



Utilization Pattern of Information and Communication Technologies among the Farming Community of West Bengal

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ABSTRACT

Information and Communication Technologies (ICTs) represent a pivotal paradigm shift, rendering agricultural extension services more realistic and efficient manner, especially in the ever-changing agrarian landscape. Considering the importance of ICTs among rural producers, a study was conducted in the year 2021 to delineate the utilization pattern of ICTs in two purposively selected districts of West Bengal, one representing an agriculturally prosperous district (Purba Burdwan), while other being a backward district (Birbhum), constituting randomly selected 160 respondents engaged in crop and dairy farming. The information about weather forecasting for crop production and dairy animal management was the most utilized information by Purba Burdwan farmers, contrasting to Birbhum farmers' focus on marketing of crop produce and breeding of animals. Television and smartphones were the most preferred ICT tools. Multiple comparisons by Duncan Multiple Range Test revealed a notable disparity in ICT usage between the districts, with Purba Burdwan farmers exhibiting higher utilization levels. Additionally, the study identified strategic pathways to enhance ICT adoption, especially in the backward districts, thereby offering a roadmap for elevating the socio-economic conditions of farmers in these regions.

INTRODUCTION

Over the years, Agricultural Extension has been at the forefront in disseminating relevant information to the stakeholders, not only to increase productivity, but also to improve their standard of living. Keeping in view the demand for agricultural growth, evolutionary changes were made from time-to-time in the mechanism of transfer of technology. In the present information era and changed extension paradigm, the Information and Communication Technology (ICT) is one such paradigm, providing timely, cost-effective and relevant information to the rural masses in general, and farming community in particular, ensuing in changed agricultural scenario (Hadiya, 2019 & Monikha et al., 2021). In fact, ICTs have shrunk the world *via* various gadgets, like smart phones, computers, tablets and the like. Exploiting such ICT tools for

communicating new ideas is quite feasible. Moreover, the future generation's need lies in discernment and skill to use the mechanised information services. The use of ICT in the agriculture sector helped in knowledge-sharing within and among various agricultural networks comprising of researchers, extension personnel, farmers, traders, etc. (Adegbedi, 2012 & Panda et al., 2019). ICT helps the farming communities by providing information on the availability of inputs, cutting-edge technologies, early warning systems (for pests, diseases, and natural calamities), credit, market pricing, and rivals (Yekini & Hussein, 2008). ICTs are described as those technologies used in collecting, processing, storing, retrieving, disseminating, and implementing data and information with the use of microelectronics, optics, telecommunication and computers (Richardson, 2006).

Access to ICT is now considered as one of the major determining factors in the development of a modern and sustainable society (Dobrota et al., 2012; Yu et al., 2017; Torkavesh & Torkavesh, 2021). Considering that knowledge and information are essential components of food security, ICTs have the capacity to retain and communicate the information required for agricultural and rural development if used effectively (Okiedo-Okogie & Omoregbee, 2012; Nain et al., 2019; Niranjana et al., 2023). Developing country like India has been increasingly integrating ICT into its national development plans for transforming the country into a knowledge-vibrant e-learning society (Panda et al., 2019). The basis of development lies in strengthening people's capacity to determine their own goals, which is only possible with the effective use of ICT tools (Shah et al., 2014). With the advent of ICTs, there has been reformation of traditional agriculture, leading to noteworthy improvements in productivity and sustainability of agriculture sector (Mishra et al., 2020).

In light of the development scenario of Indian Agriculture, ICT movement is still undergoing evolution. Nevertheless, there lies lack of uniformity in the ICT initiatives due to inconsistencies in the quality of information, effort of individual, public and private organizations and varying nature of demand of farming community across different regions. As a consequence, several successes and failures have been witnessed, lessons learned and experiences acquired so far. Since these initiatives are meant for addressing the needs of the rural producers, their actual utilization at the farmers' level for developing a remunerative agriculture need to be assessed.

