Economic Affairs, Vol. **69**(04), pp. 1561-1565, December 2024
DOI: 10.46852/0424-2513.5.2024.4

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RESEARCH PAPER

Analysis of Constraints Affecting Farmers Using Information Communication Technology in Agriculture in Odisha

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Received: 16-09-2024 **Revised:** 26-11-2024 **Accepted:** 05-12-2024

ABSTRACT

The study was conducted in 2023 in Balipatna and Balianta blocks of Khurda district and in Barpali and Bargarh blocks of Bargarh district of Odisha to determine the obstacles faced by 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 respondents. To analyse the constraints faced by farmers under the social, economic, and technical dimensions, Garrett's ranking technique was employed. Lack of education and confidence are major societal limitations affecting ICT adoption among farmers while ICT instruments having high beginning expenses and the absence of physical assets as credit collateral are major economic constraints and insufficient knowledge on operation of ICTs platform is important constraints under technical dimension. As a result, important stakeholders must 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.

HIGHLIGHTS

- Gender bias is the biggest constraint to use of ICT in Odisha.
- Complex barriers hinder ICT integration in agriculture.
- Lack of education and confidence hinders farmers' willingness to embrace ICT in agriculture.
- High initial expenses associated with ICT tools suppresses use of ICT.
- Collaboration among various stakeholders is imperative To remove these obstacles.

Keywords: Farmers, Agriculture, ICT, Constraint, Garrett's ranking

The importance of ICT (information and communication technology) in agriculture has increased as a result of its potential to change the sector by boosting productivity, sustainability, and farmer livelihoods. The key arguments in favor of ICT in agriculture are listed below (Adu, 2020). Thanks to ICT technologies, farmers today have quick access to essential information including weather forecasts, market prices, pest and disease alerts, and best agricultural practices. Farmers can make well-informed decisions based on this knowledge to enhance their crop management practices and reduce their risks (Brown, 2018). ICT enables precision agriculture, which lets farmers adapt their farming practices depending on specific data about their farms. Input waste is avoided, crop yields are enhanced, and the environmental effect is minimized as a result of maximizing resource usage. ICT platforms connect farmers to local and global markets, allowing them to bypass middlemen and reach a wider audience of consumers. ICT tools can track a product's journey from the farm

How to cite this article: Satapathy, G.P., Das, S., Tripathy, M., Swain, D. and Mishra, S. (2024). Analysis of Constraints Affecting Farmers Using Information Communication Technology in Agriculture in Odisha. *Econ. Aff.*, **69**(04): 1561-1565.

Source of Support: None; **Conflict of Interest:** None

to the market (Qamar, 2017). ICT in agriculture can support rural development by creating new tech-related employment opportunities, reducing emigration to metropolitan areas, and enhancing the general economic health of rural populations (Goyal *et al.* 2021). By providing timely information, tools, and resources, ICT helps farmers make better decisions, facilitates more efficient resource management, and contributes to the overall growth and sustainability of the agricultural sector.

A number of enterprises throughout the world have undergone radical change as a result of the usage of information and communication technology (ICT), and the agricultural industry is no different. The Indian state of Odisha, where agriculture is the backbone of the economy and provides a living for a sizable portion of the population, has seen a considerable impact of ICT on this sector. According to statistics, Odisha's agricultural landscape has seen a noteworthy transformation as a result of the adoption of ICT. According to a research by the Odisha Department of Agriculture and Farmers' Empowerment, the usage of ICT tools including mobile applications, online markets, and weather forecasting platforms has significantly increased crop yields.Between 2015 and 2020, the output of pulses increased by 9.8%, while the average yield of rice increased by 12.5% per hectare (Kachwaha, 2021). These outstanding statistics show how well ICT works to give farmers timely information and aid in making informed decisions (Monika *et al.* 2020). Farmers using online agricultural marketplaces increased by 35% between 2019 and 2022. Direct sales to consumers using online channels raised the average revenue of participating farmers by 25%.

