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Constraints and improvement strategies in digital agricultural extension: A study of field extension functionaries in Chhattisgarh

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Abstract

The present study was conducted in Chhattisgarh state to identify the constraints faced by field extension functionaries and to obtain their suggestions for improvement in digital extension. A descriptive research design was followed and 305 Rural Agricultural Extension Officers (RAEOs) were selected from the three agro-climatic zones of the state by using proportionate stratified random sampling. Primary data were collected through a structured and pre-tested interview schedule, while secondary data were collected from official records and relevant publications. The constraints were measured on a four-point continuum and analysed using frequency, percentage, mean score and rank order. The findings revealed that among organizational constraints, inadequate infrastructural facilities to support ICT tools was the most serious constraint, followed by inadequate technical support for ICTs. Among personal constraints, high cost of ICT gadgets emerged as the major constraint, while among technical constraints, insufficient availability and inadequate maintenance of ICT equipment ranked first. The major suggestions offered by the respondents included provision of subsidy for ICT tools and accessories, subsidies on internet data packages, continuous power supply, digital content in local languages, and centralized technical helpdesk support. The study concludes that strengthening infrastructural facilities, reducing financial barriers, improving technical support and organizing regular capacity-building programmes are essential for enhancing the effectiveness of digital extension services among field extension functionaries.

Keywords: Chronic cough, Congestive heart failure (CHF), Cardiogenic pulmonary Oedema

Introduction

Agricultural extension plays a critical role in disseminating scientific innovations, improving farm productivity and supporting sustainable rural development in India. In recent decades, Information and Communication Technologies (ICTs) have increasingly been integrated into extension systems, giving rise to various forms of digital extension that use mobile phones, internet platforms and multimedia tools to deliver timely, location-specific advisories to farmers (Rajkhowa 2021) ^[1].

Digital extension approaches have been shown to enhance farmers' access to market information, weather forecasts and best practices, often improving decision making, yields and income when appropriately designed and implemented (Yadav *et al.* 2026) ^[2]. In India, numerous national and state-level e-governance and agricultural ICT initiatives have been launched, and states such as Chhattisgarh have invested in digital governance infrastructure, online portals and network connectivity to reach rural and tribal communities more effectively (Subramanian and Saxena 2008) ^[3].

However, the potential of digital extension is constrained by a persistent digital divide in rural areas, characterized by uneven ICT infrastructure, unreliable internet connectivity and frequent power interruptions (Samadder *et al.* 2023) ^[4]. Studies across different regions of India highlight additional barriers including the high cost of devices and data, low levels of digital literacy, language and localization issues,

and limited technical support for maintaining and using ICT tools (Prangya *et al.* 2024 and Ferrari *et al.* 2022) ^[5, 6].

Field extension functionaries are central actors in this context, as they mediate between research institutions and farming communities and increasingly rely on digital tools to plan, implement and monitor extension activities (Sahoo *et al.* 2025) ^[7]. Evidence from different Indian states indicates that public extension workers themselves often face gaps in ICT access, skills and training, which can reduce the effectiveness of digital advisory services (Patil 2016) ^[8].

Despite the growing emphasis on digital agriculture, there remains limited empirical understanding of the extent to which field extension functionaries are prepared to effectively utilize digital tools in their day-to-day extension activities, particularly in resource-constrained regions such as Chhattisgarh. Assessing the digital readiness, media utilization pattern and challenges faced by extension personnel is therefore essential for strengthening the effectiveness of digital extension systems. In this context, the present study was undertaken to examine the digital literacy, media utilization and constraints experienced by field extension functionaries in Chhattisgarh, with the aim of identifying gaps and suggesting measures for improving the delivery of digital agricultural extension services.

