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Constraints of ICT Adoption in Agriculture in Khurda and Bargarh Districts of Odisha

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HIGHLIGHTS

- The most significant social constraint was the tendency to follow traditional methods of information seeking.
- Technical constraints were the most significant in both Khurda and Bargarh districts of Odisha.
- The significant social and economic constraints indicate the need for holistic approaches that also consider social dynamics and economic support mechanisms.

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ABSTRACT

The study was conducted in 2023 in Balipatna and Balianta blocks of Khurda district and in Bijepur and Padampur blocks of Bargarh district of Odisha to determine the constraints affecting farmers using Information Communication Technology in agriculture. The study used purposive sampling for selection of districts and blocks and random sampling procedure for selection of villages and respondent farmers and collected data through personal interviews and focussed group discussion method with 200 respondent farmers. Garrett's ranking technique was performed to analyse the challenges as perceived by farmers under social, economic and technical dimensions. Lack of knowledge on ICT application on agriculture, lack of financial support from the government and insufficient knowledge on mechanization of access on ICTs platform were important constraints under social, economic and technical dimension respectively in Khurda district. Tendency of following traditional method of information seeking, skeptical image of farmers in front of banking institutions and deficiency in support services are major constraints under social, economic and technical dimensions respectively in Bargarh district. It is important for stakeholders to take the necessary action to eliminate the identified obstacles. It is essential to solve these issues if we want to boost the productivity of farmers in Odisha.

INTRODUCTION

Agricultural development is critically dependent on the effective dissemination and adoption of Information Communication Technology (ICT). In the context of India's diverse and vibrant agrarian economy, ICT has the potential to revolutionize agricultural practices, improve productivity, and enhance farmers' livelihoods (Adu, 2020). However, the adoption of ICT in agriculture is not uniform and is influenced by various constraints. This study focuses on the districts of Khurda and Bargarh in Odisha, aiming to comparatively analyze the social, economic, and technical constraints faced by farmers in these regions in adopting ICT for their agricultural practices (Brown, 2018). In recent years, there has been a significant push towards the digitalization of agriculture, with the introduction of mobile applications, internet-based platforms, and other digital tools designed to provide farmers with

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timely information on weather, market prices, pest control, and advanced farming techniques (Qamar, 2017). Despite these advancements, the uptake of these technologies varies widely among different regions and communities. This disparity is particularly evident in the districts of Khurda and Bargarh, where the unique socio-economic and technical landscapes pose distinct challenges to ICT adoption (Goyal et al., 2021).

Social constraints play a critical role in the adoption of ICT among farmers. Factors such as literacy levels, cultural norms, and social capital influence the ability and willingness of farmers to engage with new technologies. In Khurda, which is relatively more urbanized, farmers might face different social barriers compared to Bargarh, which is predominantly rural (Kachwaha, 2021). Understanding these social dynamics is crucial for designing interventions that are sensitive to local contexts and can effectively bridge the digital divide. Economic constraints are another significant barrier to ICT adoption in agriculture. The affordability of digital devices, internet connectivity, and the cost of digital services can limit the access of resource-poor farmers to these technologies (Monika et al., 2020). In regions like Bargarh, where agricultural income is generally lower, these economic challenges are more pronounced. On the other hand, farmers in Khurda might experience different economic pressures, such as higher living costs, that also impact their ability to invest in ICT tools (Kumar & Qureshi, 2017).

Technical constraints, including the availability of infrastructure, technical know-how, and support services, are also pivotal in determining the extent of ICT adoption in agriculture (Patra et al., 2020). While Khurda might have better internet connectivity and technical support, Bargarh might struggle with inadequate infrastructure and limited access to technical training (Kumar et al., 2020). This comparative study aims to provide a detailed analysis of these technical barriers and suggest tailored solutions to enhance ICT adoption in both regions.

METHODOLOGY

The study was conducted in Balipatna and Balianta blocks of Khurda district and Bijepur and Padampur blocks of Bargarh district of Odisha purposively on the basis of highest numbers of farmers using ICTs in both the districts (Sugam portal, Govt. of Odisha, 2022). Two villages from each block i.e. a total of eight villages were selected randomly for the study. A total of 200 respondents i.e. 100 from each district were taken by selecting 25 numbers from each village by following disproportionate random sampling method. The constraints were categorized under three categories vis, social, economic and technological constraints. Data collection was done from respondents using a pre-tested, organized interview schedule. The purpose of the interview was to learn more about the challenges that Odisha's farmers are facing by using ICT in agriculture. Farmers were asked to rank the issues put forth to them in light of the indicated constraints. The final ranking of constraints are given as numerical ratings using the Garrett Ranking Technique. Because it distributes the limitations according to their importance to the responders in numerical, it has an advantage over a basic frequency distribution. This implies that different ranks may be assigned to two or more constraints that have the equal number of respondents. Using Garrett's algorithm, the ranks are transformed into percentages as follows:

$$\text{Percent position} = 100 * (R_{ij} - 0.5)/N_j$$

Where, R_{ij} = rank given for i^{th} constraint by j^{th} individual; N_j = number of constraints ranked by j^{th} individual.

