

## RESEARCH ARTICLE

# Analysis of Perceived Constraints of Farmers in Utilizing Information and Communication Technology (ICT) Tools

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## ABSTRACT

*The application of ICTs has emerged as an important pillar of agriculture extension focusing on enhancement of agricultural development through improved information and communication processes. Despite impressive advancements in ICT tools, Indian farmers lack the skills and knowledge necessary to effectively use such tools to improve their farming practices. Therefore, even if our country continues to reach new heights in the ICT sector everyday, its influence on the farming community is still in jeopardy, and there remains considerable scope for expanding the use of ICT in agriculture. The present study was undertaken to identify extent of utilization of ICT tools and the constraints hindering their use by farmers of West Bengal. An agriculturally prosperous district (Purba Burdwan) and another backward district (Birbhum) were selected purposively for comparative analysis, constituting a randomly selected sample of 160 respondents. The study revealed that among the technical constraints perceived by the respondents, lack of region-specific information, poor internet connectivity and poorly developed ICT infrastructure were most significant. Majority of the respondents considered high cost of ICT tools, hiked internet charges and lack of subsidies on ICT tools to be the major economic constraints. Among the operational constraints, lack of skill in operating ICT tools and lack of awareness about ICTs were most important. The study concluded that organization of ICT-based training; arrangement of sensitization and awareness-building programmes; establishment of Village Knowledge Centre and Internet café; localization and customization of appropriate content; strengthening ICT infrastructure and affordability of ICT tools can enhance their socio-economic development.*

**Key words:** ICT, Extent of utilization, Technical constraints, Economic constraints, Operational constraints.

Science and technology in agriculture not only play an important role in ensuring food security for the country but also in giving farmers a competitive edge, and maintaining the affordability of the produce for the general public. Farmers need access to relevant information in addition to cutting-edge technologies and capital inputs to realize their full potential (Viatte, 2001). Information is essential to human growth and survival, the progress of which depends on having access to the appropriate information at the right time and in the right form (Lahiri et al., 2017). Rural communities face difficulty in accessing important information in order to make timely decisions

(Mooventhan et al., 2016). Thus, farmers' distress is at rise since there exists a knowledge gap between the scientists and the farmers because of the short supply of extension personnel (Singh and Jahanara, 2019).

Thanks to information and communication technology (ICT) tools, new knowledge may now be quickly transferred from the lab to farmers (Shilpa et al., 2022). The agricultural sector is striving to employ modern ICTs to their fullest potential, access to which is considered essential for sustainable development of farming system (Jha et al., 2021). Development of agriculture in the present scenario depends on bridging the knowledge gap among the end users. Providing with

the necessary and updated agricultural information to the farmers in India's dispersed villages, given their diverse geographic location, is quite a challenging task (Chauhan, 2010). In this regard, the emergence of ICTs has facilitated the farmers in improving the efficiency and productivity of agriculture and allied activities, along with bringing about the overall qualitative improvement in their lives through timely access to quality information for decision-making (Burman and Singh, 2004). ICTs act as a bridging link between the information haves and information have-nots in the developing nations (Anand et al., 2020). Utilization of ICTs have proven to be effective in making rural communities prosperous by disseminating fast, reliable and cost-effective information to the end users in a user-friendly manner (Anand et al., 2020).

Despite the significant improvements in ICT tools and their applications in agricultural extension, the Indian farmers lack the abilities and knowledge required to utilise various ICT tools effectively to improve their farming practices (Mishra et al., 2020). Lack of public access facilities for ICTs in rural areas prevents small-scale farmers from using these technologies (Girard, 2003). Some of the barriers in adopting ICTs by the farmers include illiteracy, lack of pertinent localised content in their languages, affordability, poor accessibility and awareness, and unwillingness to adopt new technologies (Dhaka and Chayal, 2010). The impact of applications of ICTs on the farming community still looks fuzzy, even if our nation's ICT sector continues to reach new heights every day. Thus, the potential advantages of these technologies might not be realised, if the constraints faced by farmers are not addressed. Understanding these constraints allows policymakers, researchers, and developers to design appropriate interventions and strategies to overcome them, resulting in increased investment in ICT infrastructure, capacity building initiatives, and better information access for farmers. In such a research setting, the present study was undertaken with the objective to analyse the extent of utilization of ICTs among the farmers and the constraints perceived by them while utilizing ICT tools.

