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### Unlocking digital potential: Overcoming challenges in agricultural communication for agri-input dealers

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#### Abstract

Digitalization has become a transformative force across various sectors, including agriculture, by revolutionizing communication and service delivery. This study focuses on the implementation of digital agricultural communication and services among agri-input dealers in Telangana, India. Through a strategic sampling approach encompassing diverse agricultural settings, the study identified and analyzed constraints faced by input dealers in adopting digital technologies. The research employed the Garrett ranking method to rank the identified constraints, providing valuable insights into personnel, technological, economic, and situational challenges. Results indicate that input dealers encounter significant personnel constraints, including poor knowledge of stakeholders, difficulty in handling digital content, and lack of confidence in using digital tools. Technological constraints, such as restricted availability of agricultural services in digital formats and the complexity of digital tools, further impede their adoption of digital communication. Economic challenges, such as high costs associated with purchasing digital gadgets and telecommunication services, pose additional barriers. Situational constraints, including non-availability of repair services for digital gadgets and insufficient training, exacerbate the challenges faced by input dealers. To address these constraints, the study proposes various strategies, including comprehensive training programs, financial incentives, and simplified digital interfaces. Efforts to enhance content accessibility, improve network reliability, and promote stakeholder participation are also recommended. By implementing these strategies, input dealers can optimize their utilization of digital agricultural communication and services, leading to enhanced efficiency, improved decision-making, and better customer support.

**Keywords:** Digital agricultural communication, agri-input dealers, constraints, technology adoption, Telangana, India

#### Introduction

Digitalization is reshaping industries and societies, with agriculture emerging as one of the most pivotal sectors undergoing profound impacts. It molds modern society by exerting influence on both business operations and daily routines (Hagberg *et al.*, 2016) <sup>[6]</sup>. It drives innovation, creates jobs, and stimulates economic growth (Shallu *et al.*, 2019) <sup>[13]</sup>. The integration of Information and Communication Technology (ICT), including Artificial Intelligence (AI), the Internet of Things (IoT), and advancements from the fourth industrial revolution, is pivotal in this transformation (Morley *et al.*, 2018) <sup>[8]</sup>. Digital empowerment accelerates development by optimizing human resource utilization (Dutta & Jeerh, 2023) <sup>[4]</sup>. Incorporating digital technology into Indian agriculture holds substantial potential for revolutionizing the sector. It provides real-time information, expert advice, and e-Services that enhance government efficiency, reduce corruption, increase transparency, and empower citizens (Dutta & Devi, 2015) <sup>[3]</sup>. Digitalization involves adopting digital technologies at individual, organizational, and societal levels (Brennen & Kreiss, 2016) <sup>[1]</sup>. Effective

agricultural knowledge systems are crucial for empowering Indian farmers with the critical information they need to make informed decisions. Traditionally, farmers have relied heavily on informal networks for accessing agricultural information and services (Singh *et al.*, 2023) <sup>[14]</sup>. Digital tools, such as mobile apps, Interactive Voice Response (IVR) systems, digital kiosks, and social media, significantly enhance the efficiency and effectiveness of agricultural systems (Rai, 2023) <sup>[10]</sup>. Digital communication is transforming access to agricultural advisory services, bridging the gap between small-scale farmers and emerging markets (Zolkepli & Kamarulzaman, 2015) <sup>[15]</sup>. The integration of ICT in agriculture is a crucial component of agricultural extension, aiming to advance rural and agricultural development through improved communication and information dissemination (Dhaka & Chayal, 2010) <sup>[2]</sup>. The declining costs of smartphones and the availability of budget-friendly options have expanded technology access. The growing role of social media in general and agricultural discourse is evident, with content tailored to user needs and user-friendly interfaces on these platforms (Nain *et al.*, 2019; Sandeep *et al.*, 2022) <sup>[9, 11]</sup>.

