult to increase women's access to information in rural areas. Prior studies have shown that women farmers encounter not just a dearth of information sources to consult. (Hassan *et al*., 2007; Sadaf *et al*., 2006) [11, 32], however, most people consider the sources they do examine to be of low quality (Sadaf *et al*., 2006) [32].

Need of study

Both men and women's access to income is impacted directly and indirectly by modern technology, which also enhance their standard of living by increasing productivity and production. In contrast to males, women continue to adopt agricultural technologies at lower rates than men, despite the fast advancement of technology. It is acknowledged that closing the gender gap is a top priority in order to support agricultural development and progress, particularly in emerging nations. At the same time, most people agree that empowering women is essential to attaining gender equality, raising agricultural output, and demonstrating more significant development results. Empowering rural women and implementing agricultural technology may have a favorable effect on technical efficiency, which can lead to improved time and risk management, more productive use of resources, and increased output from female farmers. By increasing productivity and quality, Women's restricted access to wealth, land, labor, and time may be maximized. In this context, it is crucial to acknowledge gender roles and priorities when creating agricultural programs and efforts, as well as when developing and introducing new technologies. This study's objective is to look at the different aspects of digital gender divide, exposing how it impacts rural women's engagement in agriculture and purposing methods to implement it to develop the women society.

Objectives

- To identify the demographic characteristics of respondents
- To understand the extent and nature of the digital gender divide in rural areas, specifically in relation to woman's engagement in agriculture.
- To identify the barriers and challenges faced by rural women in accessing and using digital technologies for agricultural purposes.
- To explore the potential benefits and opportunities that digital technologies can offer for rural women in agriculture, such as improved access to markets, information, and resources.
- To compile research-based recommendations to promote digital devices regarding agriculture in the rural areas

Methodology

De Vaus, (2001) [7] claimed that the term "research design" refers to the overarching plan and analytical technique you have selected to logically and cogently combine the many study components, guaranteeing a full investigation of the research problem. It serves as the guide for gathering, calculating, and interpreting data and information. Interviewing respondents is a crucial part of survey research design since it elicits the necessary information from them and provides researchers with in-depth understanding for significant findings. The cross-sectional research design was used to conduct study. The study was conducted in Punjab province. Multi-stage sampling was used to conduct this study. At first stage, district Bhakkar was selected purposively, because in this area women were highly engaged in agriculture but had less access to the digital devices. Out of 4 tehsils of Bhakkar one tehsil Kallurkot was chosen conveniently, at second stage. At 3rd stage, three rural union councils were selected randomly out of 14 union councils. At 4th stage, from each selected union council, 2 villages and from each village 20 respondents of pulse growers and cattle breeders (10 males and 10 females) were selected by using snowball sampling. The data was collected through an Interview schedule and collected data was analyzed using SPSS. The instrument (interview schedule) was presented to a committee of experts from the Department of Agriculture (Extension and Adaptive Research) Punjab and the University of Agriculture, Faisalabad, Pakistan, in order to determine the face and content validity of the instrument and demonstrate the extent to which a measure covers the range of significance include within an assumed idea**.** It was chosen to pre-test the interview schedule by presenting it to 10 farmers in order to ensure its reliability. The research study's actual sample did not contain these ten farmers. The consistency with which a method measures something is known as reliability. A measurement is deemed trustworthy if the same outcome can be consistently obtained under the same conditions using the same techniques. An instrument's reliability can be assessed using a variety of techniques. The value of Cronbach's alpha was 0.752.

Results and discussion

The degree to which people used various digital tools to acquire information from these contemporary instruments depended on their age, gender, income, and ownership of land (Mwombe *et al*., 2014) [22]. Similarly, age, education, and income were found to be significant factors in determining which information sources farmers chose to obtain information from, according to reports from Jenkins *et al*. (2011) [14]. According to Khan (2010) [15], people get better at understanding commonplace events as they get older. As one ages, they naturally become more mature and

capable of making judgements with greater mental strength. Data depicted that most of the females (43.3%) were falling in the age category of 31-40 years. The second most prominent age category among females was 41-50 years. While 21.7% females were falling in 21-30 years age category and 11.7% were above 50 years old. Data showed that 78.3% females were above 30 years old. Data depicted that most of the males (38.3%) were falling in the age category of 41-50 years. The second most prominent age category among males was 31-40 years. While 16.7% males were falling in 21-30 years age category and 11.7% were above 50 years old. Data showed that 83.3% females were above 30 years old. The outcomes are comparable to those of Lamontagne-Godwin *et al*. (2018) [18]. According to their research, 69% of men and 72% of women were over 30.