METHODOLOGY

The present study was undertaken to assess the utilization pattern of ICTs among farming community. West Bengal was purposively selected for the study for being an agriculturally progressive state. Likewise, purposive selection was done while selecting the districts. An agriculturally prosperous district, viz., Purba Burdwan (extending from 22°56' to 23°50' N latitudes and from 87°27' to 88°25' E longitudes), and a backward district, viz., Birbhum (Ministry of Panchayati Raj, 2011), extending from 23° 32' 30" to 24° 35' 0" N latitudes and 88° 1' 40" to 87° 5' 25" E longitudes, were chosen, so that a comparative analysis can be done between the farmers of both the districts regarding the pattern of utilization of ICTs *vis-à-vis* purpose of usage, perceived practical utility of information received *via* various ICT tools and specific ICT tool used for obtaining crop and dairy farming related information.

Administratively, Purba Burdwan district consists of 4 sub-divisions, out of which Burdwan Sadar (N) and Burdwan Sadar (S) were randomly selected. On the contrary, Birbhum district comprises of 3 sub-divisions, out of which, 2 sub-divisions, viz., Rampurhat and Bolpur were randomly chosen to carry out the proposed work. Further, 2 blocks were selected following random sampling from each of the four sub-divisions. From each of these selected blocks, 2 villages were selected randomly. Thus, a total of 16 villages were selected for the study. And 10 respondents from each of the villages were selected, based on the criteria that they should have one milch animal, while having at least five years of farming

experience, thereby constituting a total sample size of 160 respondents, engaged in both crop and dairy farming. A pre-tested interview schedule was used for primary data collection.

Purpose of ICT usage was operationalised as the intention of using various ICT tools for acquiring, storing, processing, transmitting and retrieving information. The practical utility of different crop and dairy farming related information as perceived by the farmers was assessed with the help of mean weighted scores (m), which were ranked thereafter, thereby facilitating easy comprehension. To evaluate the specific ICT tools used by the respondents for obtaining information, correspondence analysis was used, which helps in visualizing patterns or relationships between two or more categorical variables. In the present study, ICT tools and different crop and dairy farming related information constituted the two categorical variables. Extent of utilization was operationalised as the frequency of respondents' exposure to different ICT tools for seeking information related to crop and dairy farming, and was measured using schedule developed for the study, wherein respondents were asked to indicate their extent of utilization of different ICT tools on a six-point continuum, viz., daily, weekly, fortnightly, monthly, rarely and never. Multiple comparisons, following Post-hoc Duncan Multiple Range Test (DMRT) (Duncan, 1955) were done in order to judge the significance of differences in the extent of utilization scores of different ICT tools across both the districts.

RESULTS

Purpose of ICT usage

The study revealed that among the radio owners (Table 1), 42.50 per cent in Purba Burdwan and 31.25 per cent in Birbhum districts used it for listening to farm broadcast. Almost all the respondents owned television (Table 1), which most of them used for watching news and for entertainment purpose. Almost 67.50 per cent in Purba Burdwan and 55.00 per cent in Birbhum used television for watching *Krishi Darshan*, *Annadata* and other agricultural telecasts. Smartphone was used by almost 95.00 per cent of Purba Burdwan farmers and 80.00 per cent of Birbhum farmers for social communication (Table 1). Further, 77.50 per cent and 53.75 per cent of Purba Burdwan farmers, whereas 53.75 per cent and 36.25 per cent of Birbhum farmers used smartphones for receiving information from Veterinary Officers (VOs) / Agriculture Officers (AOs) / input agencies/other extension personnel as well as to obtain agriculture market news, respectively. Among the respondents having internet connection, majority (65.00% in Purba Burdwan and 45.00% in Birbhum) used it for net banking or other financial services, while only 45.00 per cent of Purba Burdwan farmers and 31.25 per cent of Birbhum farmers used it for surfing ICAR or any other agriculture and animal husbandry websites.

