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Paddy farmers' knowledge, perception, and satisfaction on the use of Information and Communication Technology (ICT) tools in Nepal

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ABSTRACT

Information and communication technology (ICT) tools such as radio, television, mobile phone, the internet, computers are gaining momentum in the development discourse of the agriculture sector in Nepal. In agriculture extension, ICT tools fill the void that traditional agriculture extension cannot address. So, this study aimed at assessing the paddy farmers' knowledge, perception, and satisfaction on ICT tools in Jhapa, Kapilbastu, and Kailai districts following a multistage purposive sampling method. A survey research design was used for the study. Pretested semi-structured interview schedule was employed to randomly selected 390 sample respondents. Descriptive statistics along with the appropriately developed scales were used in the data analysis. The findings revealed that respondents were moderately aware (0.44) of the significant roles of ICT tools. Respondents do have more knowledge on the radio (0.87), TV (0.85), and mobile phones (0.76), whereas the majority possess TV (94%), radio (93%), and mobile phones (88%) among ICT tools. Farmers from Bardiya were more aware of the roles of ICT as compared to other study districts. Likewise, Radio and TV were the primary ICT tools used for agriculture-related information. Respondents had high skills in using radio and TV for information but poor skills in using the computer in all study districts. Most of the respondents positively perceived (0.14) ICT tools and were satisfied (0.23) with them, but their use was limited to radio, TV, and mobile phones. In addition, farmers of Kapilbastu districts were less satisfied with the use of ICT tools as compared to other study districts.

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Introduction

This study is about the knowledge, perception, and satisfaction of Information and Communication Technology (ICT) tools in Agriculture in Nepal.

The agriculture sector's contribution to the economy has been gradually declining. It was 30.27 percent in 2014 AD, and it has been declining steadily since then to 24.26 percent in 2019 AD (MoALD, 2019).

Application of Information and Communication Technology (ICT) to various sectors improved work efficiency and productivity. Like other economically contributing areas, agriculture is now experiencing the tremendous application of ICT in all aspects. Daum (2020) revealed that it had become one of the critical tools used by the farmers to manage various information related to input factors like land, labor, capital and soil. Using this information, they can identify and find problems and solutions faced by them regarding agriculture such as natural disasters, outbreaks, farming, marketing, insect pests, and diseases. (Anh et al., 2019).

The government can resolve agriculture related challenges like farmers' communication, valuation and taxation by using ICT (Daum, 2020). The popularity of ICT applications in agriculture across the globe is gaining popularity and transforming the sector's business.

Compared to a decade earlier, the agriculture sector has experienced a new technological revolution, responding to farmers' needs accurately and swiftly. Wolfert et al. (2017) found that e-commerce, agro-advisory apps, computational power, and satellite systems like remote sensing are significant technological advancements that help quicken communication and information sharing among farmers. Mobile phones, having internet connectivity, especially smartphones, are the most widely used ICT devices among other tools across the globe (O'Dea, 2020). According to O' Dea (2020), the number of smartphone users worldwide was 3.2 billion in 2019 and is forecasted to reach 3.8 billion by 2021, and developing countries have the highest share of smartphone users worldwide. The speed of growth of the ICT application in every sector of the world leads to the

development of ICT application in the agriculture sector too for faster access the information by farmers, extension workers, and other stakeholders (O'Dea, 2020).

The primary function of the extension includes the dissemination of information, ideas, innovations, and technologies related to farms and agriculture to farmers and rural people. International Food Policy Research Institute (IFPRI) glorifies the role of agricultural extension in promoting productivity, increasing food security, improving rural livelihoods, and promoting agriculture as a pro-poor economic growth engine (IFPRI, 2020).

Improved agricultural production improves income, positively affecting the access to food supply contributing to agricultural sustainability by improving agricultural practice. (OECD and FAO, 2015). Nepal is an agrarian country, although its economy has witnessed considerable diversification over the years (FAO, 2017). Agriculture is one of the dominant economic sectors of the country, it contributes about 24.26% of the Gross Domestic Product (GDP), and 75% of the rural people are associated with agriculture (MoALD, 2021).