Despite the positive achievements, there are still a number of barriers preventing farmers in Odisha from efficiently and widely utilizing ICT. A major obstacle is the "digital divide," or the unequal access to technology between urban and rural residents. While larger cities usually have access to cell phones and good internet connectivity, rural areas frequently lack basic infrastructure (Kumar *et al.* 2017). According to the National Sample Survey Office (NSSO), little over 30% of rural households in Odisha have access to the internet in 2020. Only a sizeable portion of the rural population can employ ICT-enabled services as a result of this inequality (Kumar *et al.* 2020). Another significant impediment is the lack of digital literacy among farmers. Many farmers, particularly those who are elderly, find it difficult to use ICT equipment and traverse computer interfaces. Only 20% of rural individuals in Odisha over the age of 15 were technologically literate, according to the 2021 Annual Health Survey. This lack of proficiency hinders the use of digital platforms and keeps farmers from utilizing the tools at their disposal to their fullest potential (Patra *et al.* 2020).

DATABASE AND METHODOLOGY

The study was conducted in Khurda district's Balipatna and Balianta blocks as well as Bargarh district's Barpali and Bargarh blocks in the Indian state of Odisha. According to secondary data from the Sugam portal (AGRISNET), Odisha, these districts were chosen since the majority of farmers use ICT in agriculture in both the districts. The four blocks i.e. Balipatna and Balianta from the Khurda district, Bargarh and Bijepur from the Bargarh district, which had the most farmers using ICT were specifically picked based on secondary data from the Department of Agriculture and Farmer's Welfare, Odisha. For a total sample size of 200 farmers, two villages from each block and a total of 25 recipient farmers were randomly selected from each of the eight villages in each of the two districts. Henry and Garrett's method was used to evaluate the obstacles these farmers experienced as they moved toward employing ICT in agriculture. The application of this methodology was intended to guarantee a thorough examination of the barriers blocking the study area's agriculture from adopting ICT.

Measuring the predictable variable of barriers to ICT use in agriculture

The farmers were chosen at random to answer questions about the social, economic, and technological barriers they encountered when using ICT in agriculture. The respondents were chosen at random and asked to list the numerous restrictions they experienced along the dimensions mentioned above. Following that, respondents ranked the limitations they faced.

Henry Garrett's ranking technique

This method was used to assess the respondents' issues based on the orders of merit they provided, which were then converted into rank by applying a suitable formula. The respondents were initially asked about the problems that have prevented them from using ICT in agriculture, and these problems were then categorized into three categories: social, economic, and technical. It has an advantage over a simple frequency distribution since it distributes the constraints according to how important they are to the respondents. This implies that ranks may be assigned differently for two or more constraints that have the same number of respondents. Garrett's algorithm is used to convert the rankings to percentages as shown below:

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

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

The table provided by Garrett & Woodworth (1969) will first be used to convert the % position of each rank to points. The mean score for each factor will then be determined by adding these values for each element and dividing the result by the total number of respondents. The relative relevance of each constraint will next be determined by sorting the mean scores for all constraints into descending order.

Table 1: Positions in percentages and the values they relate to in the Garrett Table

Rank	Percent position		Table value
1	100(1-0.5)/12	4.16	83
2	100(2-0.5)/12	12.5	73
3	100(3-0.5)/12	20.83	66
4	100(4-0.5)/12	29.16	61
5	100(5-0.5)/12	37.5	56
6	100(6-0.5)/12	45.83	52
7	100(7-0.5)/12	54.16	48
8	100(8-0.5)/12	62.5	44
9	100(9-0.5)/12	70.83	40
10	100(10-0.5)/12	79.16	34
11	100(11-0.5)/12	87.5	27
12	100(12-0.5)/12	95.83	17

RESULTS AND DISCUSSION

When seeking to incorporate Information and Communication Technology (ICT) into agriculture, farmers around the world face a variety of obstacles. To fully utilize ICT in agriculture for increased production, sustainability, and livelihoods in rural communities, several obstacles must be overcome.

The issues that farmers view as significant restraints under the social, economic, and technical dimensions are shown by the ranking of ICT-related constraints provided in Tables 2, Table 3, and Table 4, respectively.

Social constraints

Analysis of Table 2 revealed issues including low levels of education (50.34) and confidence (52.11) as significant societal barriers preventing farmers from adopting ICT. These obstacles must be overcome in order for farmers to use ICT more productively, enhancing production and modernity. Farmers will be granted greater power if these problems are properly handled because they will be able to use technology more effectively and improve their farming practices and way of life. The results were remarkably similar to those of Satapathy (2023).