Agri-input dealers are pivotal in the rural agrarian economy, selling essential farm inputs such as fertilizers, seeds, and pesticides while also providing farm extension services to farmers. Studies indicate that farmers frequently consult agri-input dealers more than other sources for agricultural advice (Goel, 2003) [5]. These dealers serve as crucial intermediaries between manufacturers and farmers, ensuring the dissemination of the latest farm technologies to the field level (Koshe, 2004) [4]. Formal farm extension services in India are governed by institutions like SAUs, the State Department of Agriculture, KVKs, and ICAR institutes. However, these institutions are often insufficient to meet the vast demands of the farming community. Informally, farmers receive agricultural counseling, services, and inputs from local agri-input dealers, who often provide these extension services free of charge despite earning from product sales. Public extension services have been criticized for their inability to handle the diverse needs of farmers effectively. In the digital age, platforms like the Online License Management System (OLMS) and social media play a significant role in the activities carried out by input dealers. Input dealers have shown a positive attitude towards digital agricultural communication and services (Sandeep *et al.*, 2023) [12]. These digital tools enhance the efficiency and reach of agri-input dealers, making them indispensable in the dissemination of agricultural information and inputs (Koshe, 2004) [4]. It is essential to conduct a comprehensive analysis of the constraints faced by input dealers to better develop this digital ecosystem and bolster the rural economy.

### Methodology

The study was strategically conducted in Telangana state from March to June 2023, with the objective of encompassing a diverse range of agricultural settings. To achieve comprehensive representation, two districts were randomly selected from each of the Agro-Climatic Zones (ACZs) within the state i.e. Northern Telangana Zone (NTZ), Southern Telangana Zone (STZ) and Central Telangana Zone (CTZ). A simple random sampling technique was employed to ensure the selection of a representative sample from each district. Specifically, With each ACZ a sample of 10 input dealers were selected. By involving sample from the from all the ACZs, the study aimed to develop a holistic understanding of the challenges implementation of digital communication and services in agriculture at the Input dealers level. The list of hypothetical statements of constraints covering personal, technological, economic and situational constraints were developed by thorough review of literature, discussion with expert using focused group discussions. Primary data collection was meticulously carried out through individual interviews with each respondent. This method was chosen to facilitate in-depth discussions and to capture nuanced insights that might not be evident through other data collection methods. To analyze and interpret the collected data, Garrett ranking method were employed, which was specifically utilized to identify and rank the most significant constraints. The statistical analysis provided a robust framework for interpreting the data and deriving meaningful conclusions.

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

Where,  $R_{ij}$  = Rank given for the  $i^{\text{th}}$  attribute by  $j^{\text{th}}$  respondent,  $N_j$  = Number of attributes ranked by  $j^{\text{th}}$  respondent

### Results

#### Personnel constrains analysis of input dealers faced in digital agricultural communication and services ecosystem

From Table 1, it can be observed that “Poor knowledge of stakeholders in handling digital communication and services” constraint ranked top in with garret mean score 62.30 in personnel constraints in NTZ among input dealers, followed by “Difficulty in handling digital content” with Garrett mean score of 51.20, “Lack of confidence in usage of digital tools and gadgets” with Garrett mean score of 50.20, “Age factor is restricting to usage of digital services and communications” with Garrett mean score of 44.40 and the constraint “Lack of skills in usage of digital tools” ranked least with garret mean score of 39.90. In case of CTZ, of the constraint “Age factor is restricting to usage of digital services and communications” ranked top with garret mean score of 63.80 which indicates as major constraints, followed by “Lack of skills in usage of digital tools” with garret mean score of 50.20., “Difficulty in handling digital content” with garret mean score of 49.20, “Poor knowledge of stakeholders in handling digital communication and services” with garret mean score of 47.90 and the constraint “Lack of confidence in usage of digital tools and gadgets” with the garret mean score of 36.90. In case of STZ, “Poor knowledge of stakeholders in handling digital communication and services” constraint ranked top in with garret mean score 61.20 in personnel constraints in among input dealers, followed by “Difficulty in handling digital content” with Garrett mean score of 53.80, “Age factor is restricting to usage of digital services and communications” with Garrett mean score of 49.40, “Lack of confidence in usage of digital tools and gadgets” with Garrett mean score of 45.70, and the constraint “Lack of skills in usage of digital tools” ranked least with garret mean score of 37.90. In case of overall farmers sample the constraint “Poor knowledge of stakeholders in handling digital communication and services” ranked top in with garret mean score 57.13 in personnel constraints among input dealers, followed by “Age factor is restricting to usage of digital services and communications” with Garrett mean score of 52.53, “Difficulty in handling digital content” with Garrett mean score of 51.40, “Lack of confidence in usage of digital tools and gadgets” with Garrett mean score of 44.27 and the constraint “Lack of skills in usage of digital tools” ranked least with garret mean score of 42.27. To overcome the identified constraints in the optimum utilization of digital agricultural communication and services among input dealers, the following strategies can be implemented. Firstly, it is crucial to provide comprehensive training programs and workshops to enhance input dealers' knowledge and skills in handling digital communication and services. These training initiatives should focus on