Methodology

The study was conducted in Chhattisgarh state to assess the

constraints faced by field extension functionaries and their suggestions for improvement in digital extension. A descriptive research design was followed, as the study aimed to analyse the existing situation under natural field conditions. The respondents were selected from the three agro-climatic zones of Chhattisgarh, namely Chhattisgarh Plains, Bastar Plateau and Northern Hills. Rural Agricultural Extension Officers (RAEOs) in the state were considered as respondents for the study. Out of 3,063 filled RAEO posts, 305 respondents were selected by using proportionate stratified random sampling. Primary data were collected through a structured and pre-tested interview schedule, while secondary data were obtained from official records, reports and relevant publications. Constraints in digital extension were measured on a four-point continuum considering severity. Suggestions for improvement were collected through open-ended questions. The collected data were analysed using frequency, percentage and mean percent score (MPS), and ranks were assigned to identify the major constraints and important suggestions.

Results

1. Constraints faced by field extension functionaries

The data presented in Table 1 reveal the various constraints

faced by field extension functionaries in using ICT tools and digital platforms for extension activities. The constraints were categorized into organizational level constraints, personal constraints, and technical constraints, and ranked based on their mean scores.

A. Organizational level constraints

Among the organizational level constraints, inadequate infrastructural facilities to support ICT tools was perceived as the most serious constraint with a mean score of 65.46, thereby ranking first. This indicates that insufficient institutional infrastructure such as internet connectivity, electricity, and digital support facilities limits the effective use of ICT tools by extension personnel. This was followed by inadequate technical support for ICTs, which obtained a mean score of 55.41, ranking second. The constraint inadequate allocation for purchasing, maintaining, and upgrading digital devices and software secured a mean score of 51.80, ranking third. Further, heavy workload and multiple responsibilities reducing the time available for learning and using digital tools was ranked fourth with a mean score of 42.19, indicating that time constraints also hinder the effective adoption of ICT tools among extension functionaries.

Table 1: Constraints faced by field extension functionaries (n=305)

Sl. No.	Constraints	Mean score	Rank
A.	Organizational level constraints		
1.	Inadequate budget allocation for purchasing, maintaining, and upgrading digital devices and software	51.80	III
2.	Heavy workload and multiple responsibilities reduce time available for learning and using digital tools.	42.19	IV
3.	Inadequate of technical support for ICTs	55.41	II
4.	Inadequate infrastructural facilities to support ICT tools.	65.46	I
B.	Personal constraints		
1.	Inadequate digital literacy skills and low confidence in using computers, smartphones, and e-extension platforms	39.23	IV
2.	High cost of ICT gadgets like smart phones, computers etc.	51.37	I
3.	Language barriers where digital content is not available in preferred languages.	43.83	II
4.	Work-related stress and time constraints limiting self-learning and digital skill enhancement	43.28	III
C.	Technical constraints		
1.	Inadequate internet facilities.	44.59	III
2.	Lack of uninterrupted power supply	44.37	IV
3.	Insufficient availability and inadequate maintenance of ICT equipment like computers, smartphones, printers, and projectors	55.41	I
4.	Insufficient training and practical exposure.	51.26	II

B. Personal constraints

With regard to personal constraints, high cost of ICT gadgets such as smartphones and computers was perceived as the most important constraint with a mean score of 51.37, ranking first. This was followed by language barriers where digital content is not available in preferred languages, which secured a mean score of 43.83, ranking second. The constraint work-related stress and time constraints limiting self-learning and digital skill enhancement obtained a mean score of 43.28, ranking third. Further, inadequate digital literacy skills and low confidence in using computers, smartphones, and e-extension platforms was ranked fourth with a mean score of 39.23.

C. Technical constraints

Among the technical constraints, insufficient availability and inadequate maintenance of ICT equipment such as computers, smartphones, printers, and projectors was ranked

first with a mean score of 55.41. This was followed by insufficient training and practical exposure, which obtained a mean score of 51.26, ranking second. The constraint inadequate internet facilities was ranked third with a mean score of 44.59, while lack of uninterrupted power supply was ranked fourth with a mean score of 44.37. Overall, the findings indicate that inadequate infrastructure, lack of technical support, high cost of ICT gadgets, and insufficient training opportunities were the major constraints faced by field extension functionaries in effectively utilizing ICT tools for agricultural extension activities.

