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Digital Buying Behaviour among Farmers: The Impact of Smartphone Penetration on Ecommerce Adoption in Rural India

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Abstract

In India, agriculture stand like a strong pillar of the economy, with a majority of the population relying on farming for their livelihood. Despite its importance, the adoption of ecommerce platforms for agricultural purchases remains a challenge due to the low education levels and limited digital literacy among farmers. However, with the rapid increase in smart device like smartphone, tablet, laptop penetration, especially in villages as well as semi urban area or closely connected to urban areas, there is significant potential for Indian farmers to engage in online shopping and e-agribusiness. This paper explores the booming digital buying behaviour of farmers due to young generation invovle in the agricultrual activity, this young generation already know how to use smartphone and use different application on smartphone so adoption is not at all major concern due to that the its drasticall change in purchasing habits in rural India. Still majority of the farmer who lived in the remote area do not have this technology and this research examines other challenges farmers face in accessing digital ecommerce platforms and discusses how smartphone-based applications (Apps) solutions are bridging the digital divide. It highlights the potential benefits of mobile based ecommerce platforms for farmers, such as access to a wider range of agricultural inputs, better pricing, and improved market connectivity. Furthermore, the study discusses the role of government initiatives in promoting digital literacy and e-agribusiness platforms in rural areas. Ultimately, this paper presents a comprehensive view of how the increasing penetration of smartphones is facilitating the transformation of the Indian agricultural sector through digital adoption.

Keywords; Rural Ecommerce, Digital Inclusion, Rural India, Digital Agriculture, Digital Buying Behaviour.

INTRODUCTION

The sudden growth of smartphone reach in rural India is a revolutionary driver for farm modernization. The latest statistics show startling rural smartphone penetration growth, with household ownership jumping from 36.5% in 2018 to 74.8% in 2022, while rural internet users currently account for 56% of all new countrywide adoptions. Policy efforts through schemes like BharatNet have brought broadband connectivity to more than 2.12 lakh gram panchayats, building the ground digital ecosystem required for ecommerce growth(Government of India, Ministry of Agriculture & Farmers Welfare, 2023; NITI Aayog, 2021; Shukla & Kumari, 2023).

This technological transformation comes in a larger context of heavy government expenditure in rural connectivity. The Digital Bharat Nidhi program has ordered about 16,869 mobile towers, taking coverage to 22,000 villages that were not covered before. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) also promises digital literacy training for 6 crore rural citizens, bridging the important gap in which merely 23.4% of rural adults have basic digital literacy today (Kumar et al., 2020; Singh & Singh, 2022; Tupe, 2024).

Suburban farmers more and more show sophisticated digital engagement behavior extending well beyond mere communication.

Even though 79.2% of rural men and 75.6% of rural women aged 15 and over currently own smartphones, their use involves market research, product comparison, and payment processing. Recent research shows that 27.9% of rural households bought smartphones directly for educational needs during the pandemic, reflecting how rural families are willing to adopt technology for practical advantages(NITI Aayog, 2021; Singh & Singh, 2022; Mehta, 2024).

This digital evolution facilitates innovative commercial activities especially pronounced among farmers in close proximity to urban markets. Penetration of online shopping among rural consumers doubled from 4% to 8% over the period 2015-2016, while convenience and price competitiveness prove to be key drivers of rural ecommerce adoption. In addition, 43% of Indian farmers increasingly use digital payment platforms for buying inputs in agriculture, reflecting increased familiarity with online financial transactional access(NITI Aayog, 2021; Singh & Singh, 2022; Mehta, 2024).

The shift towards smartphone-supported ecommerce is more than a matter of technology adoption; it also marks profound changes in rural agricultural communities' access to information, assessment of goods, and commercial practices. This essay thus explores the nexus of smartphone penetration and new digital buying habits among rural farmers in India, with a focus on those communities that are advantageously connected to urban areas. Through an examination of the driving economic, technological, and social forces behind this shift, the study seeks to shed light on both the unparalleled potentialities and persistent difficulties that mark rural India's digital agricultural revolution(NITI Aayog, 2021; Singh & Singh, 2022; Mehta, 2024).