Despite the more significant role of agriculture in the economy and food security, the country has not realized its real agricultural production potential as it is much lower than many other countries. Moreover, the considerable gap between the actual yield and potential yield is attributed to the lack of modern technologies and this gap can be narrowed down with improved agricultural production by adopting the recommended modern technologies (Waqas et al., 2017; Ahmad et al., 2016). Therefore, farmers need more exposure to information to positively influence their adoption behavior (Musingafi and Zebron, 2014).

The primary methods of agricultural extension classified are; individual, group, and mass extension methods. (FAO, 2017). Nevertheless, due to the global movement and changing scenario, agricultural extension is taking a new path to reform extension systems, especially in developing countries (Musingafi and Zebron, 2014). ICT tools play an essential role in improving the information in quality affairs of market information and agricultural development, particularly in developing countries (Casaburi et al., 2014). In Nepal, agrarian extension staff uses different mechanisms for disseminating knowledge among the farming community.

ICT is an electronic bridge between farmers and extension workers (Chavula, 2014). It assists farmers to obtain a better price to produce and saves from exploitation from the middlemen (Anoop et al., 2015). Out of many ICTs, mobile phones serve as a vital technology to transfer farming knowledge and information to improve farming output and make easy access to the market (Chhachhar et al., 2014). Additionally, an enthusiast farmer adopting new agricultural technologies becomes the focal point of agricultural extension (Muddassir et al., 2016).

Less use of ICTs, non-availability of funds, improper transportation facilities, lack of training, and interactions are the major problems facing the agricultural extension system in Nepal. Hence dissemination of agrarian information would be decreased. (Yaseen et al., 2015). The primary barrier between farmers and extension field staff is physical distance and logistics. So, in this context, strengthening extension services with the effective use of electronic media seems indispensable. Electronic communication (Radio, TV) can play a vital role in disseminating essential information to the farmers in an urgent and emergency. Thus, farmers and rural people be quickly informed regarding various farm activities. For example, a study conducted in Kenya showed that the ICT-based market information systems (MIS) project positively and significantly affected purchased seed, fertilizer, labor productivity, and land productivity (Ogutua, 2014).

Globally, the importance of digital tools to enhance smallholder farmers' adaptive capacity and resilience (SHF) is increasing. For this reason, the World Summit on the Information Society (WSIS) decided to make e-agriculture a priority (International Telecommunication Union, 2009). Digital technologies have the "potential to end global poverty and hunger faster, including in rural parts of developing countries, where most people earn their living from agriculture" (Kremer and Houngbo, 2021). Various new digital applications, such as Connected Farmer and Esoko or Tigo Kilimo (Tanzania), are now accelerating interventions to improve productivity and growth in the agricultural sector (Warshauer, 2016). For example, in South Africa, the AgriCloud Application (2019) by Rain For Africa (R4A) provides "advisory services to rural people based on available weather and climate information at their location so that they can improve the quality of agriculture" (R4A, 2021). Various data related to weather are available with automatic weather stations, weather forecasts, weather radar, and forecast modeling output (Kroese, 2019).

The primary ICT tools available in the agricultural sector include cell phones, television, radio, internet, and landline phones (Subashini & Fernando, 2017). Although farmers for agricultural-related information and knowledge quickly access all, cell phones are widely used for communication, marketing, and contacting subject-matter specialists on a real-time basis for information (Syiem & Raj, 2015).

"Food production is risky due in part to limited information about weather patterns, soil characteristics, future market demand, and other variables" (World Bank, 2011). With limited information, farmers' decisions based on intuition are often less efficient than they could be. Moreover, many traditional methods for predicting and adapting to the changing climate are not adequate and reliable (Ackom, 2014). Several studies (Aleke and Nhamo, 2016; Ospina and Heeks, 2010; Shabajee et al., 2014) explored the following uses of ICT in farming:

- Providing early warning systems for climate change
- Sharing knowledge of adaptation among concerned people
- Raising awareness of climate-related risks
- Co-ordinating disaster information
- participation and support to develop adaptation policies
- Providing training in floods and risk management
- Providing data to aid adaptation decision-making and
- Collecting and analyzing information for vulnerability assessments

Many studies (Chikaire et al., 2017; Nzonzo and Mogambi, 2016) reveal SHFs inadequate ICT literacy skills to integrate ICT into their farming practices.