Table 2: List of constraints as opined by farmers under social dimension

Sl. no.	Constraints	Total score	Average score	Final ranks
1	Lack of education	10,068	50.34	VII
2	Lack of confidence in operating of ICTs	10,422	52.11	VI
3	The adoption of ICTs is hampered by social taboos, superstitions, and undesirable traditions and behaviors	9,712	48.56	VIII
4	Lack of expertise and skills in ICT usage and production	11,780	58.90	III
5	Lack of awareness about the benefits of ICTs	11,246	56.23	IV
6	Lack of time to acquire skills needed to use and produce ICT	7116	35.58	XII
7	Low literacy	7838	39.19	X
8	Lack of interest in ICT usage and production	7456	37.28	XI
9	Lack of ICT- oriented training programme	10658	53.29	V

10	Negative attitude toward ICTs tools	9358	46.79	IX
11	ICT applications in agriculture are not widely known	12508	62.54	I
12	Tendency of following traditional method of cultivation	12066	60.33	II

Economic constraints

Table 3 gives a summary of the financial barriers that prevent farmers from adopting ICT, including the high initial costs of ICT instruments (53.98) and the lack of physical assets as lending collateral (47.80). Lack of capital (32.29) and bank institutions' skepticism (38.98) are obstacles to progress, but it is also noted that market information has a detrimental impact (46.23) on farmer prices. We can strengthen farmers' positions and enhance the agricultural environment by removing these financial barriers and encouraging technology-driven efficiency and growth. We may accomplish this by offering tools that are subsidized, solutions for loan access, and acknowledgment for ICT producers. These findings agreed with those of Sharma, (2020) and Shreya *et al.* (2022).

Table 3: List of constraints as opined by farmers under economical dimension

Sl. no.	Constraints	Total score	Average score	Final ranks
1	Less financial support from the government	6458	32.29	VI
2	Initial cost of ICT tools high	10796	53.98	I
3	Insufficient rewards and recognition for scientists who produce ICT	6038	30.19	VII
4	Insufficiency of institutional financial resources	7112	35.56	V
5	Skeptical image of farmers in front of banking institutions	7796	38.98	IV
6	Lack of own property and being tenants leave farmer with no guarantor for getting credits	9560	47.80	II
7	Market data on pricing, supply, and demand have a negative impact on the price given to farmers	9246	46.23	III
8	Farmers are having trouble receiving ICT-based information due to the bias of the business and governmental sectors	5836	29.18	VIII

Technical constraints

The technological dimension highlights critical barriers to ICT adoption among farmers, with "Insufficient knowledge on the operation of ICT tools" emerging as the most significant constraint. This was ranked first with a mean score of 70.09, as reported by 12.50% of farmers, indicating a widespread lack of operational proficiency in using ICT tools effectively. "Poor internet connectivity," ranked second with a mean score of 67.08, was acknowledged by 54.16% of respondents, reflecting the persistent issue of inadequate digital infrastructure in rural areas. Similarly, "Erratic power supply," with a mean score of 63.53, ranked third and was reported by 62.50% of farmers, highlighting the critical need for stable electricity to support ICT usage in agriculture. These findings indicate the urgent necessity of improving rural ICT infrastructure, providing training, and ensuring service availability to bridge the digital divide in agriculture.

Table 4: List of constraints as opined by farmers under technical dimension

Sl. no.	Constraints	Total score	Average score	Final ranks
1	Inadequate availability of ICT services to rural farmers	11214	56.07	IV
2	Deficiency in support services for maintenance of ICT infrastructure	10446	52.23	V
3	Erratic power supply	12506	62.53	III
4	Poor internet connectivity	13416	67.08	II
5	Insufficient knowledge on operation of ICT tools	14018	70.09	I

CONCLUSION

The study exemplifies the complex web of obstacles stopping farmers and rural women from utilizing ICTs. These include biases against women, poor political implementation, expensive initial ICT instrument expenses, and educational disparities. To overcome these difficulties, focused activities are needed, including increasing digital literacy, offering

affordable tech solutions, enacting legislation that reflect gender equality, and promoting female leadership. These kinds of programs are necessary to advance agriculture, realize the full potential of ICTs, and achieve gender parity. Stakeholders must cooperate to overcome these challenges and pave the way for a technologically sophisticated and inclusive agricultural landscape.

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