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Factors Influencing ICT Accessibility among the Farming Community of Odisha

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ABSTRACT

In the dynamic agrarian landscape, Information and Communication Technologies (ICTs) herald a transformative era for agricultural services, providing a realistic and efficient platform essential for adapting to constant change and optimizing agricultural productivity. A study was conducted in the year 2023 to delineate the accessibility of ICTs in two purposively selected districts of Odisha, having the highest numbers of farmers using ICTs i.e. Khurda and Bargarh, constituting randomly selected 200 respondents. The study categorizes accessibility of ICTs among farmers into high (30%), medium (41.5%), and low (28.5%) levels. The significant predictors were ICT accessibility, with educational qualification ($b = 0.133$, $p < 0.01$), annual income ($b = 0.068$, $p < 0.01$), social participation ($b = 0.0341$, $p < 0.01$), and media exposure ($b = 0.478$, $p < 0.01$) exhibiting positive regression coefficients. Conversely, age ($b = -0.888$, $p < 0.01$) demonstrated a negative association with ICT accessibility. By prioritizing equitable access to resources and tailored interventions, policymakers and development practitioners can contribute to inclusive agricultural development and digital empowerment in Odisha, thereby fostering sustainable growth and resilience in the agricultural sector.

INTRODUCTION

Agriculture is the backbone of the Indian economy, employing a significant portion of the population and contributing to food security and rural development. However, the sector faces numerous challenges such as climate change, limited access to resources, and low productivity (Anand & Prakash, 2022). In recent years, Information and Communication Technology (ICT) has emerged as a powerful tool to address these challenges and transform the agricultural landscape. This essay aims to explore the impact of ICT on agriculture, with a specific focus on the state of Odisha, India. Information and Communication Technology (ICT) refers to the use of digital technologies, including computers, smartphones, the internet, and other communication tools, to gather, store, process, and disseminate information (Bardhan & Bhardwaj, 2022). In the context of agriculture, ICT applications encompass a wide range of tools and services such as mobile apps, online platforms, remote sensing, and data analytics. These technologies have gained significant momentum in recent years, aiming to improve productivity, efficiency, and sustainability in the agricultural sector (Lahiri et al., 2024). According to the National Sample Survey Office (NSSO), in its 70th round conducted during 2012-13, around 42.7 per cent of agricultural households in India had access to mobile phones, indicating the increasing penetration of ICT in rural areas.

The integration of ICT in agriculture has had a profound impact on various aspects of farming practices. Firstly, ICT has improved access to information and knowledge for farmers, empowering them to make informed decisions about crop selection, pest management, and resource allocation. It has enabled farmers to access weather forecasts, market prices, and expert advice, leading to enhanced productivity and profitability (Panda et al., 2019; Lahiri et al., 2024). Secondly, ICT has facilitated the creation of online marketplaces, connecting farmers directly with buyers and eliminating intermediaries (Chikaire et al., 2017). Odisha, located

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on the eastern coast of India, is predominantly an agrarian state with a significant rural population. The state has made considerable progress in the adoption of ICT in agriculture (Lahiri et al., 2017). ICT in agriculture holds great significance in the state of Odisha, contributing to the overall development and prosperity of the agricultural sector. Odisha, being a predominantly agrarian state, heavily relies on agriculture for livelihoods and economic growth.

By examining the association between selected socio-economic variables and the usage patterns of ICTs, we can identify key factors that influence adoption rates of ICTs and guide future policy interventions. Additionally, identifying the constraints in the use of ICTs by farmers allows for the development of strategies to overcome these barriers and maximize the potential benefits of ICTs in agriculture. In this regard, a thorough investigation was conducted to determine the type of usage, degree of access, and factors influencing the access to ICT tools by the farmers in the Khurda and Bargarh districts of Odisha.

METHODOLOGY

The study was conducted in Balipatna and Balianta blocks of Khurda district and Barpali and Padampur blocks of Bargarh district of Odisha purposively based on the highest numbers of farmers using ICTs in both 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 were selected considering 25 respondents from each village by following a random sampling method. The nature and extent of accessibility and use of ICTs by farmers were operationally defined as the availability and utilization of ICTs such as mobile phones, internet services, and agricultural apps, enabling farmers to access crucial agricultural information, market data, and advisory services to enhance productivity and decision-making in their farming practices (Mishra, 2016). With a few minor adjustments, the Tayade et al., 2011 scale was used to assess farmers' ICT accessibility in this study. The scale has 23 components spread over four dimensions. A five-point continuum with the following categories: Very Much Accessible, Very Accessible, Accessible, Seldom, and Not Accessible was used to evaluate the responses. The mean score for each statement was calculated by adding the accessibility scores of that particular statement and then dividing by five as there was five-point continuum. The range of possible scores, which were eventually standardized, was 23 (lowest) to 115 (highest). Using the cumulative square root frequency approach, respondents' degrees of ICT accessibility by farmers were categorized as low, medium, and high. The method of personal interviews was used to get information from the respondents. The results of a thorough literature analysis along with professional consultation and assistance led to the selection of factors that were pertinent for the study. Multiple regression was used to ascertain the relative