Therefore, poor ICT literacy skills and farmers' poverty are possible barriers to ICT adoption in agriculture.

The rapid emergence of modern information and communication technologies (ICT) has substantially changed the skills needed to successfully communicate and work in contemporary agriculture.

Advanced computer technologies and the diffusion of smartphones and internet applications in farm activities have fundamentally changed how people find, process, and evaluate information. The massive amount of knowledge that is electronically accessible today also created new affordances of information use that allow people to successfully live in and cope with the demands of a technological world. These new skills have been termed as digital competencies.

Among all these this study aims to study the knowledge, attitude and perception of the paddy farmers regarding the use of ICT tools along with the satisfaction of the farmers while using ICT tools.

Research Methodology

A survey research design was used for the study. Three districts, namely Jhapa, Kapilbastu, and Bardiya, were purposively selected as the study site as identified by Prime Minister Agricultural Modernization Project (PMAMP) as a superzone for paddy as paddy is considered the most important cereal crop in Nepal. A multistage sampling procedure was followed for the study. After finalization of the districts, respective local levels (palika) and groups were identified after the vigorous discussion with stakeholders purposively. Altogether 390 households were randomly sampled, 130 from each district. The Household Survey, Focused Group Discussion (FGD) and Key Informants Interview (KII) were the methods, whereas semi-structured pre-tested Interview Schedules and Checklist were the instruments used for primary data collection. Published articles, journals, and publications of other various sources were used for secondary data. Descriptive statistics and appropriate scaling techniques were used to analyze the collected data after they were adequately cleaned and managed. Knowledge of ICT tools was measured on yes, no upon the various types of ICT tools considered in the study. At the same time, the appropriate five-point rating scale was developed for both perception and satisfaction upon various statements asked. Later, index values were calculated to rank the perception and satisfaction of the respondents on ICT tools.

Results and Discussion

Demographic characteristics of the respondents showed that the average age of the respondents was 47.62 years that ranged from 20 years to 82 years, having a standard deviation of 11.79 yrs. The majority (54.6%) of the respondents were up to 48 years, and 45.4% were more than 48 years. (see table 1) Many researchers suggested that age is a critical factor that plays an essential role and is positively correlated with information dissemination, innovation adoption, and transfer of technologies. Older farmers are more resistant to change than the younger farmers, and the former hardly accept and adopt innovations quickly, resulting a slower adoption rate (Crusan et al., 1982; Habib et al., 2007).

Study showed that male respondents were higher (66.7%) compared to female respondents (33.3%). Findings revealed that 14.6% of the respondents were illiterate whereas 28.2% of the respondents only can read and write, followed by 24.1% of the respondents having education level of SLC and 15.9% of the respondents having education less than SLC, and 10 % of the respondents had an intermediate level of education. (see table 1) The overall literacy rate was encouraging. Educated people have more favorable attitudes towards agricultural skills, knowledge, and information than uneducated ones (Hassan, 1991 and Habib et al., 2007). Results revealed that the average landholdings of the respondents were 0.93ha ranging from 0.1 ha to 5 ha. A majority (82.1%) of the respondents hold 0.17ha to 1.69ha of the land, followed by respondents (11%) holding more than 1.69ha of land, and then 6.9% of the respondents hold less than 0.17ha of the land (see table 1). More landholdings mean more potential to increase productivity and efficiency to adopt modern technologies.

The size of land holdings plays an essential role in disseminating and adopting modern agricultural practices among the farming community. Results also showed agriculture only and livestock as the primary occupation in the study area, having 41% and 44.9% of the respondents respectively.