Perceived practical utility of information available through ICTs

The practical utility of different crop and dairy farming related information as perceived by the farmers was evaluated using mean weighted scores (m), the result of which (Table 2) showed that in

Table 1. Distribution of respondents according to purpose of ICT usage (%)

ICT tools	Purpose	Purba Burdwan (n ₁ =80)	Birbhum (n ₂ =80)
Radio	Farm broadcast	42.50	31.25
	News	36.25	28.75
	Entertainment	20.00	28.75
	Advertisements	5.00	2.50
Television	Viewing Krishi Darshan/ Annadata/other agri-telecast	67.50	55.00
	News	92.50	72.50
	Advertisements	23.75	13.75
	Entertainment	87.50	66.25
Smartphone	Receiving information via voice calls / SMS from VO's/ AO's/ input agencies/other extension personnel	77.50	53.75
	Taking photos/ videos	46.25	26.25
	Agriculture market news	53.75	36.25
	Weather news	38.75	21.25
	Social communication	95.00	80.00
Internet	Surfing ICAR or any other agriculture and animal husbandry websites	45.00	31.25
	Surfing agri-commodity exchange and dairy co-operative websites	20.0	10.00
	Browsing search engines like Google, Yahoo, etc.	28.75	21.25
	Communication purpose	51.25	41.25
	Net banking or other financial services	65.00	45.00
	Entertainment (playing online games, downloading movies/music/software, going through e-books, magazines, e-journals)	61.25	35.00

Table 2. Mean weighted scores and rankings of crop and dairy farming related information available through ICTs, according to their practical utility

Particulars	Purba Burdwan (n ₁ =80)		Birbhum (n ₂ =80)	
	Mean weighted score (m)	Rank	Mean weighted score (m)	Rank
Crop production				
Production	28.67	IV	23.67	III
Quality inputs	27.67	V	20.50	V
Disease & pest management	30.67	II	23.33	IV
Weather forecasting	32.83	I	26.00	II
Market information	30.00	III	33.00	I
Post-harvest handling	25.17	VI	16.33	VI
Dairy farming				
Breeding	28.00	III	24.17	I
Feeding	28.83	II	19.17	V
Management	31.17	I	23.50	II
Health-care	28.00	III	22.00	III
Market information	27.50	IV	21.50	IV
Dairy products' preparation	26.50	V	14.67	VI

Purba Burdwan district, majority of the respondents mostly utilised the information related to weather forecasting (m=32.83), assigning it first rank, followed by disease and pest management (m=30.67), market information (m=30.00) and production (m=28.67) with second, third and fourth ranks, respectively. In case of Birbhum district, majority of the respondents mostly utilised information related to market information (m=33.00), giving it the highest rank, followed by weather forecasting (m=26.00), production (m=23.67) and disease and pest management (m=23.33), respectively. Information related to post-harvest handling was least utilised by majority of respondents of both the districts (m=25.17 in Purba Burdwan and m=16.33 in Birbhum).

Regarding dairy farming related information, in case of Purba Burdwan district, management got the highest rank with a mean weighted score of 31.17, followed by feeding (m=28.83), as evident from Table 2. Both breeding and health-care related information, having mean weighted scores of 28.00, were ranked third. In case of Birbhum district, information related to breeding (m=24.17) was utilised by majority of the respondents. Likewise, management and health-care related information got the second and third highest mean weighted scores, i.e., 23.50 & 22.00, respectively. Information related to feeding, market information and dairy products preparation was least utilised by majority of the Birbhum district farmers, as accounted by mean weighted scores of 19.17, 21.52 & 14.67, respectively.

Specific ICT tools used for obtaining particular information

Table 3 indicated the specific ICT tools used by the respondents for obtaining information related to crop and dairy farming, wherein it can be observed that regarding production-related information, most of the farmers of both districts preferred using television (52.50% in Purba Burdwan and 37.50% in Birbhum), followed by smartphone and radio. The similar findings can be observed with the help of correspondence analysis, the result of which have been shown in Figure 1(a). The proximity of

TV to production in Figure 1(a) indicated their association. Likewise, the proximity of smartphone to quality inputs portrayed that smartphone was mostly used for seeking information related to quality inputs (45.00% in Purba Burdwan and 35.00% in Birbhum). Landline was used only by a negligible number of respondents (Table 3), which is confirmed from the result of correspondence analysis by the position of landline far away from the origin [Figure 1(a)]. Internet, accessed through smartphone/computer, was mainly used for getting weather forecasting related information (51.25% in Purba Burdwan and 36.25% in Birbhum).