An independent sample t-test was conducted to find out if there was a significant difference in the degree of constraints faced by farmers from climate smart villages to that of non-climate smart villages.

RESULTS

Constraints faced by farmers in the adoption of ICTs in Agricultural Practices

The data in Table 1 outlines that social constraints include lack of knowledge on ICT application in agriculture, which ranks the highest with a mean score of 62.54, indicating it as the most significant barrier. This is followed by the tendency to follow traditional methods of information seeking (60.33), and lack of expertise and skills in ICT usage (58.90). Economic constraints reveal that lack of financial support from the government (mean score 53.98) is the most prominent, with the skeptical image of farmers in front of banking institutions (46.23) and insufficiency of institutional financial resources (38.98) also being notable barriers. Technical constraints highlight insufficient knowledge on mechanization of access on ICT platforms (mean score 70.09) as the most significant issue, followed by poor ICT infrastructure (67.08) and deficiency in support services for maintenance of ICT infrastructure (63.53).

Table 1 outlines the various constraints faced by farmers in Bargarh district of Odisha in adopting ICTs for agricultural practices. The most significant social constraint was the tendency to follow traditional methods of information seeking, with a mean score of 64.39, followed by lack of knowledge on ICT application in agriculture (62.54), and lack of expertise and skills in ICT usage (58.90). Economic constraints highlight the skeptical image of farmers in front of banking institutions as the most critical issue (56.23), with lack of financial support from the government (50.98) and market information adversely affecting product prices (42.29) also being prominent barriers. In the realm of technical constraints, deficiency in support services for maintenance of ICT infrastructure has the highest mean score (73.53), indicating a severe limitation, followed by poor ICT infrastructure (71.08) and insufficient knowledge on mechanization of access on ICT platforms (70.09).

The data indicates that among the various constraints faced by farmers in the adoption of ICTs in agricultural practices, technical constraints were the most significant in both Khurda and Bargarh districts of Odisha, with the highest mean scores of 53.66 and 57.26 respectively, both ranking first. Social constraints follow, with mean scores of 51.14 in Khurda and 52.17 in Bargarh, both ranking second. Economic constraints are identified as the least impactful, with mean scores of 39.54 in Khurda and 40.70 in Bargarh, both ranking third. This ranking consistency across both districts highlights the relative impact of each type of constraint on farmers' ability to adopt ICTs.

Table 1. Constraints faced by farmers in the adoption of ICTs in Agricultural Practices

S.No.	Constraints	Mean Score (Khurda)	Rank	Mean Score (Bargarh)	Rank
I.	Social Constraints				
1.	Lack of confidence in operating of ICTs	52.11	V	57.11	IV
2.	Social taboos, superstitions, unhealthy tradition and customs hinder in ICTs adoption	48.56	VI	49.86	VI
3.	Lack of expertise and skills in ICT usage	58.90	III	58.90	III
4.	Lack of awareness about the benefits of ICTs	56.23	IV	55.23	V
5.	Lack of time to acquire skills needed to use ICT	35.58	XII	45.58	VII
6.	Low literacy	39.19	IX	36.19	IX
7.	Negative attitude toward ICTs tools	46.79	VIII	39.79	VIII
8.	Lack of knowledge on ICT application on agriculture	62.54	I	62.54	II
9.	Tendency of following traditional method of information seeking	60.33	II	64.39	I
II.	Economic Constraints				
1.	Lack of financial support from the government	53.98	I	50.98	II
2.	High initial cost of ICT tools	30.19	VI	30.19	VI
3.	Insufficient rewards and recognition for scientists who produce ICT	35.56	IV	35.56	IV
4.	Insufficiency of institutional financial resources	38.98	III	28.98	V
5.	Skeptical image of farmers in front of banking institutions	46.23	II	56.23	I
6.	Market information adversely affects product price	32.29	V	42.29	III
III.	Technical Constraints				
1.	Erratic Power supply	52.13	V	62.13	VI
2.	Poor internet connectivity	50.92	VI	62.92	V
3.	Poor ICT infrastructure	67.08	II	71.08	II
4.	Deficiency in support services for maintenance of ICTs infrastructure	63.53	III	73.53	I
5.	Unavailability of power backup	46.11	VIII	46.11	VIII
6.	Lack of sufficient tools to support use of ICTs	56.17	IV	66.17	IV
7.	Lack of information in regional language	38.73	X	38.73	IX
8.	Inadequate availability of ICT services to rural farmers	47.76	VII	47.76	VII
9.	Insufficient knowledge on mechanization of access on ICTs platform	70.09	I	70.09	III
10.	Lack of Govt. initiatives to enlarge ICTs connectivity to rural areas	44.12	IX	34.12	X