Table 1: Demographic characteristics of respondents

	Male		Female	
Demographic attributes	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Age				
21-30	10	16.7	13	21.7
31-40	20	33.3	26	43.3
41-50	23	38.3	14	23.3
Above 50	07	11.7	07	11.7
Education				
Illiterate	14	23.3	19	31.7
Primary	13	21.7	16	26.7
Middle	12	20.0	10	16.7
Matric	16	26.7	11	18.3
Above matric	05	08.3	04	06.7
Farming experience				
1-5	06	10.0	12	20.0
6-10	28	46.7	17	28.3
11-15	16	26.7	26	43.3
16-20	07	11.7	03	05.0
Above 20	03	05.0	02	03.3
Tenancy status				
Owner	48	80.0	47	78.3
Owner-cum-tenants	12	20.0	13	21.7
Tenants	00	00	00	00
Major income sources				
Farming	14	23.3	24	40.0
Farming+ business	06	10.0	03	05.0
Farming+ job	04	06.7	02	03.3
Farming+ livestocks	36	60.0	31	51.7

According to Molin (2017) [21], one of the main barriers to technology adoption was educational attainment. This suggests that farmers' lower educational attainment will continue to reduce the chance of technology adoption. Data demonstrates that the vast majority of responders had varying levels of schooling when taken as a whole. i.e., 31.7% females and 23.3% males were illiterate, 21.7% males and 26.7% females had 5 years of schooling, 20% males and 18.3% females had 8 years of schooling, 26.7% males and 16.7% females had 10 years of schooling, while 8.3% males and 6.7% females had more than 10 years of schooling. More or less contradict results in the education were also observed by Lamontagne-Godwin *et al*. (2018) [18] that three quarters of women, but only 38% of men, were illiterate. Data showed that most of the females (46.7%) had 6-10 years of farming experience, while males (43.3%) had 11-15 years of farming experience. The second most prominent category among females was 11-15 years of experiences, while in males 6-10 years of experience. The experience above 20 years was almost negligible in both male and females. Data revealed that 78.3% males and 80% females had their land ownership. While 21.7% females and 20% males were owner-cum-tenants. Das and Ganesh-Kumar (2017) [6] revealed that there is a significant correlation between the increase in farmers' income and their off-farm and on-farm revenue streams. Some researchers viewed diversity of farms is beneficial to increase revenue. Farm diversification has a major part in raising incomes and reducing poverty. Data depicted that most of the males (60%) were dependent on farming and livestock for their earning. More than half (51.7%) females were dependent on farming and livestock. Farming was the 2nd most prominent source of income of both male (23.3%) and female (40%). Some were engaged in job (10% males and 5% females) and business (6.7% males and 3.3% females) along with farming.

Access to ICT's

Having ICTs in one's possession provides a wealth of opportunities for meeting information needs. It also allows users to reveal profound insights on how different ICTs are used and how effective they are. Respondents were asked if they possessed ICTs in this particular circumstance.