## METHODOLOGY

The present study was conducted in two purposively chosen districts of West Bengal, India in 2020–2021, one of which (Purba Burdwan)

represented an agriculturally prosperous district and the other was a backward district (Birbhum). In case of Purba Burdwan district, approximately 58 per cent of the total population is engaged in agriculture according to the Population Census (2011). This district, is also having the highest number of exotic cattle population (3,90,916) in West Bengal (20<sup>th</sup> Livestock Census). It is the second highest milk producing district in the state, with the per capita milk availability being 233 grams/day (NDDDB, 2017). Birbhum district, was named as one of the most backward districts of the country since 2006 by Ministry of Panchayati Raj. Around 75 per cent of the population here is dependent on agriculture as per the Population Census (2011). It is also having the highest buffalo population (39,013) in the state (20<sup>th</sup> Livestock Census).

Following multi-stage random sampling, two subdivisions from each district (Burdwan Sadar (N) and Burdwan Sadar (S) sub-divisions from Purba Burdwan district and Rampurhat and Bolpur subdivisions from Birbhum district, two blocks from each subdivision, and two villages from each block were chosen. Finally, 10 respondents from each of the villages, subjected to have at least five years of farming experience and one milch animal, were selected. Thus, a total of 160 farmers, with 80 farmers from each district, made up the final sample size.

Extent of utilization was operationalised as the frequency with which respondents use different ICT tools for seeking crop and dairy farming related information. It was measured using a schedule developed for the study, in which respondents were asked to indicate their extent of utilisation of various ICT tools on a six-point continuum, ranging from daily, weekly, fortnightly, monthly, rarely, and never. Thereafter, the respondents of both districts were categorised based on cumulative square root frequency method to have a glimpse about the differential level of utilization of ICTs. Mann-Whitney U Statistics was applied to analyse whether the difference in utilization level of ICTs among farmers of both the districts was significant or not.

Constraints were operationalised as the bottlenecks perceived by the respondents in utilizing ICT tools. These were classified into three broad groups, viz., technical, economic and operational constraints. Based on their personal experiences, farmers were asked to rank the constraints faced by them in using ICT tools. Constraints were arranged based on their

severity to the respondents. Following Garret's Ranking technique, the study asked respondents to rank various issues according to their impact, which was then converted into a score value and rank using the following formula:

$$\% \text{ position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

where,

R<sub>ij</sub> = Rank assigned to the i<sup>th</sup> constraint by the j<sup>th</sup> respondent  
 N<sub>j</sub> = Number of constraints ranked by the j<sup>th</sup> respondent.

By using the Garrett's table given by *Garrett and Woodworth (1969)*, the percent position estimated was converted into scores. After adding up each person's scores for each factor, the total value of scores was obtained. The mean scores were determined by dividing the total scores with the total number of respondents, and ranked by arranging them in descending order. Thus, the most significant factor was thought to be the one with the highest mean value.

**RESULTS AND DISCUSSION**

*Extent of utilization of ICTs among farmers* : Table 1 indicates that majority (51.25%) of the farmers of Purba Burdwan district were having high extent of utilization, followed by medium (28.75%) and low (20.00%) extent of utilization, as compared to most (45.00%) of Birbhum district farmers who were having medium extent of utilization. Unfavourable attitude towards ICTs, lower annual income, lack of proper training, irregular extension contacts and low levels of e-readiness might have resulted in lower utilization of ICTs by the farmers of Birbhum district.

Non-parametric test, Mann-Whitney U Statistics was applied on the extent of utilization score of the two sampled districts to compare the difference in the level of extent of utilization of ICTs among the farmers

**Table 1. Distribution of respondents according to extent of utilization of ICTs and its comparison between the selected districts**

Categories	Purba Burdwan (n <sub>1</sub> =80)	Birbhum (n <sub>2</sub> =80)
	No. (%)	No. (%)
Low (0-6.92)	16 (20.00)	30 (37.50)
Medium (6.93-13.72)	23 (28.75)	36 (45.00)
High (13.73-23)	41 (51.25)	14 (17.50)

(Values in parentheses in the first column indicate reference range and remaining values in parentheses indicate percentage)

**Table 2. Comparison of extent of utilization of ICTs among the farmers of the selected districts**

Districts	Extent of Utilization (Mean ± SD)	Mann-Whitney Test Statistics		
		U-statistic	Z-value	p-value
Purba Burdwan (n <sub>1</sub> =80)	11.69 ± 5.18	1988.00	-4.15	0.00
Birbhum (n <sub>2</sub> =80)	8.16 ± 4.69			

of both the districts and “Z value” was obtained at 5 per cent level of significance (Table 2), indicating there was a significant difference (p=0.00) between the extent of utilization of both the sampled districts. Table 2 also indicates that the extent of utilization was significantly higher in case of Purba Burdwan district, as compared to Birbhum district. Favourable attitude towards ICT, and comparatively higher levels of extension contact, e-readiness, innovativeness, risk-orientation, and scientific-orientation, observed in case of Purba Burdwan district farmers, might have enhanced their extent of utilization of ICTs.