Table 1 Smartphone Adoption by Indian Farmers (2000–2025)

Year	Statistic	Value in %
2015	Rural online shopping penetration (%)	4.0
2016	Rural online shopping penetration (%)	8.0
2018	Rural smartphone household ownership (%)	36.5
2020	Rural households buying smartphones for education (%)	27.9
2022	Rural smartphone household ownership (%)	74.8
2023	Smartphone penetration rate in India (%)	71
2025	Mobile phone usage among 15–29 age group (%)	97.1

Source: - (www.statista.com & www.pib.gov.in)

In table1 The data illustrates a remarkable transformation in digital adoption among rural populations in India over the past decade. In 2015, rural online shopping penetration was just 4%, but this figure doubled to 8% by 2016, indicating a rapid early uptake of e-commerce in rural areas. By 2018, over a third (36.5%) of rural households owned a smartphone, reflecting growing accessibility and affordability of mobile technology. The importance of smartphones for educational purposes became evident in 2020, with nearly 28% of rural households purchasing smartphones specifically for education, likely accelerated by remote learning needs during the pandemic.

This digital momentum continued to accelerate, as rural smartphone household ownership soared to 74.8% by 2022, demonstrating widespread integration of mobile technology into daily life. Nationally, smartphone penetration reached 71% in 2023, signalling that mobile connectivity had become mainstream across urban and rural India alike. By 2025, mobile phone usage among the 15–29 age group reached an impressive 97.1%, highlighting near-universal adoption among young people and underscoring the pivotal role of mobile devices in shaping the future of communication, commerce, and education in rural India. These trends collectively underscore a digital revolution, bridging the rural-urban divide and empowering rural communities with unprecedented access to information and services.

THE RISE OF ECOMMERCE IN RURAL INDIA

India's e-commerce industry has witnessed growth at an exponential rate over the past few years (Kumar, S., Sharma, R., & Singh, A., 2020). Although urban India has been expeditiously embracing online shopping for a range of products, rural India has remained behind because of infrastructural issues, low penetration of internet, and limited exposure to digital gadgets (Department of Telecommunications, 2022; Press Information Bureau, 2022). But since the introduction of cheap smartphones and data packages, rural India has witnessed a gradual transition to digital platforms (Mehta, 2024).

As per a report prepared by the Internet and Mobile Association of India (IAMAI), more than 500 million Indians had smartphones in 2020, with a considerable number of these smartphone users living in rural areas (IAMAI, 2024). In rural India, particularly villages near cities, smartphone penetration is gradually growing (Kumar et al., 2020; Singh & Singh, 2022). This trend has also created opportunities for farmers to utilize ecommerce

websites for buying agricultural commodities like seeds, fertilizers, pesticides, and even equipment (Subhash & Agarwal, 2024). These platforms include Amazon, Flipkart, and niche e-agribusiness portals like AgroStar and BigHaat, which are now selling agriculture inputs directly to farmers, reducing intermediaries' dependence and making it easier for farmers to have access to better quality products (Tupe, 2024; Patel & Gupta, 2024).

Smartphones enabled farmers to search through product listings, compare prices, and view reviews from other farmers who bought similar products (Subhash & Agarwal, 2024). In addition, mobile-supporting platforms made purchasing simpler, enabling farmers to order products and pay online through digital wallets or UPI (Mehta, 2024). The creation of mobile apps tailor-made for agricultural ecommerce further streamlined the shopping process by offering farmers simple-to-use interfaces, designed specifically to meet their particular needs (National Institute of Agricultural Extension Management, n.d.).

The contribution of mobile-based solutions to restructuring the agricultural marketplace cannot be overemphasized. Beyond connecting buyers and sellers, the platforms are also equipping farmers with insights on optimal practices, weather updates, and market intelligence (Patel & Gupta, 2024; Kumar & Sharma, 2024). Consequently, farmers are in a better position to make informed choices, both about their agricultural practices and their buying habits (Shukla & Kumari, 2023).