improving their understanding of digital tools, content management, and effective usage. Additionally, efforts should be made to address the age factor restriction by offering specialized training tailored to the needs and preferences of older input dealers. Building their confidence in using digital tools and gadgets can be achieved through hands-on training, providing technical support, and demonstrating success stories. Furthermore, enhancing digital content accessibility and simplifying its handling can

alleviate the constraint of difficulty in managing digital content. Lastly, fostering skill development programs to improve the overall digital literacy and competence of input dealers can mitigate the constraint of lacking skills in utilizing digital tools. By implementing these strategies, input dealers can optimize their utilization of digital agricultural communication and services, leading to improved efficiency, better decision-making, and enhanced customer support.

**Table 1:** Personnel Constraints faced by input dealers in digital agricultural communication and services ecosystem (n=30)

Sl. No	Category	NTZ (n <sub>1</sub> =10)		CTZ (n <sub>2</sub> =10)		STZ (n <sub>3</sub> =10)		Total (n=30)	
		Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank
1.	Lack of confidence in usage of digital tools and gadgets	50.20	3	36.90	5	45.70	4	44.27	4
2.	Lack of skills in usage of digital tools	39.90	5	50.20	2	37.90	5	42.67	5
3.	Poor knowledge of stakeholders in handling digital communication and services	62.30	1	47.90	4	61.20	1	57.13	1
4.	Age factor is restricting to usage of digital services and communications	44.40	4	63.80	1	49.40	3	52.53	2
5.	Difficulty in handling digital content	51.20	2	49.20	3	53.80	2	51.40	3

**Table 2:** Technological Constraints faced by input dealers in digital agricultural communication and services ecosystem (n=30)

Sl. No	Category	NTZ (n <sub>1</sub> =10)		CTZ (n <sub>2</sub> =10)		STZ (n <sub>3</sub> =10)		Total (n=30)	
		Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank
1.	Restricted availability of agricultural services and communications in digital communication	31.10	5	33.20	5	33.20	5	32.50	5
2.	Majority of the content is not available in vernacular language	70.50	1	59.80	1	62.30	1	64.20	1
3.	Complexity of digital tools hinders its optimum usage	51.10	2	52.50	3	46.80	4	50.13	3
4.	Fluctuating telecommunication networks / Internets	48.70	3	47.60	4	49.90	3	48.73	4
5.	Lack of continuous availability of digital services and communication	46.60	4	54.90	2	55.80	2	52.43	2

### Technological Constrains analysis of input dealers faced in Digital Agricultural Communication and Services Ecosystem