2. Suggestions given by field extension functionaries

The suggestions given by field extension functionaries for further improvement in ICT and digital resource utilization are presented in Table 2. The responses were obtained on multiple response basis and ranked according to the percentage of respondents supporting each suggestion. The

majority of the respondents (76.07%) suggested the need for subsidy to purchase ICT tools and accessories, which was ranked first. This indicates that financial constraints are a major barrier in accessing and upgrading digital tools. Closely following this, 71.48 per cent of the respondents suggested providing subsidies on internet data packages, which secured the second rank, highlighting the importance of affordable internet access for effective digital functioning. Ensuring continuous power supply was suggested by 66.23 per cent of the respondents and ranked third, reflecting infrastructural challenges faced in rural areas. Providing digital content and messages in local languages for better understanding by extension workers and farmers was supported by 62.30 per cent of the respondents and ranked fourth, emphasizing the need for localized and context-specific digital materials. Providing centralized technical helpdesk support for troubleshooting ICT and e-resource access issues was suggested by 60.33 per cent of the respondents, securing the fifth rank. Introducing periodic refresher courses on advanced digital applications for agricultural extension was supported by 58.36 per cent and ranked sixth, indicating the need for continuous capacity building. Training on ICT skills for

better handling of ICT tools was suggested by 53.11 per cent of the respondents and ranked seventh. Creating awareness campaigns on the benefits of ICT tools was supported by 51.80 per cent and ranked eighth, suggesting the need for motivation and sensitization. Strengthening internet connectivity and bandwidth capacity across rural areas was recommended by 49.18 per cent of the respondents and ranked ninth. Providing reliable internet facilities with Wi-Fi connectivity at the workplace was supported by 45.25 per cent and ranked tenth, reflecting the demand for stable institutional connectivity. Improving infrastructure facilities was suggested by 40.00 per cent of the respondents and ranked eleventh. Finally, developing a dedicated digital knowledge portal for field extension functionaries with updated agricultural e-resources was suggested by 38.03 per cent and ranked twelfth. Overall, the findings reveal that financial support for ICT tools and internet access, reliable infrastructure (power and connectivity), and continuous training are the primary requirements for enhancing digital competency and effective utilization of ICTs among field extension functionaries.

Table 2: Suggestions given by field extension functionaries for the further improvement (n=305)

Sl. No.	Suggestions	F	%	Rank
1.	Need subsidy to purchase ICT tools and accessories.	232	76.07	I
2.	Should provide better infrastructure facilities.	122	40.00	XI
3.	Should provide trainings on ICT skills for better handling of ICT tools.	162	53.11	VII
4.	Develop a dedicated digital knowledge portal for field extension functionaries with updated agricultural e-resources.	116	38.03	XII
5.	Should provide reliable internet facilities with Wi-Fi connectivity at work place.	138	45.25	X
6.	Should ensure continuous power supply.	202	66.23	III
7.	Introduce periodic refresher courses on advanced digital applications for agricultural extension.	178	58.36	VI
8.	Create awareness campaigns on benefits of ICT tools.	158	51.80	VIII
9.	Provide centralized technical helpdesk support for troubleshooting ICT and e-resource access issues.	184	60.33	V
10.	Provide digital content and messages in local languages for better understanding by extension workers and farmers.	190	62.30	IV
11.	Strengthen the internet connectivity and bandwidth capacity across the rural areas.	150	49.18	IX
12.	Provide subsidies on internet data packages.	218	71.48	II

F= Frequency based on multiple response, %= Percentage

Constraints

The study concluded that field extension functionaries faced a number of organizational, personal and technical constraints in the effective use of ICTs and digital tools for extension work. Among the organizational constraints, inadequate infrastructural facilities and lack of technical support emerged as the most serious problems. At the personal level, high cost of ICT gadgets and language barriers were the major constraints, while among technical constraints, inadequate availability and poor maintenance of ICT equipment, along with insufficient training and practical exposure, were found to be important. The suggestions offered by the respondents clearly indicated the need for subsidy support for ICT tools and internet data packages, continuous power supply, digital content in local languages, technical helpdesk support and regular capacity-building programmes. Overall, the findings suggest that strengthening infrastructure, reducing financial barriers, improving technical support and organizing need-based training programmes are essential for enhancing the effectiveness of digital extension services among field extension functionaries.

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