Table 2: Distribution of respondents according to access of respondents to ICT's

Access of respondents to ICT's	Male				Female			
ICT's Tools	**Yes**		**No**		**Yes**		**No**	
	f	***%***	***f***	***%***	***f***	***%***	***f***	***%***
Radio/FM	39	65	21	35	10	16.6	50	83.3
Smart phone	48	80	12	20	19	31.7	41	68.3
Laptop	18	30	42	70	5	8.3	55	91.7
Computer	11	18.3	49	81.7	4	6.7	56	93.3
Agri-helplines	14	23.3	46	76.7	3	5	57	95
Agri-websites	19	31.7	41	68.3	6	10	54	90
Internet	47	78.3	13	21.7	13	21.7	47	78.3
Fixed/landline Phones	6	10	54	90	2	3.3	58	96.7
Social Media	45	75	15	25	7	11.7	53	88.3
Tablets	26	43.3	34	56.7	2	3.3	58	96.7
TV	51	85	9	15	53	88.3	7	11.7
FB	45	75	15	25	11	18.3	49	81.7
Instagram	28	46.7	32	53.3	4	6.7	56	93.3
X (Twiter)	15	25	45	75	00	00	60	100
Whatsapp	46	76.7	14	23.3	15	25	45	75

The state of the respondents' various ICT tools is shown by the data in Table 2. A varied range of devices, including computers, radios, TVs, internet, and mobile and fixed phones, were owned by the respondents. One of the greatest inventions of the contemporary era is the mobile phone, which is widely used these days. As a result, 80 percent of the men who responded owned mobile phones with various features. Additionally, 85% of the male respondents admitted to owning a TV. 65% of respondents were male and owned radio or FM. About 78.3, 76.7 and 75% male respondents were using internet, FB and whatsapp, respectively. While the use of twitter, fixed landlines, computer, agri-helplines and websites was very low among male farmers. While, data depicted that most of the females

(88.3%) were used TV and 31.7% were using smart phones. The use of other ICT's was very low near to negligible among female farmers due to several challenges that were discussed below.

Prodhan and Afrad (2015) [29] reported the male gender has greater access to mobile phones (75.00%), televisions (33.33%), radios (29.17%), CDs and DVDs (19.17%), cameras (10.87%), computers and the internet (5.03%) than the female gender has. This study typically showed that access to modern ICTs was limited for both genders, with the exception of mobile phones, where access was rather significant. This suggests that, similar to mobile phones, modern ICTs like computers and the internet will flourish and expand even to rural regions if the right conditions are given for them.

Extent of use of ICT

The extent of use of various ICTs was questioned of the respondents. On a five-point Likert scale, with 1 denoting extremely low, 2 low, 3 medium, 4 high, and 5 very high, their answers were recorded.

Table 3: Distribution of respondents according to extent of use of ICT's by the respondents

Extent of use of ICT	Male			Female		
ICT's	Weighted score	Mean	SD	Weighted score	SD	Mean
Radio/FM	185	3.08	1.51	86	0.81	1.43
Smart phone	248	4.13	0.96	100	1.08	1.67
Laptop	136	2.27	1.20	74	0.62	1.23
Computer	163	2.72	1.09	68	0.50	1.13
Agri-helplines	154	2.57	0.96	64	0.25	1.07
Agri-websites	156	2.60	1.09	64	0.25	1.07
Internet	210	3.50	1.22	93	0.85	1.55
Fixed/landline Phones	97	1.62	1.09	60	0.00	1.00
Social Media	156	2.60	1.09	70	0.52	1.17
Tablets	151	2.52	1.09	63	0.22	1.05
TV	214	3.57	0.96	243	0.89	4.05
FB	252	4.20	0.60	74	0.67	1.23
Instagram	120	2.00	0.66	63	0.22	1.05
X (Twiter)	79	1.32	1.34	60	0.00	1.00
Whatsapp	256	4.27	0.63	81	0.93	1.35

According to the data, whatsapp, facebook and an ICT that was popular and extensively used was the cell phone. It was classified as having a mean value of high usage 4.27, 4.20 and 4.13. TV appeared 4th leading ICT under use of male respondents with mean value 3.57 inclined from medium to high. Use of internet among male respondents was also prominent with 3.50 mean score inclined to high. Use of agri-helplines and websites were same depressing, supported by the average value of 2.57 and 2.60 which is hardly approaching towards medium level. But the use of social media, fixed/landlines, computer, laptop, intsagram, twitter(X), tablets was almost negligible. The results are consistent with those of Agwu *et al*. (2008) [2], who found that farmers heavily used mobile phones, TVs, and radios as information sources. Among female respondents the use of TV was most prominent with mean value 4.05. But the use of other ICT's was below average that lead to very low. This situation implies that the access of females to ICT's was very low in the study area. Males are more likely than females to use the mobile phones that are present in their homes (91 versus 70%). This disparity is most noticeable in the Tharparkar district, where 71% of men and only 5% of women who live in homes with cell phones truly use them (Zainudeen *et al*., 2008) [39]. The use of agricultural helplines, websites, and the internet was depressing because the mean values were hardly at all low. While fixed phone use was at a very low level, social media and computer use was slightly above that. The results of Kodagavallihatti *et al*. (2016) [17], who revealed a poor usage of social media and the internet to obtain information about farm operations, corroborate the findings. This suggests that, except from their cell phones, respondents in the research area were not very accustomed to using modern technologies.