*Constraints perceived by the respondents while utilising ICT tools* :

*Technical constraints* : Table 3 indicates the technical constraints perceived by the respondents in utilizing ICT tools, a perusal of which shows that lack of region-specific information (mean score of 63.88 in Purba Burdwan district and 61.38 in case of Birbhum district) was the most important constraint in both the regions. Lack of understanding of the unique demands of the different rural regions by individuals engaged in developing applications and content could lead to a mismatch between applications and content created with consideration for the needs of the rural community. Poor internet connectivity with mean score 61.38 and poorly developed ICT infrastructure with mean score 57.00 constituted the second and third most significant technical obstacles in Purba Burdwan district. In case of Birbhum district, poorly developed ICT infrastructure and poor internet connectivity were ranked second and third by the respondents with mean score 59.94 and 59.06, respectively. The findings were in conformity with *Balu, Kavaskar and Santha (2018)* who reported that connectivity issues were the major constraint faced by the farm youth, leading to limited access to internet networks. Connection is very constrained in the rural areas, supporting only a handful of networks. This has made the farmers not to consider the use of smartphones or internet as reliable and respectable

**Table 3. Garrett's ranking of constraints perceived by the respondents while utilising ICT tools**

Constraints	Purba Burdwan (n <sub>1</sub> =80)		Birbhum (n <sub>2</sub> =80)	
	Mean score	Rank	Mean score	Rank
<i>Technical Constraints</i>				
Poorly developed ICT infrastructure	57.00	III	59.94	II
Erratic electric power supply	38.88	IV	39.13	IV
Poor internet connectivity in villages	61.38	II	59.06	III
Insufficient access centres of ICTs in villages	28.88	V	30.50	V
Lack of region-specific information	63.88	I	61.38	I
<i>Economic constraints</i>				
High cost of ICT tools like smartphones, computers, etc.	68.13	I	69.50	I
High call rates of landline/smartphones	30.00	V	37.63	IV
Hiked internet charges	56.38	III	55.50	II
High cost of service of ICT tools	36.75	IV	33.13	V
Lack of subsidies on ICT tools	59.00	II	54.50	III
<i>Operational constraints</i>				
Lack of skill in operating the ICT tools	55.13	I	58.00	I
Lack of interest among the farmers	53.50	II	45.00	IV
Lack of awareness about ICTs	49.25	III	50.88	III
Difficulty in understanding the language of operation of ICT gadgets	44.38	V	44.75	V
Insufficient training and practical exposure towards ICTs	48.38	IV	52.00	II

when poor network connection prevents their use. *Sobalaje et al. (2013)* also reported that infrastructure is one of the significant factors constraining the use of ICTs by farmers, since most of the infrastructural facilities are concentrated in the cities, rather than the rural areas. Erratic electric power supply was ranked fourth (mean score 38.88 in Purba Burdwan district and 39.13 in Birbhum district), which led to low access to ICT tools due to high dependency of such tools on electricity. Presence of insufficient access centres of ICTs in villages was ranked fifth (mean score 28.88 in Purba Burdwan and 30.50 in Birbhum) in both the regions.

*Economic constraints* : Table 3 reveals that high cost of ICT tools (smartphones, computers, etc.) was the major economic constraint in both the districts with mean score of 68.13 in Purba Burdwan district and 69.50 in Birbhum district. The farmers complained of high cost of ICT tools as majority of them cannot afford to purchase the right ICT tool needed to access information for enhancing agricultural productivity. Similar findings were reported by *Jayathilake et al. (2008)* and *Sangha and Rakshit (2010)*. Lack of subsidies on ICTs, with a mean score of 59.00, constituted the second major constraint among the respondents of Purba Burdwan, followed by hiked

internet charges, high cost of service of ICT tools and high call rates of landline/ smartphones to be the next major economic constraints, with mean scores of 56.38, 36.75 and 30.00, respectively. Farmers of Birbhum district ranked hiked internet charges as the second major economic constraint, with mean score of 55.50, followed by lack of subsidies on ICT tools (mean score 54.50), high call rates of landline/ smartphones (mean score 37.63) and high cost of service of ICT tools (mean score 33.13) as the third, fourth and fifth economic constraints, respectively.