Table 3. Distribution of respondents according to specific ICT tools used for obtaining information (%)

S.No. Particulars	Purba Burdwan (n ₁ =80)					Birbhum (n ₂ =80)				
	Radio	TV	Land-line	Smart-phone	Internet	Radio	TV	Land-line	Smart-phone	Internet
Crop production										
1 Production	25.00	52.50	0.00	36.25	20.00	21.25	37.50	5.00	26.25	16.25
2 Quality inputs	13.75	37.50	2.50	45.00	17.50	10.00	26.25	2.50	35.00	15.00
3 Disease & pest management	35.00	52.50	0.00	32.50	31.25	27.50	32.50	2.50	26.25	20.00
4 Weather forecasting	50.00	67.50	0.00	31.25	51.25	31.25	41.25	0.00	22.50	36.25
5 Market information	16.25	61.25	15.00	65.00	40.00	12.50	45.00	11.25	32.50	22.50
6 Post-harvest handling	7.50	22.50	0.00	21.25	5.00	17.50	18.75	0.00	7.50	2.50
Dairy farming										
1 Breeding	27.5	45.00	3.75	40.00	16.25	28.75	35.00	0.00	25.00	12.50
2 Feeding	18.75	30.00	2.50	33.75	8.75	17.50	20.00	0.00	15.00	5.00
3 Management	33.75	48.75	6.25	46.25	18.75	23.75	27.50	8.75	28.75	8.75
4 Health-care	22.50	42.50	15.00	57.50	12.50	25.00	31.25	12.50	40.00	11.25
5 Market information	20.00	52.50	10.00	58.75	37.50	6.25	23.75	7.50	33.75	22.50
6 Dairy products' preparation	8.75	21.25	0.00	12.50	21.25	10.00	20.00	0.00	7.50	17.50
7 Government schemes	16.25	62.50	0.00	42.50	46.25	22.50	38.75	0.00	27.50	25.00
8 Credit information	5.00	32.50	0.00	31.25	42.50	2.50	17.50	0.00	28.75	17.50