Barriers and challenges faced by rural women in accessing and using ICT's for agriculture purposes

Kim *et al*., (2010) [16] found that the main barriers to internet use were inadequate infrastructure, inadequate connectivity, and a shortage of experts with the necessary skills to provide instructional materials. To ensure that rural women take full advantage of these ICTs, It is critical to comprehend the challenges they encounter when utilizing ICTs.

Women face numerous challenges in accessing Information and Communication Technologies (ICTs), each varying in severity and impact. At the forefront is the lack of education, which stands as the most significant barrier. This issue, with a weighted score of 273 and a mean of 4.55, is consistently highlighted by women, suggesting a critical need for educational reforms and opportunities to bridge the digital divide. The standard deviation of 50 indicates that this is a widely recognized problem across different groups. Close behind is the lack of infrastructure, scoring 254 with a mean of 4.23. This challenge reflects the absence of necessary technological frameworks in many regions, making it difficult for women to connect to and benefit from ICTs. The relatively low standard deviation of 42 underscores a general consensus on this issue's importance.

Table 4: Distribution of respondents according to challenges faced by women in accessing ICT's

Challenges faced by women in accessing ICT's	Weighted score	Mean	SD	Rank
Lack of education	273	4.55	0.50	1
Lack of infrastructure	254	4.23	0.42	2
Gender discrimination	253	4.22	0.94	3
Lack of governmental policies	239	3.98	0.83	4
Male dominance	234	3.90	1.20	5
Expensive internet packages	226	3.77	0.92	6
Religion	225	3.75	0.93	7
Lack of training	221	3.68	1.06	8
Low farm wages for rural female	220	3.67	0.47	9
Lower internet speed	220	3.67	1.05	10
Lack of awareness	194	3.23	0.78	11
Affordability	192	3.20	0.79	12
Cultural norms	191	3.18	1.33	13
Lack of land ownership	182	3.03	1.07	14
Language barrier	173	2.88	1.19	15

Gender discrimination emerges as the third major challenge, with a weighted score of 253 and a mean of 4.22. The higher standard deviation of 0.94 suggests varying experiences of discrimination, but it remains a prevalent issue affecting women's access to technology. Lack of governmental policies is another significant barrier, with a score of 239 and a mean of 3.98. This highlights the need for more supportive and inclusive policies that encourage women's participation in the digital economy. The standard deviation of 0.83 indicates some variation in how this issue is perceived. Male dominance**,** with a score of 234 and a mean of 3.90, reflects the societal structures that often prioritize men's access to technology over women's. The higher standard deviation of 1.20 suggests that this issue is more pronounced in certain areas or communities. Other notable challenges include the lack of awareness (194, mean 3.23), affordability (192, mean 3.20), and cultural norms **(**191, mean 3.18). These issues highlight the need for broader educational and cultural shifts to improve women's access to ICTs.