*Operational constraints* : Among the operational constraints, lack of skill in operating the ICT tools was considered most important by the respondents of both the districts (mean score 55.13 in Purba Burdwan and 58.00 in Birbhum), as indicated in Table 3. The results were in conformity with the findings of *Jayathilake et al. (2008)*. Lack of interest among the farmers, with mean score 53.50, and insufficient training and practical exposure towards ICTs, with mean score 52.00 constitute the second major operational constraint among the farmers of Purba Burdwan district and Birbhum district, respectively. Lack of awareness about ICTs was ranked third by farmers of both districts, with mean score 49.25 in Purba Burdwan and 50.88 in Birbhum. This finding

is in consonance with the results of *Balu, Kavaskar and Santha (2018)*. Farmers of Purba Burdwan district ranked insufficient training and practical exposure towards ICTs, with mean score 48.38, as the fourth major constraint. They held the opinion that lack of training opportunities prevents the rural population from learning ICT-related skills and competencies that are tailored to their particular needs. *Balu, Kavaskar and Santha (2018)* and *Sangha and Rakshit (2010)* reported similar findings. Difficulty in understanding the language of operation of ICT gadgets, with mean score 44.38 was ranked fifth, since most of ICT tools have English as their default language which the farmers found difficult to comprehend. On the contrary, farmers of Birbhum district considered lack of interest among farmers and difficulty in understanding the language of operation of ICT gadgets to be the fourth and fifth major operational constraints, with mean scores of 45.00 and 44.75, respectively. *Jayathilake et al. (2008)* has also added that trust level of the farmers in the ICT system is another important factor which affects the utilization of ICT tools.

*Suggestions given by respondents for enhancing the utilization of ICT tools* : Table 4 provides a glimpse of the suggestions given by the respondents for increasing the level of utilization of ICT tools. Majority (82.75%) of the farmers of Purba Burdwan district considered that localization and customization of appropriate content can enhance the utilization level of ICT tools. Similar findings were reported by *Balu, Kavaskar and Santha (2018)*. Organization of ICT-based training to enhance the knowledge, attitude, and skills of farmers regarding scientific farming practices ranked second (as indicated by 78.50% of the respondents).

**Table 4. Suggestions given by respondents for enhancing the utilization of ICT tools**

Strategies	Purba Burdwan (n <sub>1</sub> =80)		Birbhum (n <sub>2</sub> =80)	
	%	Rank	%	Rank
Training	78.50	II	88.50	I
Sensitization and awareness	43.75	V	60.00	III
Village knowledge centre/ Internet café	47.50	IV	52.50	IV
Localization and customization of content	82.75	I	63.75	II
Strengthening ICT infrastructure	61.25	III	41.25	V
Affordability of ICT tools	35.00	VI	39.25	VI

The efforts aimed at improving skills in using ICTs need to be strengthened through the establishment of suitable life-long learning and training structures in rural areas as well as the promotion of information sharing and mutual learning among communities with identical needs. Strengthening ICT infrastructure for overcoming power and connectivity problems ranked third (61.25%), establishment of Village Knowledge Centre and Internet café in every village or cluster of villages ranked fourth (47.50%), arrangement of sensitization and awareness building programmes at the grass root level to inform the farmers about the ICT-enabled extension services ranked fifth (43.75%) and affordability of ICT tools to make full use of new technologies for socio-economic development ranked sixth (35.00%).

On the other hand, most (88.50%) of the farmers of Birbhum district have suggested that training is most important for them to enhance the extent of utilization of ICT tools, followed by localization and customization of content (63.75%), sensitization and awareness programmes (60.00%), establishment of Village Knowledge Centre and Internet café (52.50%), strengthening ICT infrastructure (41.25%) and affordability of ICT tools (39.25%). *Senthilkumar and Mahesh (2009)* also reported similar findings wherein they suggested that provision of battery back-up, minimising connectivity issues through equipping with broadband connection and regular updating of content could be useful in overcoming the constraints faced by the farmers in utilising the ICT tools.

## CONCLUSION

With an emphasis on advancing agricultural and rural development through better information and communication processes, the use of ICT in agriculture has become a key pillar of agriculture extension. Rural areas could prosper through the effective use of ICT because it makes it possible to disseminate relevant information in timely, cost-effective, and user-friendly form. The present study has identified some of the major constraints perceived by the respondents while utilizing ICT tools, such as lack of region-specific information, poorly developed ICT infrastructure, high cost of ICT tools, hiked internet charges, lack of subsidies on ICT tools, lack of skill in operating ICT tools and lack of awareness about ICTs among the respondents of the selected districts. Government policy should therefore concentrate on enhancing

ICT infrastructure and providing effective training to rural farmers, which will surely increase accessibility and lessen the cyberphobia that has been encountered by the farming community. By being aware of these constraints, policy makers and researchers can tailor their policies and interventions to address the specific challenges experienced by farmers in embracing ICTs. Policymakers may encourage the widespread adoption and use of ICTs in agriculture by addressing the identified barriers, thereby leading to increased productivity, improved livelihoods, and sustainable agricultural development.

### CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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