From Table 2, it can be observed that the constraint “Restricted availability of agricultural services and communications in digital communication” ranked as top indicating major constraints in NTZ with the garret mean score of 70.50, followed by “Complexity of digital tools hinders its optimum usage” with the garret mean score of 51.10, “Fluctuating telecommunication networks / Internets” with the garret mean score of 48.70, “Lack of continuous availability of digital services and communication” with garret mean score of 46.60 and the constrained least ranked among all technical was “Restricted availability of agricultural services and communications in digital communication” with the garret mean score of 31.10. In case of CTZ, the constraint “Majority of the content is not available in vernacular language” ranked as top indicating major constraints with the garret mean score of 59.80, followed by “Lack of continuous availability of digital services and communication” with garret mean score of 54.90, “Complexity of digital tools hinders its optimum usage” with the garret mean score of 52.50, “Fluctuating telecommunication networks / Internets” with the garret mean score of 47.60 and the constrained least ranked among all technical was “Restricted availability of agricultural services and communications in digital communication” with the garret mean score of 32.20. In case of STZ, the

constraint “Majority of the content is not available in vernacular language” ranked as top indicating major constraints with the garret mean score of 62.30, followed by “Lack of continuous availability of digital services and communication” with garret mean score of 55.80, “Fluctuating telecommunication networks / Internets” with the garret mean score of 49.90, “Complexity of digital tools hinders its optimum usage” with the garret mean score of 46.80, and the constrained least ranked among all technical was “Restricted availability of agricultural services and communications in digital communication” with the garret mean score of 33.20. In case of overall sample of input dealers, the constraint “Majority of the content is not available in vernacular language” ranked as top indicating major constraints with the garret mean score of 64.20, followed by “Lack of continuous availability of digital services and communication” with garret mean score of 52.43, “Complexity of digital tools hinders its optimum usage” with the garret mean score of 50.13, “Fluctuating telecommunication networks / Internets” with the garret mean score of 48.73 and the constrained least ranked among all technical was “Restricted availability of agricultural services and communications in digital communication” with the garret mean score of 32.50.

To overcome the identified constraints in the optimum utilization of digital agricultural communication and services among input dealers, the following strategies can be implemented. Firstly, addressing the constraint of content

availability in vernacular languages is crucial. Efforts should be made to translate and adapt digital content into local languages to ensure its accessibility and understanding for input dealers. Simplifying the complexity of digital tools through user-friendly interfaces, clear instructions, and technical support can enhance their optimum usage. Improving the reliability and stability of telecommunication networks and internet services is essential to overcome the constraint of fluctuating connectivity. Ensuring continuous availability of digital services and communication through robust server infrastructure and maintenance protocols is vital. Lastly, efforts should be made to increase the availability of agricultural services and communications in the digital domain to overcome the constraint of restricted availability.

### Cultural Constrains analysis of input dealers faced in Digital Agricultural Communication and Services Ecosystem

From Table 3, it can be depicted that “High cost in purchasing digital gadgets” ranked top with garret mean score of 66.90 indicating major constraint in NTZ, followed by “High cost of tele network and internet services” with garret mean score of 51.60, “Lack of subsidies on digital gadgets procurement” with the garret mean score of 47.40 and “Lack of capital to servicing or maintaining or update digital tools for agricultural communication and services” ranked lest with the garret mean score of 35.10 indicating lesser importance as perceived by the input dealers. In case of CTZ, the constraint “Lack of subsidies on digital gadgets procurement” ranked top with the garret mean score of 59.40 as most major constraint followed by “High cost in purchasing digital gadgets” with garret mean score of 53.90, “High cost of tele network and internet services” with garret mean score of 51.40 and the constraint “Lack of capital to servicing or maintaining or update digital tools for agricultural communication and services” raked least with garret mean score of 36.30. In case of STZ, the constraint “Lack of subsidies on digital gadgets procurement” ranked

top with the Garrett mean score of 50.60, followed “Lack of capital to servicing or maintaining or update digital tools for agricultural communication and services” with garret mean score of 50.30, “High cost in purchasing digital gadgets” 50.20 and the constraint “High cost of tele network and internet services” ranked least with the garret mean score of 49.90. In case of overall input dealers in Telangana, the constraint “High cost in purchasing digital gadgets” ranked top with garret mean score of 57.00, followed by the “Lack of subsidies on digital gadgets procurement” with the garret mean score of 52.47, “ High cost of tele network and internet services” with garret mean score of 52.47, “High cost of tele network and internet services” reported with the garret mean score of 50.97 and the constraint “Lack of capital to servicing or maintaining or update digital tools for agricultural communication and services” ranked least with the garret mean score of 40.57.