The challenges women face in accessing ICTs are multi-faceted, spanning educational, infrastructural, economic, cultural, and policy-related barriers. Addressing these issues requires a holistic approach that considers the diverse and intersecting factors impacting women's digital inclusion. Understanding the difficulties they face in using ICTs is crucial. Partey *et al*. (2020) [26] noted that women in some regions of northern Ghana were dependent on their husbands to buy agricultural inputs and mobile phones. So, whether or not they will get access depends on how willing their husbands are. Cultural norm barriers were also clearly visible. For example, in Nigeria's e-wallet system, Uduji *et al*. (2019) [38] revealed that the requirement for husbands' consent and cultural barriers made married women less likely to participate. When it comes to mobile phones, over 40% of female respondents who live with them said they can't make calls without the male owners' consent. Similar results were found in the research of Pebiyanti and Latif (2022) [28], main problems as reported by the respondents were lack of training on use of ICTs (94.00%) technical illiteracy with regards to computer (90.00%), lack of knowledge on operating ICTs (89.00%) and high cost of repairing ICTs (86.00%), ICT services (Kiosks/Internet Cafe) far away and high cost of net packs (86.00%). Respondents also expressed the problem of lack of repairing centers in the area (83.00%), lack of awareness about ICTs (81.00%) and language problem (76.00%).

Benefits perceived by respondents regarding the use of ICT's

Respondents' perception regarding effect of ICTs on improving information access was asked to know whether rural women perceive ICTs as beneficial or of no use.

Table 5: Distribution of respondents according to benefits perceived by respondents regarding the use of ICT's

Benefits	Weighted score	Mean	SD	Rank
Easy access of information	267	4.45	0.50	1
Reduced gender disparities	266	4.43	0.50	2
Increased social awareness	260	4.33	0.68	3
Improve farming skills	247	4.12	0.58	4
Reduction in transaction costs	246	4.10	0.57	5
Filled the gap among farmer and extension field staff	240	4.00	0.84	6
Connect globally	227	3.78	0.41	7
Provide accurate information	226	3.77	0.92	8
Provides timely information	225	3.75	0.93	9
Risk management	225	3.75	0.93	10
Farm management	219	3.65	0.48	11
Reduced labor cost	213	3.55	0.69	12
Increased income generation facilities	205	3.42	1.07	13
Increase Efficiency	201	3.35	0.82	14
Advertise products globally	200	3.33	0.68	15

Enhance skills	199	3.32	0.67	16
Improve agricultural productivity	187	3.12	0.73	17
Better communication	186	3.10	0.75	18
Easy to use	182	3.03	0.96	19
Cheaper source of information	178	2.97	1.07	20

Data depicted that the respondents reported that following benefits were perceived by using ICT's, easy access of information (mean=4.45), reduction in gender disparities (mean=4.43), increase in social awareness (mean=4.33), improve farming skills (mean=4.12), reduction in transaction costs (mean=4.10), filled gap among farmers and extension field staff (mean=4.00), connect globally (mean=3.78), provide accurate information (mean=3.77), provide timely information (mean=3.75), risk management (mean=3.75), farm management (mean=3.65), reduced labor cost (mean=3.55), that inclined to high rate.

Otter and Thruvsen (2013) [24] had documented the beneficial effects of email, internet, and mobile services on farm and farmer development. A superior source of agricultural information was thought to be mobile. Nagaman *et al*., (2016) [23] found that 90.00%respondents perceived that ICT increases knowledge, 86.00%perceived ICT as helpful in increasing information flow, 85.00%perceived that it improves information seeking behavior, enhances accuracy of information (73.00%), improves quality of information (72.00%), improves awareness of agricultural events and news (64.00%), helpful in collecting lot of information within time (61.00%) and enhances timeliness of information (55.00%). Singh *et al*., (2018) [37] reveals that 53.00%respondents perceived that ICT reduces male-female digital divide, 50.00%expressed that it enhances timely feedback, improves access to agricultural inputs and reduces rural-urban digital divide. Thus, it can be interpreted that rural women perceived positively towards the effect of ICT on their life with regards to increasing knowledge, increasing information flow, improves information seeking behavior, enhances accuracy of information, and improves awareness of agricultural events and news, helpful in collecting lot of information within time.