Table 1. Item-wise analysis of accessibility of ICT tools among farmers

S.No.	Tools	Very much accessible (%)	Very accessible (%)	Accessible (%)	Rarely (%)	Not accessible (%)	Mean score	Rank
Gadgets								
1.	Mobile phone	33.5	22.5	17	11.5	15.5	3.50	2
2.	Computer	13.5	17.5	12	31.5	25.5	2.62	5
3.	Television	44	17.5	14	14.5	10	3.71	1
4.	Laptop	9.5	12.5	15	36	27	2.41	6
5.	Mobile camera	39	17.5	22	5	16.5	3.47	3
6.	F.M/ Radio	18.5	23	19	26	13.5	3.07	4
7.	CD's/ DVD's	7	9.5	13.5	31	39	2.14	7
Applications								
1.	e-mail	4	7.5	12.5	31	45	1.94	8
2.	SMS	49	20	15	16.5	10	4.13	1
3.	WhatsApp	39	17.5	22	5	16.5	3.50	2
4.	Facebook	31.5	22	19.5	11.5	15.5	3.42	3
5.	YouTube	23.5	15	20	28	13.5	3.07	4
6.	Video films	10	20	13	31.5	25.5	2.57	5
7.	Agri Apps	7.5	9.0	17.5	39	27	2.31	6
8.	Agri portals	5	8.5	16.5	31	39	2.09	7
Print media								
1.	e-Magazines	3	6	11.5	31.5	48	1.84	4
2.	e-Journals	2.5	6.5	11	30	50	1.81	5
3.	e-Books	2.5	7	14	33	43.5	1.92	3
4.	e-Newspaper	5	7.5	12.5	31	44	1.98	1
5.	Online Agri Farm Publication	4.5	7	11.5	32.5	44.5	1.94	2
Networking technologies								
1.	Internet	39	17.5	22	5	16.5	3.50	1
2.	Information Kiosks	5	7.5	12.5	31	44	1.98	2
3.	Community radio	3	6	11.5	31.5	48	1.84	3

contributions of the chosen independent variables and their combined effect on the dependent variable Accessibility of ICTs.

RESULTS

Item-wise analysis of accessibility of ICT tools among farmers of Odisha

The result provided in Table 1 reveals varying degrees of accessibility across different categories. In terms of gadgets, television emerges as the most accessible tool, with a mean score of 3.713.50 and a rank of 1, indicating that they are very much accessible to a significant proportion of farmers (44% and accessible to a considerable extent to others (17.5%) following closely is mobile phones, ranking second with a mean score of 3.50, indicating high accessibility (33.5%) among farmers. Among applications, SMS ranks highest with a mean score of 4.13, demonstrating its widespread accessibility among farmers, with 49 per cent being very accessible. In terms of print media, e-Newspapers are the most accessible among farmers, with a mean score of 1.98, suggesting a moderate level of accessibility (12.5% very accessible). Networking technologies are dominated by the Internet, ranking highest in accessibility with a mean score of 3.50, indicating significant accessibility (39%) among farmers.

Levels of accessibility of ICTs by farmers of Odisha

The levels of accessibility of ICTs among farmers in Odisha in Figure 1 indicate a diverse distribution, with 30 per cent categorized as having high accessibility, 41.5 per cent with medium accessibility, and 28.5 per cent with low accessibility. This distribution suggests that while a significant portion of farmers have access to ICTs at a moderate level, there is also a substantial proportion with either high or low levels of accessibility. This variation underscores the importance of understanding the factors influencing ICT accessibility and designing interventions tailored to address the specific needs and constraints faced by different segments of the farming population in Odisha.