To overcome the economic constraints faced by input dealers in digital agricultural communication and services, the following strategies can be implemented. Firstly, addressing the high cost of purchasing digital gadgets is crucial. Providing financial incentives, subsidies, or affordable financing options can make digital gadgets more accessible and affordable for input dealers. Similarly, tackling the high cost of telecommunication and internet services can be done through negotiations with service providers, exploring alternative connectivity solutions, or advocating for reduced tariffs. Additionally, offering subsidies on digital gadget procurement can further incentivize input dealers to adopt digital tools. Lastly, ensuring access to capital for servicing, maintenance, and updates of digital tools is vital to sustain their functionality and effectiveness. Collaboration with financial institutions or creating support programs can assist input dealers in overcoming this constraint. By implementing these strategies, input dealers can effectively utilize digital agricultural communication and services, enhancing their operational efficiency and competitiveness.

**Table 3:** Economic Constraints faced by input dealers in digital agricultural communication and services ecosystem (n=30)

Sl. No	Category	NTZ (n <sub>1</sub> =10)		CTZ (n <sub>2</sub> =10)		STZ (n <sub>3</sub> =10)		Total (n=30)	
		Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank
1.	High cost in purchasing digital gadgets	66.90	1	53.90	2	50.20	3	57.00	1
2.	High cost of tele network and internet services	51.60	2	51.40	3	49.90	4	50.97	3
3.	Lack of capital to servicing or maintaining or update digital tools for agricultural communication and services	35.10	4	36.30	4	50.30	2	40.57	4
4.	Lack of subsidies on digital gadgets procurement	47.40	3	59.40	1	50.60	1	52.47	2

**Table 4:** Situational Constraints faced by input dealers in digital agricultural communication and services ecosystem (n=30)

Sl. No	Category	NTZ (n <sub>1</sub> =10)		CTZ (n <sub>2</sub> =10)		STZ (n <sub>3</sub> =10)		Total (n=30)	
		Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank	Garrett mean score	Rank
1.	Non-availability of digital gadgets repair services and spare parts in local markets	57.30	1	55.90	2	59.00	2	57.40	2
2.	Insufficient training and practical exposure towards usage of digital communication and services	50.30	3	47.00	4	42.00	5	46.43	4
3.	Lack of awareness of benefits of digitalization	43.60	5	42.80	5	50.10	3	45.50	5
4.	Lack of faith in digital communication and services	43.20	6	42.00	6	38.40	6	41.20	6
5.	Consuming more time and energy in digital ecosystem than traditional methods	49.60	4	53.70	3	47.00	4	50.10	3

### **Situational Constrains analysis of input dealers faced in Digital Agricultural Communication and Services Ecosystem**