Opportunities for women by using ICT's

Table 6: Distribution of respondents according to opportunities for women by using ICT's

Opportunities for women by using ICT's	Weighted score	Mean	SD	Rank
Women Empowerment	260	4.34	0.94	1
Direct access to markets	253	4.22	0.41	2
Diversify earning opportunities	246	4.10	0.57	3
Value addition of products	233	3.88	0.73	4
Entrepreneurship	232	3.87	0.74	5
Fighting against violence, harassment	227	3.78	0.94	6
Flexible and mobile working opportunities	226	3.77	0.42	7
Earning through social media channels	214	3.57	.050	8
E-learning platforms	194	3.23	0.78	9
E-commerce	178	2.97	1.07	10

By the involvement of ICT's several opportunities were generated for women other than agriculture. At the forefront of these opportunities is women empowerment, which achieved the highest rank with a weighted score of 260, a mean score of 4.34, and a standard deviation of 0.940. This indicates a strong consensus on the significant role ICTs play in empowering women. Following closely is the opportunity for direct access to markets, which earned a weighted score of 253, a mean of 4.22, and a notably low standard deviation of 0.415, reflecting a consistent agreement on its importance. Next, diversifying earning opportunities stands out with a weighted score of 246, a mean of 4.10, and a standard deviation of 0.57, highlighting its potential in broadening income sources for women. The value addition of products is ranked fourth, with a weighted score of 233, a mean of 3.88, and a standard deviation of 0.73, indicating its effectiveness in enhancing product value through ICT. Close behind, entrepreneurship holds the fifth spot with a weighted score of 232, a mean of 3.87, and a standard deviation of 0.74, showcasing its role in fostering business ventures among women. ICTs also provide significant support in fighting against violence and harassment, ranking sixth with a weighted score of 227, a mean of 3.78, and a standard deviation of 0.94, emphasizing its crucial role in promoting safety and security. The provision of flexible and mobile working opportunities follows, with a weighted score of 226, a mean of 3.77, and a low standard deviation of 0.42, reflecting the adaptability it offers to women's work environments. Earning opportunities through social media channels are also notable, with a weighted score of 214, a mean of 3.57, and a standard deviation of 0.50, underscoring the financial benefits of social media engagement. E-learning platforms provide educational benefits, ranked ninth with a weighted score of 194, a mean of 3.23, and a standard deviation of 0.78, indicating their role in enhancing learning opportunities. Lastly, e-commerce holds the tenth position with a weighted score of 178, a mean of 2.97, and the highest standard deviation of 1.07, reflecting diverse opinions on its impact. This comprehensive analysis underscores the multifaceted benefits that ICTs offer to women, from empowerment and market access to entrepreneurship and flexible work arrangements.

Conclusion

The study's conclusions show that men have more access to mobile phones, televisions, radios, and other devices than women do, agri-helplines, agri-websites, whatsapp,

facebook, instagram, twitter, laptop, social media, and computer/internet. This study typically showed that access to modern ICTs was minimal for both genders, with the exception of TV, where access to ICTs was comparatively significant. Additionally, a large gender gap was observed in the access of males and females to ICTs, with the male gender predominating.

In the research area, challenges faced by male and female farmers are similar, but they disproportionately affect the former. In order to promote social and economic change as well as agricultural and rural development, information is crucial. The findings of this study regrettably show that, in comparison to their male counterparts, female genders in Bhakkar District who engage in more agricultural activities have less access to information and communication technologies (ICTs). The following suggestions can be used to address the gender gap in the study area's access to ICTs:

Recommendations

- Participation of women in the formation of agricultural policy and decision-making, particularly at the local government area (LGA) level where access to ICTs and other production factors are a major concern.
- Empowering rural women to increase agricultural productivity, which will raise their socioeconomic standing and enable them to purchase some of these ICT amenities.
- The education of girls and adult women in the study region is crucial because it contributes to the empowerment of women and their advancement in obtaining access to ICTs. particularly with regard to computer literacy initiatives.
- In order to make ICT infrastructure, such as televisions, phones, computers, and other accessories, affordable for both male and female farmers at the grassroots level, the government should step up its efforts to liberalize and deregulation of the economy.