Table 2. Identification and comparison of major constraints faced by farmers

Constraint category	Mean score (Puri)	Rank	Mean score (Bargarh)	Rank	Mean difference	t-value
Social Constraints	51.14	2	52.17	2	1.03	1.998**
Economic Constraints	39.54	3	40.70	3	1.16	2.123**
Technical Constraints	53.66	1	57.26	1	3.60	4.456**

(Note: **= Significant at 0.01 level of significance)

The Table 2 also provides a comparative analysis of the constraints faced by farmers in the adoption of ICTs in agricultural practices between Khurda and Bargarh districts of Odisha. The mean scores indicate that for all three constraint categories, farmers in Bargarh face slightly higher challenges than those in Khurda. Social constraints have mean scores of 51.14 in Puri and 52.17 in Bargarh, with a mean difference of 1.03 and a t-value of 1.998**, indicating a significant difference. Economic constraints show mean scores of 39.54 in Khurda and 40.70 in Bargarh, with a mean difference of 1.16 and a t-value of 2.123**, also significant. Technical constraints exhibit the largest disparity, with mean scores of 53.66 in Puri and 57.26 in Bargarh, a mean difference of 3.60, and a t-value of 4.456**, signifying a highly significant difference.

DISCUSSION

The obstacles in ICT adoption among farmers in Khurda district are multifaceted, spanning social, economic, and technical domains. The prominent social constraint, the lack of knowledge on ICT application in agriculture, suggests a significant gap in awareness and education, necessitating targeted training programs. The economic constraints underscore the critical need for enhanced financial support and better credit facilities for farmers to invest in ICT tools. On the technical front, the high ranking of insufficient knowledge on mechanization and poor access to reliable and updated information systems are significant constraints faced by farmers using ICTs in agriculture.

The analysis reveals that farmer in Bargarh district face substantial challenges in adopting ICTs, with the constraints spanning social, economic, and technical aspects. The high score for the tendency to follow traditional methods suggests a deeply ingrained resistance to change, necessitating extensive educational campaigns and training programs to highlight the benefits of ICTs in agriculture. The economic constraints, particularly the skeptical image of farmers by financial institutions and lack of governmental financial support,

underline the need for better financial policies and support mechanisms to facilitate access to necessary resources for ICT adoption. Technically, the severe deficiency in support services for ICT maintenance and poor infrastructure points to a critical need for investment in infrastructure development and maintenance services. A holistic approach addressing these multi-dimensional constraints is essential to enable effective ICT adoption among farmers, thereby improving agricultural productivity and sustainability in Bargarh district (Patra et al., 2020).

The comparative results highlight that farmer in Bargarh district experience more pronounced constraints across social, economic, and technical domains when adopting ICTs in agricultural practices compared to those in Khurda. The significant t-values across all categories underscore that these differences are statistically meaningful. The largest mean difference and highest t-value in technical constraints suggest that technological issues are the most critical area needing attention in Bargarh. This disparity could be due to variations in infrastructure, access to technological resources, or support systems between the districts. Addressing these technical barriers through targeted interventions such as improved access to technology and training programs could facilitate better ICT adoption. Additionally, the significant social and economic constraints indicate the need for holistic approaches that also consider social dynamics and economic support mechanisms to enhance the overall adoption process.

CONCLUSION

The findings highlight the urgent need for targeted interventions that address technical limitations, such as improving infrastructure and providing comprehensive training programs, alongside efforts to mitigate social and economic barriers. By focusing on these key areas, policymakers and development agencies can enhance the effectiveness of ICT adoption, thereby empowering farmers and promoting sustainable agricultural practices in the region. Increasing investment in rural ICT infrastructure to ensure reliable and widespread connectivity, developing localized and user-friendly digital tools tailored to the specific needs of farmers, and implementing capacity-building initiatives that offer hands-on training and support can facilitate ICT adoption. By focusing on these key areas, policymakers and development agencies can enhance the effectiveness of ICT adoption, thereby empowering farmers and promoting sustainable agricultural practices in the region.

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