From Table 4, it can be depicted that the constraint “Non-availability of digital gadgets repair services and spare parts in local markets” ranked top with the garret mean score of 57.30 in NTZ under situational constraints, followed by “Poor participation of stakeholders until it’s made as mandatory” with garret mean score of 56.00, “Insufficient training and practical exposure towards usage of digital communication and services” with the garret mean score of 50.30, “Consuming more time and energy in digital ecosystem than traditional methods” with Garrett means core of 49.60, “Lack of awareness of benefits of digitalization” with garret means core of 43.60 and the constraint “Lack of faith in digital communication and services” ranked least with the garret mean score of 43.20. In case of CTZ, the constraint “Poor participation of stakeholders until it’s made as mandatory” ranked top with the garret mean score of 58.60, followed by “Non-availability of digital gadgets repair services and spare parts in local markets” with garret mean score of 55.90, “Consuming more time and energy in digital ecosystem than traditional methods” with mean garret score of 53.70, “Insufficient training and practical exposure towards usage of digital communication and services” with garret mean score of 47.00, “Lack of awareness of benefits of digitalization” with garret mean score of 42.80 and the constraint “Lack of faith in digital communication and services” ranked least with mean score of 42.00. In case of STZ, the constraint “Poor participation of stakeholders until it’s made as mandatory” ranked as top as most important with garret mean score of 63.50, followed by “Non-availability of digital gadgets repair services and spare parts in local markets” with the garret mean score of 59.00, “Lack of awareness of benefits of digitalization” with garret mean score of 50.10, “Consuming more time and energy in digital ecosystem than traditional methods” with garret mean score of 47.00, “Insufficient training and practical exposure towards usage of digital communication and services” with garret mean score of 42.00 and the constraint “Lack of faith in digital communication and services” ranked least with the mean score of 38.40. In overall sample of input dealers, the constraint “Poor participation of stakeholders until it’s made as mandatory” ranked top with the garret mean score of 59.37 followed by “Non-availability of digital gadgets repair services and spare parts in local markets” with garret mean score of 57.40, “Consuming more time and energy in digital ecosystem than traditional methods” with mean garret score of 50.10, “Insufficient training and practical exposure towards usage of digital communication and services” with garret mean score of 46.43, “Lack of awareness of benefits of digitalization” with garret mean score of 45.50 and the constraint “Lack of faith in digital communication and services” ranked least with mean score of 41.20.

To overcome the situational constraints faced by input dealers in digital agricultural communication and services, the following strategies can be implemented. Firstly, addressing the non-availability of digital gadgets repair services and spare parts in local markets is crucial. Establishing partnerships with service providers or training

local technicians can ensure prompt repair and maintenance support. Secondly, promoting stakeholder participation can be achieved by creating awareness about the benefits of digitalization, organizing training programs, and demonstrating successful case studies. Additionally, reducing the time and energy consumed in the digital ecosystem compared to traditional methods can be achieved through user-friendly interfaces, streamlined processes, and improved connectivity. Providing comprehensive training and practical exposure to input dealers will enhance their proficiency in using digital communication tools. Lastly, fostering faith in digital communication and services requires building trust through transparent and reliable service delivery, effective customer support, and showcasing positive outcomes. By implementing these strategies, input dealers can overcome situational constraints and optimize the utilization of digital agricultural communication and services for their business growth and success.

### **Conclusion**

the findings of this study shed light on the multifaceted constraints faced by input dealers in the adoption and utilization of digital agricultural communication and services. Across various dimensions including personnel, technological, economic, and situational factors, input dealers encounter challenges that hinder the optimal integration of digital tools into their operations. Personnel constraints, such as poor knowledge of stakeholders and difficulties in handling digital content, underscore the importance of comprehensive training programs to enhance digital literacy among input dealers. Addressing these constraints is vital to ensure effective utilization of digital tools and maximize their potential benefits. Moreover, technological constraints, including restricted availability of agricultural services in digital formats and complexity of digital tools, emphasize the need for user-friendly interfaces and improved digital infrastructure. Overcoming these barriers requires collaborative efforts between stakeholders to enhance accessibility and usability of digital platforms in agricultural communication. Economic constraints, such as high costs associated with purchasing digital gadgets and lack of subsidies, pose significant challenges for input dealers, highlighting the need for financial incentives and support mechanisms to facilitate the adoption of digital technologies. Additionally, situational constraints, such as non-availability of repair services and insufficient training, underscore the importance of localized solutions and capacity-building initiatives tailored to the specific needs of input dealers. In light of these findings, it is imperative to implement targeted strategies aimed at mitigating the identified constraints and fostering an enabling environment for the effective utilization of digital agricultural communication and services by input dealers. By addressing these challenges comprehensively, stakeholders can harness the transformative potential of digitalization to drive agricultural development, enhance productivity, and improve livelihoods in rural communities. Collaboration between government agencies, technology providers, financial institutions, and other relevant stakeholders is essential to ensure the successful implementation of these strategies and realize the full benefits of digitalization in

agriculture.

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