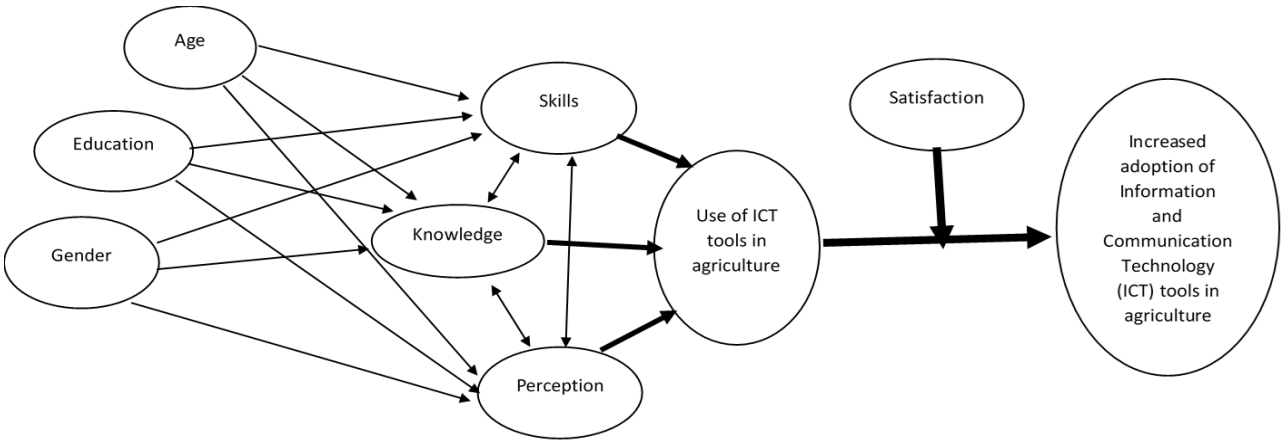

Figure 1. Conceptual framework of the study

Table 1. Respondents various social characteristics

Characteristics		Frequency	Percentage
Gender	Male	260	66.7
	Female	130	33.3
	Min:20yrs, Max: 82yrs	Avg: 47.62 yrs	Std: 11.793 yrs
Age	Young (below 48yrs)	213	54.6
	Adult	177	45.4
Educational level	Illiterate	57	14.6
	Only read and write	110	28.2
	Less than SLC	62	15.9
	SLC level	94	24.1
	Intermediate level	39	10.0
	More than intermediate	28	7.2
Occupation	Agriculture	160	41.0
	Agriculture and Livestock	175	44.9
	Skilled Occupation	9	2.3
	GO service	18	4.6
	Business	21	5.4
	Wage labor	6	1.5
	Private service	1	0.3
	Min: 0.1ha, Max: 5ha	Avg: 0.93ha	Std: 0.76ha
Total land area	Low (less than 0.17ha)	27	6.9
	Medium (0.17-1.69)	320	82.1
	High (more than 1.69)	43	11

Source: Field Survey, 2020

Table 2. Respondents' knowledge and possession of ICT tools in study districts

SN	ICT tools	Knowledge level of the ICT tools					Possession of the ICT tools				
		Jhapa	Kapilbastu	Bardiya	Mean	Rank	Jhapa	Kapilbastu	Bardiya	Mean	Rank
1	Radio	0.92	0.88	0.80	0.87	I	0.95	0.86	0.90	0.90	II
2	TV	0.89	0.88	0.77	0.85	II	0.94	0.95	0.83	0.91	I
3	MP	0.68	0.86	0.73	0.76	III	0.70	0.92	0.95	0.85	III
4	Smartphones	0.52	0.62	0.52	0.55	IV	0.46	0.51	0.58	0.52	IV
5	Tele phones	0.47	0.67	0.43	0.52	V	0.30	0.08	0.35	0.24	IX
6	Newspaper	0.32	0.74	0.52	0.52	V	0.26	0.27	0.33	0.29	VII
7	Posters	0.10	0.62	0.45	0.39	VIII	0.06	0.17	0.28	0.18	XII
8	Booklets	0.09	0.58	0.43	0.37	IX	0.06	0.21	0.27	0.19	XI
9	Pamphlets	0.20	0.54	0.36	0.37	IX	0.15	0.13	0.27	0.18	XII
10	Computers	0.33	0.48	0.27	0.36	XI	0.25	0.20	0.28	0.28	VIII
11	Internet	0.51	0.47	0.33	0.44	VII	0.51	0.37	0.36	0.41	V
12	Social media	0.37	0.45	0.26	0.36	XI	0.35	0.39	0.25	0.33	VI
13	Mobile apps	0.19	0.38	0.10	0.23	XIII	0.21	0.36	0.13	0.23	X
14	CS	0.02	0.10	0.07	0.07	XIV	0.04	0.03	0.05	0.04	XIV
	Mean	0.40	0.56	0.42	0.46		0.36	0.36	0.40	0.38	