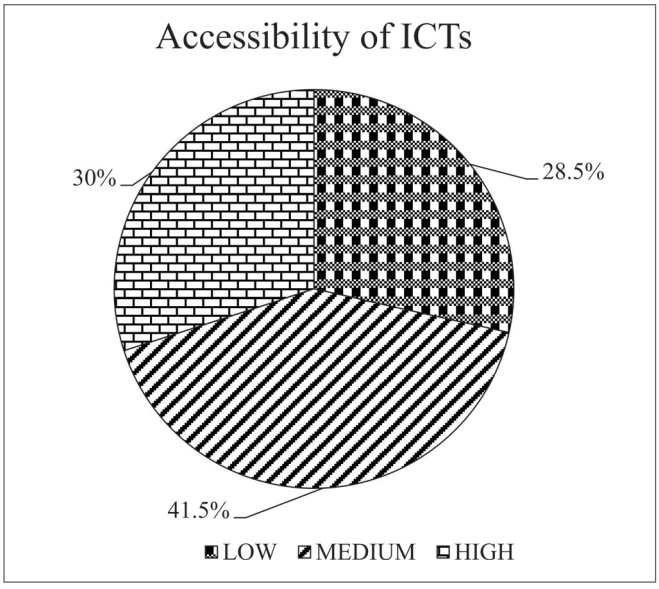

Figure 1. Levels of accessibility of ICTs by farmers of Odisha

Pearson's Correlation coefficients between ICT accessibility and profile characteristics

The correlation coefficients between ICT accessibility and profile characteristics in Table 2 reveal several noteworthy associations. Among the variables studied, educational qualification, annual income, social participation, extension contacts, media exposure, and scientific orientation exhibit statistically significant positive correlations with ICT accessibility. Specifically, educational qualification, annual income, social participation, extension contacts, media exposure, and scientific orientation all demonstrate positive correlations with the accessibility of ICTs among the studied population. Conversely, age, family type, family size, occupation, operational landholdings, and housing pattern exhibit weaker or non-significant correlations with ICT accessibility.

Multiple regression analysis of ICTs accessibility on profile characteristics

The multiple regression analysis in Table 3 reveals several significant predictors of ICT accessibility among the surveyed population. Age (X1), educational qualification (X2), annual income (X7), social participation (X9), and media exposure (X11) all demonstrate statistically significant relationships with ICT accessibility. Specifically, educational qualification ($b = 0.133$, $p < 0.01$), annual income ($b = 0.068$, $p < 0.01$), social participation (b

Table 2. Pearson's Correlation coefficients between ICT accessibility and profile characteristics

Variables	Correlation Coefficient (r)
Age	-0.059
Educational qualification	0.187*
Family type	0.038
Family size	0.042
Occupation	0.036
Operational landholdings	0.054
Annual income	0.195*
Housing pattern	0.028
Social participation	0.227**
Extension contacts	0.267**
Media exposure	0.254**
Scientific orientation	0.229**

Table 3. Multiple regression analysis of ICTs accessibility on profile characteristics

Variables	Regression coefficients/ (b) values	SE (Standard Error)	"t" value
Constant	1.456	1.326	1.098
Age (X1)	-0.888	0.216	-4.102**
Educational qualification (X2)	0.133	0.031	4.245**
Annual income (X7)	0.068	0.031	2.216**
Social participation (X9)	0.0341	0.131	2.600**
Media exposure (X11)	0.478	0.056	8.500**

$R^2 = 49.20\%$

$Y_1 = 1.456 - 0.888\ X1 + 0.133\ X2 + 0.068\ X7 + 0.0341\ X9 + 0.478\ X11$

** Significant at P < 0.01, * Significant at P < 0.05

= 0.0341, $p < 0.01$), and media exposure (b = 0.478, $p < 0.01$) exhibit positive regression coefficients, indicating that higher levels of education, income, social participation, and media exposure are associated with greater accessibility to ICTs. Conversely, age (b = -0.888, $p < 0.01$) is negatively associated with ICT accessibility, suggesting that older individuals may encounter greater barriers to accessing ICTs. The regression model accounts for 49.20 per cent of the variance in ICT accessibility, indicating a moderate level of predictive power.