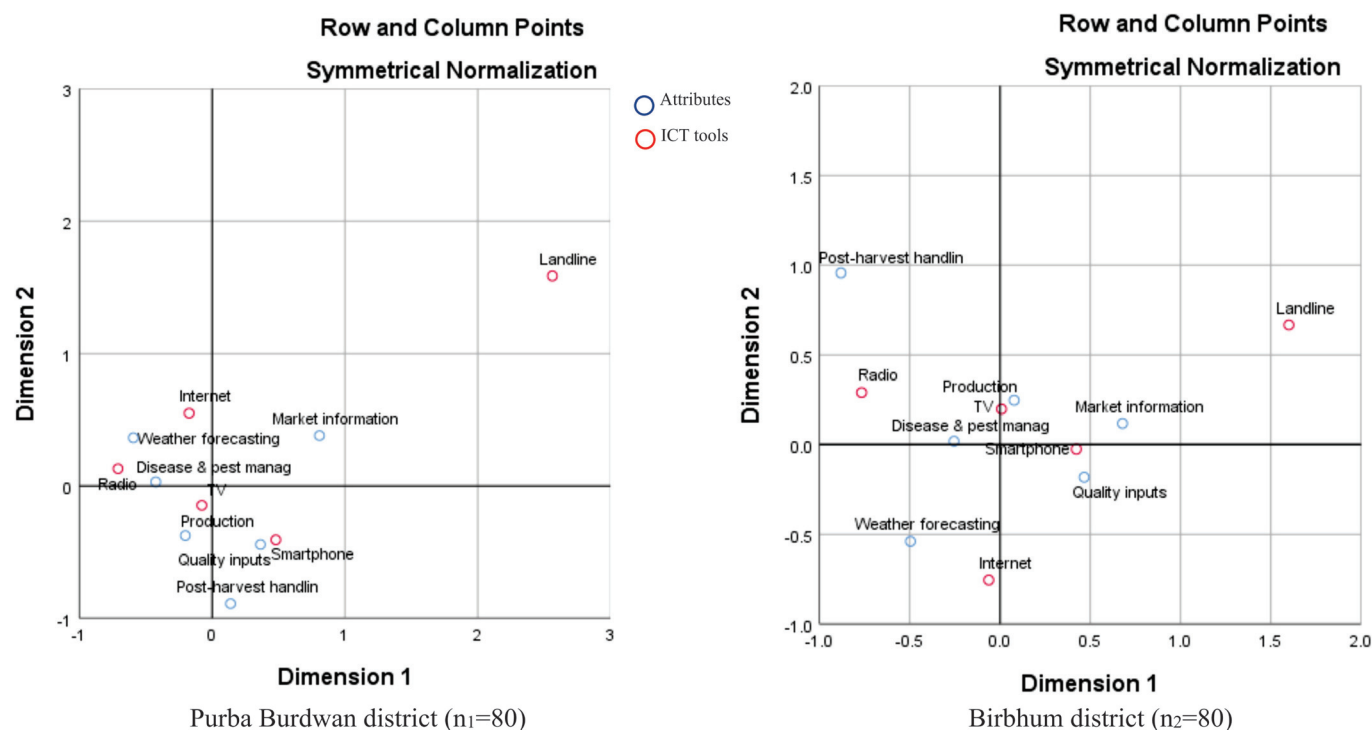


Figure 1(a). Correspondence analysis of specific ICT tool used for obtaining crop production related information

Figure 1(b) and Table 3 showed that in case of dairy farming, majority of the respondents of both the districts were using television for getting information related to breeding (45.00% in Purba Burdwan and 35.00% in Birbhum), management (48.75% in Purba Burdwan and 27.50% in Birbhum) and government schemes (62.50% in Purba Burdwan and 38.75% in Birbhum). While smartphone was mainly used for obtaining market information (58.75%) in Purba Burdwan district, it was mainly used for seeking health-care related information (40.00%) in Birbhum district. Radio was mainly used for getting breeding, feeding and management-related information as can be observed from the proximity of radio to these information parameters in Figure 1(b). Internet was mainly used for getting information related to credit and government schemes.

Multiple comparisons among the extent of utilization level of different ICT tools

Table 4 showed the results of multiple comparisons, following Post-hoc Duncan Multiple Range Test (DMRT), conducted to

assess the significance of differences in the extent of utilization scores of different ICT tools between the two districts. The findings indicated that there was a significant difference in the extent of utilization of Television ($p=0.00$), Smartphone ($p=0.00$) and Internet ($p=0.00$) between both the districts. However, Radio ($p=0.46$) and Landline ($p=0.57$) showed no such significant difference in their usage pattern. A glimpse of the mean extent of utilization scores given in Table 4 also depicted that the extent of utilization of all the mentioned ICT tools was comparatively higher in case of Purba Burdwan district, as compared to Birbhum district.

DISCUSSION

The majority of the farmers owned smart phones, and they were eager to use them to access information. Farmers claimed that voice-based advices and information were more practical, because it allowed them to ask questions and converse with experts in their own language, whereas they also needed information in text and pictorial formats to fully comprehend technological information.