MP: Mobile phones; CS: Computer software; Source: Field Survey, 2020

According to the results, the overall knowledge index regarding the ICT tools was found of 0.46, where the value ranges from 0 to 1, and the overall possession index of the ICT tools was 0.38. According to results, radio and TV, and mobile phones are the major ICT tool. The knowledge indices are, 0.87. 0.85 and 0.76 whereas possession indices are 0.90, 0.91, and 0.85 respectively. The knowledge level and possession were recorded on a three-point level, i.e., very well, well, and no based upon their literacy on ICT. Very well has been considered for those who can access, integrate, manage and evaluate the ICT tools, well has been considered for those who can only access and interpret or integrate the ICT tools. The given level was calculated after assigning the appropriate weightage. Furthermore, similar procedures were followed for possession of the ICT tools. The results showed that there were no respondents who were unaware of TV and radio. However, compared to knowledge or awareness on radio and TV, respondents did not possess radio and TV. Results show that respondents from Kapilbastu do have more knowledge (0.56) followed by the respondents from Bardiya (0.42) and Jhapa (0.40), whereas the respondents from Bardiya do possess more (0.40) ICT tools, followed by the respondents from Bardiya (0.36) and Jhapa (0.36) (See Table 2).

Note: The index value ranges from 0 to 1; closer to 1 related higher knowledge and possession of ICT tools

For rural people, mobile phones provide multi-benefits like interaction, communication easily and readily. Additionally, mobile phones are helpful in case of urgency and emergency (Sife et al., 2010). Aker (2011) maintains that they effectively access the information on agricultural technologies and extension services. The study by

Ndyetabula and Legg (2011) revealed that mobile phone-enabled technologies were used to monitor and disseminates information about crop disease outbreaks. Bochtis (2013) mentioned the innovative technologies like Geographic Information Systems (GIS), telematics, ICT with satellite-based navigation could lead to sustainable and efficient agricultural production systems. Raza et al. (2020) found that farmers make use of mobile phones more frequently followed by TV and radio than other various ICT tools. Islam et al. (2017) found out there is minimal use of the Internet, computer, email, and social media. Adegbidi et al. (2012) revealed that the significant ICT tools used by farmers were mobile phones, radio, and Television. Despite all this positivity, 9.2% of the respondents were unaware of mobile phones, and 12.3% did not possess mobile phones.

Regarding the awareness of the role of the ICT tools, the awareness level of the respondents was recorded on five-point scales, i.e., Highly aware, moderately aware, somewhat aware, little aware, and not aware, and later the scales were assigned appropriate and indexed values were calculated for ranking. Furthermore, the mean index value shows that respondents were moderately aware (0.44) of the roles of various ICT tools. Among various roles, most respondents were aware that ICT tools are the potential source of information followed by the timely availability of the information and the availability of higher choice of information. On the other hand, the findings show that they were less aware of other ICT tools, i.e., provide environmentally friendly technology. The table shows that the higher awareness level on roles of ICT tools was shown by the respondents of Bardiya (0.51) followed by Jhapa (0.45) and Kapilbastu (0.37) (See Table 3). Prodhan & Afrad (2015) revealed that ICT enhanced agricultural service and information dissemination and had a significant role in agricultural development. Patil et al. (2008) mentioned that newly evolved ICT-based Internet social media tools had a vital role in disseminating information and acting as a significant and vital source of information. Casaburi et al. (2014) mentioned that ICT tools had roles to increase agricultural production and productivity, leading to increased yield by 11.5% relatively.