References

1. Agriculture Victoria. What is digital agriculture? [Internet]. Available from: https://agriculture.vic.gov.au/farm-management/digital/agriculture/what-is-digital-agriculture. [Accessed June 2021].
2. Agwu AE, Uchemba UC, Akinnagbe OM. Use of information and communication technologies (ICTs) among researchers, extension workers and farmers in Abia and Enugu states: Implications for a national agricultural extension policy on ICTs. J Agric Ext. 2008;12:37-49.
3. Azam A, Shafique M. Agriculture in Pakistan and its impact on economy. Int J Adv Sci Technol. 2017;103:47-60.
4. Balamurugan S, Divyabharathi N, Jayashruthi K, Bowiya M, Shermy RP, Shanker R. Internet of agriculture: Applying IoT to improve food and farming technology. Int Res J Eng Technol. 2016;3:713-9.
5. Butt TM, Hassan ZY, Mehmood K, Muhammad S. Role of rural women in agricultural development and their constraints. J Agric Soc Sci. 2010;6:53-6.
6. Das VK, Ganesh-Kumar A. Drivers of farmers' income: The role of farm size and diversification. Indira Gandhi Institute of Development Research; c2017. Report No.: 2017-013.
7. De Vaus DA. Research design in social research. London: SAGE; c2001.
8. Food and Agriculture Organization, International Fund for Agricultural Development, World Food Programme. The state of food insecurity in the world 2015: Meeting the 2015 international hunger targets: Taking stock of uneven progress. FAO; c2015.
9. Gebre GG, Isoda H, Rahut DB, Amekawa Y, Nomura H. Gender differences in agricultural productivity: Evidence from maize farm households in southern Ethiopia. GeoJournal. 2021;86:843-64.
10. GSMA. The Mobile Gender Gap Report 2022. [Internet]. Available from: https://www.gsma.com/r/wpcontent/uploads/2022/06/The-Mobile-Gender-Gap-Report-2022.pdf?utm_source=website&utm_medium=download-button&utm_campaign=gender-gap-2022. [Accessed December 2023].
11. Hassan MZY, Ali T, Ahmad M. Determination of participation in agricultural activities and access to sources of information by gender: A case study of district Muzaffargarh. Pak J Agric Sci. 2007;44(4):664-9.
12. Jabeen S, Haq S, Jameel A, Hussain A, Asif M, Hwang J. Impacts of rural women's traditional economic activities on household economy: Changing economic contributions through empowered women in rural Pakistan. Sustainability. 2020;12:2731.
13. Jamil S. From digital divide to digital inclusion: Challenges for wide-ranging digitalization in Pakistan. Telecomm Policy. 2021;45(8):102206.
14. Jenkins A, Velandia M, Lambert DM, Roberts RK, Larson JA, English BC. Factors influencing the selection of precision farming information sources by cotton producers. Agric Econ Res Rev. 2011;40:307-20.
15. Khan GA. Present and prospective role of electronic media in the dissemination of agricultural technologies among farmers of the Punjab, Pakistan. PhD Thesis, Department of Agricultural Extension, University of Agriculture, Faisalabad; c2010.
16. Kim L, Niewolny KL, Lillard PT. Expanding the boundaries of beginning farmer training and program development: A review of contemporary initiatives to cultivate a new generation of American farmers. J Agric Food Syst Community Dev. 2010;1:1-65.
17. Kodagavallihatti PM, Mahanthesh BS, Dechamma S. Attitude of farmers about use of ICT tools in farm communication. J Agric Food Syst Community Dev. 2016;1:1-65.
18. Lamontagne-Godwin J, Williams FE, Aslam N, Cardey S, Dorward P, Almas M. Gender differences in use and preferences of agricultural information sources in Pakistan. J Agric Educ Ext. 2018;1389-224X.
19. Lari S, Yamagani P, Pandiyan A, Vanka J, Naidu M, Senthil Kumar B, *et al*. The impact of the use of personal protective equipment on the minimization of effects of exposure to pesticides among farm workers in India. Front Public Health. 2023;11:1075448.
20. Meena HR, Singh YP. Importance of information and