DISCUSSION

The findings underscore the pivotal role of mobile phones and television as the most accessible ICT tools among farmers. Mobile phones, in particular, serve as versatile tools for communication, access to information, and even financial transactions in rural areas (Lahiri et al., 2019). The widespread adoption of SMS and WhatsApp further emphasizes the importance of mobile-based communication platforms in agricultural contexts, facilitating information exchange and market transactions (Lahiri et al., 2020; Godara et al., 2024). However, the relatively low accessibility of computers and laptops highlights potential barriers to more advanced ICT usage among farmers, such as cost, infrastructure limitations, and digital literacy challenges (Nirmalkar et al., 2022). Print media, especially e-newspapers, still play a crucial role in disseminating agricultural information, although their accessibility remains moderate compared to digital platforms. The dominance of the Internet in networking technologies signifies its potential for enhancing agricultural extension services, market access, and knowledge dissemination. However, efforts are needed to bridge the digital divide and ensure equitable access to these tools among farmers, particularly in remote and marginalized communities. Overall, these results provide valuable insights for policymakers, extension agents, and development practitioners to tailor ICT interventions that effectively meet the diverse needs and accessibility challenges faced by farmers. There are clear strengths in strategy, technology, and human resources support, areas requiring improvement, particularly organizational support and aspects of e-culture readiness, should be addressed with strategic initiatives. (Sondarva et al., 2024)

The distribution of ICT accessibility levels among farmers in Odisha reflects the complex interplay of socioeconomic, infrastructural, and geographical factors influencing technology adoption and access. While the proportion of farmers with medium accessibility indicates a certain level of penetration of ICTs in the agricultural sector, the presence of both high and low-accessibility groups highlights disparities in access and utilization. This aligns with the results of Panja et al., (2022) . Efforts to promote ICT adoption and improve accessibility should take into account the unique challenges faced by farmers with low accessibility, such as limited infrastructure, connectivity issues, and socioeconomic constraints. Moreover, strategies aimed at enhancing ICT accessibility should prioritize equitable distribution of resources and targeted interventions tailored to the specific needs and contexts of different farmer groups, ultimately contributing to inclusive agricultural development and digital empowerment in Odisha.

The results indicate that certain socio-demographic and socioeconomic factors are significantly associated with ICT accessibility among the surveyed population. Notably, individuals with higher educational qualifications tend to have better access to ICTs, suggesting a potential role of education in enhancing digital literacy and technological adoption (Lahiri et al., 2017). Similarly, higher annual incomes are positively correlated with ICT accessibility, possibly due to increased purchasing power and access to digital infrastructure. Furthermore, active social participation, frequent extension contacts, exposure to media, and a scientific orientation are all linked to greater ICT accessibility, reflecting the importance of social networks, information dissemination channels, and a proactive attitude towards technology in facilitating access to ICTs. This aligns with the results of Singh et al., (2023). These findings underscore the need for targeted interventions aimed at improving digital literacy, expanding digital infrastructure, and fostering a conducive socio-cultural environment to promote equitable access to ICTs, particularly among marginalized and underserved populations. Additionally, the non-significant correlations observed for certain variables highlight the complexity of factors influencing ICT accessibility and call for further research to explore additional determinants and nuanced relationships in diverse agricultural contexts.

The results of the multiple regression analysis underscore the importance of socio-demographic and socioeconomic factors in shaping ICT accessibility among the surveyed population. Educational qualification emerges as a significant predictor, highlighting the role of education in enhancing digital literacy and facilitating access to ICTs. Similarly, higher annual incomes are associated with greater ICT accessibility, reflecting the influence of economic resources on technology adoption and access to digital infrastructure. Active social participation and exposure to media also contribute positively to ICT accessibility, underscoring the importance of social networks and information dissemination channels in promoting digital inclusion. Conversely, the negative relationship between age and ICT accessibility suggests that older individuals may face unique challenges in accessing and utilizing ICTs, highlighting the need for targeted interventions to bridge the digital divide across age groups. Overall, these findings provide valuable insights for policymakers and development practitioners seeking to design inclusive ICT interventions that address the diverse needs and barriers faced by different segments of the population.

CONCLUSION

The diverse distribution of ICT accessibility levels among farmers in Odisha underscores the multifaceted nature of technology adoption and utilization in the agricultural sector. While the presence of both high and medium accessibility groups signifies a certain level of ICT penetration, the existence of a significant proportion with low accessibility highlights persistent challenges in bridging the digital divide. Addressing these challenges requires a holistic approach that encompasses infrastructural development, capacity building, and policy support to create an enabling environment for technology adoption. By leveraging ICTs effectively, policymakers, extension agencies, and development practitioners can enhance agricultural productivity, improve market access, and empower farmers with valuable information and resources. Furthermore,

fostering digital literacy and promoting inclusive innovation can unlock the full potential of ICTs to contribute to sustainable agricultural development and poverty reduction in Odisha.

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