The study examined the skill level of the respondents on the use of various ICTs for various purposes. The skill level was categorized into three, namely no, poor and high. High-skill respondents use, integrate, and evaluate the ICT tools, whereas poor-skill respondents only use the ICT tools for their purpose. The results revealed that most of the respondents were skilled in using radio and TV for use, integrating and evaluating the information, followed by mobile phones for information management. Specifically, the respondents of Bardiya were more skilled (0.32) as compared to Jhapa (0.27) and Kapilbastu (0.25) (See Table 4). Raza et al. (2020) showed that mobile phones, radio, and TV are easier to use than other ICT tools which justifies having more skills of using phones, radio and TV to other ICT tools.

The results revealed that radio and TV were used for agriculture information by most respondents, followed by the newspaper, mobile phones, and smartphones, i.e., 61.88%. 52.33%, 41.62, 18.42%, and 19.66%, respectively, out of the respondents who used respective ICT tools. The findings showed higher use of ICT in other areas than agriculture (See Table 5). Mobile phones and the Internet are the primary and valuable means of disseminating agricultural information (Sinha et al., 2018). Meena & Singh (2013) revealed that mobile phones could play a pivotal role in disseminating information related to agriculture. Ashraf et al. (2015) concluded that various ICT tools and social media were the primary alternative sources of agricultural information to traditional sources of information. Raza et al. (2020) revealed that mobile phones, TV, and Radio are the primary ICT tools used to disseminate agricultural information than other ICT tools as alternate information sources to traditional sources to meet their information needs. Adegbidi et al. (2012) mentioned that farmers use ICT tools in their farming activities.

As depicted by the study, respondents positively perceive ICT tools, but the index value is not encouraging in all aspects. Specifically, respondents positively believe that ICT helps gain knowledge related to the subject, and they too believe that ICT helps develop skills related to the subject. However, respondents were disagreed on generation and creative aspects along with the psychological perspective of ICT. Furthermore, they do not believe that ICT helps solve problems efficiently, and they too do not believe that ICT helps better communicate and express emotions freely. Furthermore, more specifically, the respondents from Jhapa perceived ICT tools in a more positive way (0.27) than Kapilbastu (0.18) and Bardiya (0.18) (See Table 6).

Table 3. Respondents classified according to their awareness regarding the role of various ICT tools by study districts

SN	Role	The extent of awareness on the role of various ICT tools			Mean value	Rank
		Jhapa	Kapilbastu	Bardiya		
1	A potential source of information	0.53	0.54	0.54	0.54	I
2	Having a higher diversity of information	0.46	0.49	0.52	0.52	IV
3	Availability of higher choice of information	0.50	0.46	0.54	0.54	III
4	Timely availability of information	0.44	0.53	0.57	0.57	II
5	Availability of demand-driven information	0.42	0.38	0.44	0.44	VIII
6	Provide solution to the complicated farm problem	0.47	0.32	0.56	0.56	V
7	Reference of problem solution of other places is possible	0.44	0.29	0.56	0.56	VI
8	An alternative solution to a problem is possible	0.40	0.29	0.57	0.57	VII
9	Provide environmentally friendly technology	0.26	0.20	0.51	0.51	X
10	Offer resource-based technology	0.54	0.19	0.33	0.33	IX
	Mean	0.45	0.37	0.51	0.45	

Source: Field Survey, 2020; Note: The index value ranges from 0 to 1; closer to 1 symbolizes the higher level of awareness

Table 4. Respondents classified according to their skills regarding use of ICT tools by study districts