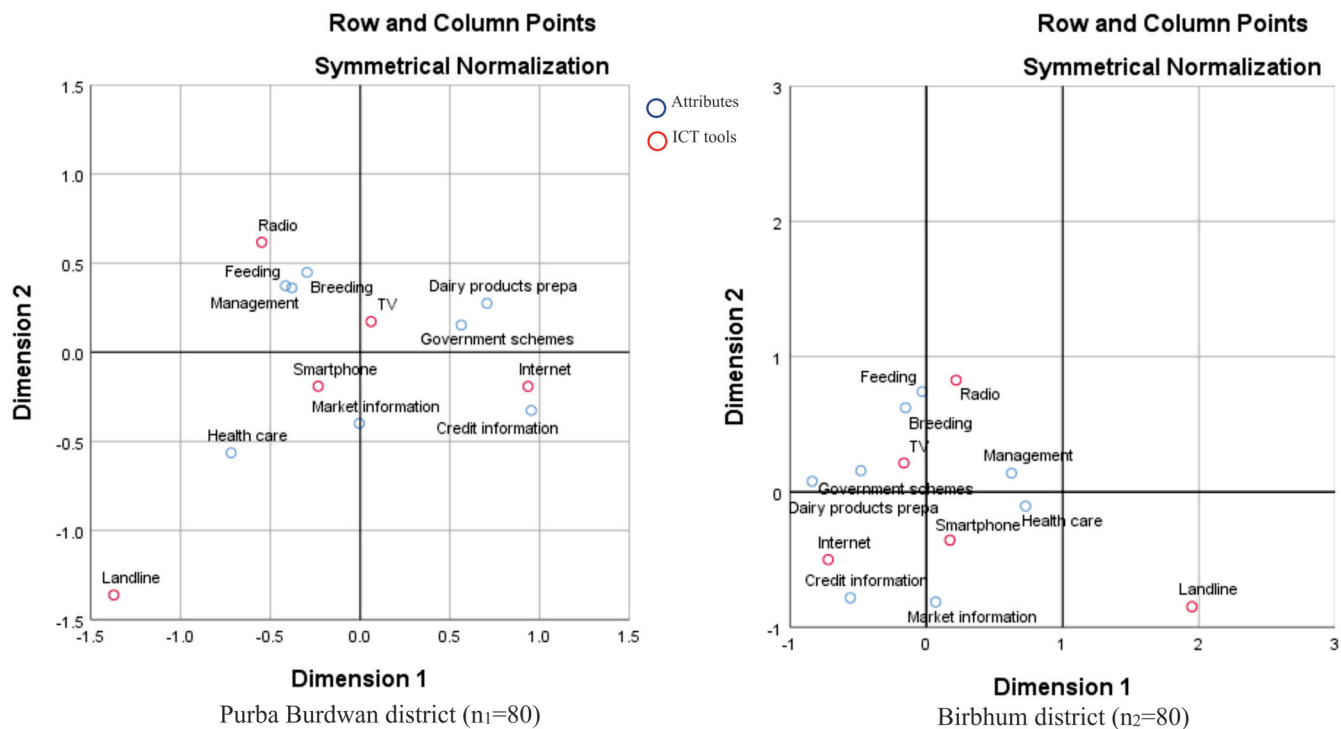


Figure 1(b). Correspondence analysis of specific ICT tool used for obtaining dairy farming related information

Table 4. Multiple comparisons among the extent of utilization level of different ICT tools across the selected districts

S.No.	Gadgets	Purba Burdwan (Mean $\pm$ SD)	Birbhum (Mean $\pm$ SD)	Mann-whitney test statistics		
				U-statistic	Z value	p value
1	Radio	1.55 ^d $\pm$ 1.76	1.29 ^b $\pm$ 1.69	2999.00	-0.74	0.46
2	Television	3.70 ^a $\pm$ 1.35	2.45 ^a $\pm$ 1.74	1878.00	-4.62	0.00
3	Landline	0.60 ^e $\pm$ 1.33	0.40 ^c $\pm$ 1.03	3086.00	-0.57	0.57
4	Smartphone	3.16 ^b $\pm$ 1.58	2.37 ^a $\pm$ 1.68	2337.00	-2.99	0.00
5	Internet	2.67 ^c $\pm$ 1.76	1.65 ^b $\pm$ 1.68	2184.00	-3.54	0.00