communication technology tools among livestock farmers: A review. J Pure Appl Sci. 2013;2:57-65.
21. Molin JP. Agricultura de precisão: Números do mercado Brasileiro. [Internet]. Available from: http://www.agriculturadeprecisao.org.br/upimg/publicacoes/pub_-boletim-tecnico-03---agricultura-de-precisao-numeros-do-mercado-brasileiro-11-04-2017.pdf. [Accessed January 2024].
22. Mwombe SOL, Mugivane FI, Adolwa IS, Nderitu JH. Evaluation of information and communication technology utilization by smallholder banana farmers in Gatanga District, Kenya. J Agric Educ Ext. 2014;20:247-61.
23. Nagaman TS, Veni GK. ICTs for the empowerment of rural women: A review. Int J Comput Sci Technol. 2016;7(2):166-70.
24. Otter V, Theuvsen L. ICT and farm productivity: Evidence from the Chilean agricultural export sector. In: Clasen M, Hamer M, Lehnert S, Petersen B, Theuvsen B, editors. IT-Standards in der Agrar- und Ernährungswirtschaft; Fokus: Risiko- und Krisenmanagement. Bonn: Bonner Köllen Verlag; c2013. p. 113-6.
25. Pakistan Telecommunication Authority. Annual report 2021. [Internet]. Available from: https://www.pta.gov.pk/assets/media/pta_annual_report_2021_01032022.pdf. [Accessed June 10, 2022].
26. Partey ST, Dakorah AD, Zougmoré RB, Ouédraogo M, Nyasimi M, Nikoi GK, Huyer S. Gender and climate risk management: Evidence of climate information use in Ghana. Clim Chang. 2020;158:61-75.
27. Patel D. Digital India reaching to small, marginal & women farmers. Int J Res Granthaalayah. 2016;4:109-21.
28. Pebiyanti TN, Latif IP. Empowerment of women farming group through digital marketing in Kentolan Lor, Pajangan District, Bantul Regency. In: ACCEPT: Annual Conference on Community Engagement for Peaceful Transformation; c2022. p. 204-209.
29. Prodhan FA, Afrad MSI. Gender issues and access to ICTs for agricultural farming and rural development in Gazipur District of Bangladesh. New India Publishing Agency; c2015. p. 261-70.
30. Rijswijk K, Klerkx L, Bacco M, Bartolini F, Bulten E, Debruyne L. Digital transformation of agriculture and rural areas: A socio-cyber-physical system framework to support responsibilisation. J Rural Stud. 2021;85:79-90.
31. Rola-Rubzen MF, Paris T, Hawkins J, Sapkota B. Improving gender participation in agricultural technology adoption in Asia: From rhetoric to practical action. Appl Econ Perspect Policy. 2020;42:113-25.
32. Sadaf S, Asif J, Muhammad L. Preferences of rural women for agricultural information sources: A case study of district Faisalabad, Pakistan. Pak J Agric Soc Sci. 2006;2(3):145-9.
33. Saghir A, Ashfaq M, Noreen A. Gender and information and communication technologies (ICTs). J Anim Plant Sci. 2009;19(2):94-7. Available from: https://www.apc.org/en/system/files/Genardis_EN.pdf.
34. Saha P, Prusty AK, Nanda C. Extension strategies for bridging gender digital divide. J Appl Biol Biotech. 2024;12(4):76-80.
35. Sandvik KB, Gabrielsen Jumbert M, Karlsrud J, Kaufmann M. Humanitarian technology: A critical research agenda. Int Rev Red Cross. 2014;96:219-42. https://doi.org/10.1017/S1816383114000344.
36. Shahid S, Arfeen B. Bridging the gender and digital divide in post COVID-19. Empowering Women Through ICT; c2021.
37. Singh R. Gender issues are central to the empowerment dialogue. Comments to Digital Opportunity Channel: Providing opportunity to all. Ministry of Agriculture, Government of India; c2018.
38. Uduji JI, Okolo-Obasi EN, Asongu SA. Growth enhancement support scheme (GESS) and farmers' fertilizer use in rural Nigeria. Afr Dev Rev. 2019;31:348-63.
39. Zainudeen ZA, Iqbal T, Samarajiva R, Ratnadiwakara D. Who's got the phone? The gendered use of telephones at the bottom of the pyramid. LIRNEasia; Colombo; c2008.