SN	Use of ICT tools	Skills to use various ICT tools			Mean	Rank
		Jhapa	Kapilbastu	Bardiya		
1	Use of mobile for text/SMS	0.62	0.50	0.60	0.57	III
2	Use of mobile to access information	0.49	0.56	0.47	0.51	IV
3	Use of mobile to send and receive emails	0.49	0.13	0.43	0.35	V
4	Use of radio for information	0.84	0.79	0.81	0.82	I
5	Use of TV for information	0.50	0.77	0.60	0.62	II
6	Use of a computer to manage information	0.06	0.05	0.10	0.07	XIV
7	Use of a computer to create PowerPoint	0.07	0.03	0.06	0.05	XV
8	Use of a computer to play games	0.14	0.04	0.17	0.12	XII
9	Use of mobile for apps	0.16	0.20	0.23	0.19	IX
10	Use of computer for software	0.13	0.06	0.13	0.10	XIII
11	Use of the Internet for email	0.06	0.10	0.23	0.13	XI
12	Use of the Internet for web browsing	0.09	0.08	0.27	0.15	X
13	Use of the Internet for social networking	0.18	0.24	0.28	0.23	VII
14	Use of the Internet for calls	0.17	0.23	0.27	0.22	VIII
15	Use of the Internet for the conference call	0.05	0.03	0.06	0.04	XVI
16	Use of the Internet for sharing information	0.32	0.15	0.38	0.28	VI
	Mean	0.27	0.25	0.32	0.28	

Source: Field Survey, 2020; Note: The index value ranges from 0 to 1; closer to 1 show an increase in skill

Table 5. Use of ICTs by respondents in the study areas

SN	ICT tools	Use of ICT tools in agriculture			Total
		Jhapa	Kapilbastu	Bardiya	
1	Mobile phone	34 (26.15)	16(12.31)	13 (10)	63 (18.42)
2	Smartphone	10(7.69)	20(15.38)	16(12.31)	46(19.66)
3	Computer	6(4.62)	0(0)	14(10.77)	20(14.39)
4	Radio	47(36.15)	79(60.77)	98(75.38)	224(61.88)
5	TV	21(16.15)	95(73.08)	75(57.69)	191(52.33)
6	Newspaper	4(3.08)	34(26.15)	39(30)	77(41.62)
7	Internet	11(8.46)	16(12.31)	12(9.23)	39(20.53)
8	Mobile apps	6(4.62)	3(2.31)	2(1.54)	11(10.58)

Source: Field Survey, 2020; Note: figures in parentheses indicate the percentage

Table 6. Perception of the respondents on use of ICT in the various study area

SN	Statement	Level of agreement			Mean	Rank
		Jhapa Index value	Kapilbastu Index value	Bardiya Index value		
1	ICT helps gain knowledge related to the subject	0.58	0.45	0.51	0.51	I
2	ICT helps develop skills related to the subject	0.49	0.35	0.25	0.36	III
3	ICT helps allow the exchange of ideas	0.36	0.45	0.35	0.39	II
4	ICT helps understand ideas in an easier way	0.32	0.15	0.15	0.21	VIII
5	ICT helps apply the acquired knowledge	0.29	0.20	0.29	0.26	VII
6	ICT facilitates the self-assessment process	0.23	0.15	0.25	0.21	VIII
7	ICT facilitates the assistance	0.23	0.25	0.34	0.27	VI
8	ICT facilitates integration	0.37	0.12	0.10	0.20	X
9	ICT helps resolve the problems	0.55	0.19	0.11	0.28	V
10	ICT helps better communication with other	0.27	0.47	0.27	0.34	IV
11	ICT helps express emotions freely	0.14	-0.06	0.19	0.09	XII
12	ICT helps enable attention	0.20	0.25	0.16	0.20	X
13	ICT helps explain the problems easily	0.16	-0.07	-0.12	-0.01	XIII
14	ICT helps ask questions easily	0.05	-0.12	-0.10	-0.06	XIV
15	ICT helps solve problems easily	-0.12	-0.11	-0.10	-0.11	XV
	Mean	0.27	0.18	0.18	0.21	

Source: Field Survey, 2020; Note: The index value ranges from -1 to +1; positive value resonates with agreement

Nzonzo & Mogambi (2016) revealed that easy availability of information, easy access to information, and reduced cost in acquiring information were the primary reasons for positive perceptions towards various ICT tools. Bano (2020) showed that people were aware and had a positive perception and favorable attitude towards using ICT tools. Khan et al. (2019) concluded that easy access to market information and financial transaction were the major contributing factors for the positive perception of farmers towards various ICT tools, especially mobile phones.