(Means with different superscript in a column differ significantly at 5 per cent level of significance in two-tailed test. Multiple comparisons are based on Duncan Multiple Range test)

Only 45.00 per cent of Purba Burdwan farmers and 31.25 per cent of Birbhum farmers used internet for accessing any information related to agriculture or animal husbandry and is in conformity with the findings of Kumari et al., (2019) & Niranjana et al., (2023). Reasons behind less utilization of internet in the present study area might be on account of lack of infrastructural resources, low internet penetration in the study area, non affordability of the ICT tool and lack of knowledge of the farmers in this regard. The findings show distinct trends in farmers' preferences for agricultural information in the districts of Purba Burdwan and Birbhum. Weather forecasting and market information stand out as significant in both the regions, highlighting how important they are for making agricultural decisions. These results are in conformity with the findings of Dhaka & Chahal (2010) and Nain et al., (2015). Purba Burdwan farmers demonstrate a holistic approach by placing a high priority on disease management and efficient production. Farmers in Birbhum, however, lack awareness of post-harvest handling while appreciating market data, it places a strong emphasis on management and feeding in dairy farming, which reflects their attention to animal welfare. Birbhum, however, suffers difficulties with feeding awareness and the preparation of dairy products. Addressing these regional disparities is vital for tailored agricultural support, enhancing productivity, and ensuring sustainable farming practices.

The study reveals complex information-acquisition patterns and preferred Television and smartphone as ICT tools among the farmers for obtaining crop and dairy related information (Singh et al., 2014; Roy et al., 2018 & Jha et al., 2021). Television shines itself as a reliable medium, especially for data pertaining to production, emphasising its effectiveness in connecting with a large farmer base. Smartphone use demonstrates its versatility to a range of farming needs and is closely related with high-quality inputs and information on health care. Smartphone was the most effective and expeditious ICT gadget utilised by majority of the respondents to obtain information, because of its widespread availability, quick interaction, and reduced time and distance obstacles for the respondents. In recent days, smartphone has become a multi-tasking gadget, whose potential is being harnessed in inquiring about the latest technologies, apart from being a major source of entertainment. Radio and landline being used by very few respondents, was probably due to the intervention of contemporary ICT tools, mainly smartphone. These results highlight the need for information distribution strategies to be in line with preferred ICT tools in order to provide targeted outreach and maximise the impact of agricultural knowledge delivery.

The study's nuanced analysis of farmers' ICT tool utilization offers insightful information. The study operationalized usage frequency and identified significant disparities between districts. Purba Burdwan's higher utilization suggests a tech-savvy farming community, possibly propelled by favourable attitudes, extensive extension contact, e-readiness, innovativeness, risk-orientation and scientific-orientation (Mukherjee et al., 2022). The stark contrasts in TV, smartphone, and internet usage underline varying digital landscapes. Interestingly, despite district-based distinctions, radio and landline usage remained consistent. These findings illustrate the complex interplay between farmer attitudes,

resource accessibility, and geographical settings, emphasising the multifaceted nature of technology adoption. Tailored interventions considering these factors are pivotal for enhancing agricultural information dissemination and ensuring equitable technological advancements.

CONCLUSION

The findings highlight the vital role of ICT tools, particularly television and smartphones, in providing farmers with relevant information. Weather forecasting, disease and pest management, market insights, and production-related information stood out in crop farming, while management, breeding, feeding, and health-care information were paramount in dairy farming. There were notable differences between the Purba Burdwan and Birbhum districts, with the former showing greater ICT utilisation. This shows that there is a need for focused efforts to close the digital divide, particularly in Birbhum. Sensitization and awareness-building programmes are pivotal, particularly for internet-enabled services, offering a pathway for farmers to leverage the benefits of modern technology. Focused efforts should be made to improve ICT infrastructure, provide affordable access to smartphones, computers, and internet services, and ensure that all farmers can fully utilise the potential of digital advancements in order to promote sustainable agriculture and improve socioeconomic development.

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