The study also recorded the respondents' satisfaction regarding ICT tools, their use, effects, and impacts. Though studies revealed that they were satisfied with ICT tools, use, effects, and impacts, the calculated index value was not encouraging, i.e., 0.23. The majority of the respondents were satisfied that ICT use reduces travel time and expenses and accesses market information and reliable information. However, they were not satisfied with the easy accessibility, easy learning, and easy availability of ICT tools. Specifically, the respondents from Bardiya were more satisfied (0.33) with the ICT tools as compared to others and followed by Jhapa (0.26) and Kapilbastu (0.10) (see Table 7). Raza et al. (2020) concluded that socio-economic conditions affect the perception and preference of the farmers to select ICT tools as their information source as less expensive, easy to use, and timely available information are the major ones. Adegbidi et al. (2012) resulted in the use of information, and fewer travel costs were the primary reasons for the positive perception of ICT tools. They were found more satisfied on these. Khan et al. (2019) concluded that farm-related use, access to updated information, and easy connectivity to stakeholders were the significant factors for farmers' satisfaction regarding ICT tools, especially mobile phones. The difference of findings in a different location could be the various factors can be seen in the previous studies as discussed earlier.

Table 7. Respondents' satisfaction on the use of ICT tools in the various study areas

SN	Statements	Level of satisfaction				
		Jhapa	Kapilbastu	Bardiya	Mean	Rank
1	The correct information at the right time	0.21	0.37	0.16	0.25	XI
2	Easy availability	0.12	0.00	-0.28	-0.05	XV
3	Easily accessible	-0.01	0.00	-0.42	-0.14	XVII
4	Easy to learn	0.00	-0.19	-0.55	-0.25	XVIII
5	Easy to use and operate	0.22	-0.19	-0.31	-0.09	XVI
6	Valuable information source	0.38	0.30	0.55	0.41	III
7	Enhance production and productivity	0.31	-0.10	0.70	0.30	IX
8	High-quality of services	0.37	0.23	0.53	0.38	V
9	A good network between farmers	0.26	0.19	0.27	0.24	XII
10	Better market prices	0.14	0.00	0.59	0.24	XII
11	Improve negotiation power	0.24	0.14	0.65	0.34	VII
12	Access market information	0.32	0.13	0.77	0.41	III
13	Reliable information	0.36	0.32	0.59	0.42	II
14	Linkage with ext. services	0.10	-0.02	0.45	0.18	XIV
15	Enables farmers to reach new markets	0.34	0.03	0.57	0.31	VIII
16	Reduces travel time and expenses	0.53	0.47	0.60	0.53	I
17	Increases farmers profitability	0.35	-0.03	0.59	0.30	IX
18	Proper maintenance of the ICT	0.50	0.16	0.42	0.36	VI
	Mean	0.26	0.10	0.33	0.23	

Source: Field Survey, 2020; Note: The index value ranges from -1 to +1; positive value resonates satisfaction

Conclusion and Recommendations

The general conclusion of the foregoing data is that respondents are aware of ICT tools, but they require further information and knowledge in order to appropriately use ICT tools across all study districts. Farmers in Bardiya, in comparison to farmers in other study areas, are more conscious of the importance of ICT tools. Furthermore, they are unlikely to utilize those technologies to gather agricultural data; rather, they use ICT for amusement. Farmers in all study districts lack skills in assessing, designing, and administering ICT solutions for their purposes. Although the results reveal that respondents in all research districts have a good attitude toward the use of ICT tools and are satisfied with various elements of their usage, the satisfaction on the use of ICT tools, of respondents in Kapilbastu district was low. It is crucial that farmers have access to, expertise in, and quality of ICT tools in order for ICT tools to be seen as a key agricultural extension. As a result, the study highlights the positive aspects of ICT tools in agriculture.

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