Table 2 Literature Review Table: Smartphone Adoption by Indian Farmers

Title of the Paper	Key Findings	Citation
Evaluating the Expediency of Smartphone Applications for Indian Farmers	Analyzed 25 smartphone applications for agriculture; highlighted usability and positive impact on Indian farmers.	Dharanidharan, Kumar, & Abishek, 2018
Mobile Technology in Agriculture: A Systematic Literature Review	Mobile apps provide weather, market info, pest control, and direct sales benefits to farmers.	(Abdullahi, Mahmud, & Rahim, 2025)
How Smartphones Can Bring About a Developmental Breakthrough in Agriculture	Smartphones enable production planning, government services access, and advanced tech use for smallholder farmers.	(Bajpai & Beriya, 2022)
Experience of Farmers Using Mobile Phone for Farming Information Flow	Examined farmers' perceptions and factors influencing mobile phone usage in farming.	(Ahmad et al., 2024)
Impact of Social Networks on Farmers Adoption of Smartphones	Social networks influence smartphone adoption; network centrality increases adoption likelihood.	(Filippini, Marescotti, Demartini, & Gaviglio, 2020)
Adoption of Mobile Telephony in Rural India: An Empirical Study	Service transparency and opinion leaders are key to adoption speed in rural India.	(Gupta & Jain, 2014)
Adoption of E-commerce by Small and Marginal Farmers in India: Challenges and Opportunities	E-commerce offers market access and income potential but faces digital literacy and connectivity challenges.	(Basak, 2024)
Capabilities, Costs, Networks and Innovations: Impact of Mobile Phones in Rural India	Mobile phones facilitate information access, social interaction, and innovation in rural India.	(Mehta, 2013)
Social Network Factors Affecting Adoption of Mobile App by Farmers	More smartphones in a household increase likelihood of mobile app adoption.	(Nikam, Kumar, & Kingsly, 2021)
A Comprehensive Analysis of the Advances in Indian Digital Agriculture	Reviewed ICT adoption and digital advances in Indian agriculture.	(Balkrishna, Pathak, Kumar, Arya, & Singh, 2023)
Adoption of Smartphones Among Indian Farmers	Cell phones provide wider access to agricultural information despite adaptation constraints.	(Sivakumar et al., 2022)
Impact of Mobile Phone on Livelihood of Rural People	Mobile phones improve information access, communication, and livelihood in rural India.	(Mehta, 2016)
Agri-input Buying Behaviour of Paddy Farmers	Identified antecedents of buying behaviour for agricultural inputs among rice farmers.	(Haidery, Kundu, & Sarkar, 2024)
Utilization Behaviour of Digital Tools by Farmers for Marketing Their Produce During Covid-19	Examined digital tool usage by farmers for marketing during pandemic lockdown.	(Pandi, Theodore, Kumar, Balasubramaniam, & Ganapathi, 2023)
E-Commerce in Agriculture: A Review of Digital Marketplaces for Direct Farm to Consumer Trade	Digital platforms enable direct sales, bypassing intermediaries and expanding market reach.	(Mueller, 2001)

Unraveling Heterogeneity in Farmer's Adoption of Mobile Payment Technology	Reviewed drivers of mobile payment technology adoption among farmers.	(Abay, Berhane, Taffesse, Koru, & Abay, 2016)
What Drives Mobile Telephony Adoption in Rural India? An Empirical Evaluation	Mobility, social influence, perceived usefulness, and cost are key factors for adoption.	Gupta and Jain (2014)
Application and Use of Mobile Phone for Indian Farmers	Increased penetration of mobile handsets and low usage costs drive growth of mobile use in agriculture.	Belakeri et al. (2017)
Digital Buying Behaviour Among Farmers: The Impact of Smartphone Penetration on Ecommerce Adoption in Rural India	Rapid smartphone penetration drives digital buying and e-commerce adoption among Indian farmers.	Su, Peng, Kong, and Chen (2021)
Digital Adoption in Indian Agriculture: Insights and Advances	Comprehensive review of digital adoption trends and challenges in Indian agriculture.	Sindakis and Showkat (2024)

Recent in table 2 the available literature shown how smartphone adoption among Indian farmers demonstrates a profound transformation in agricultural practices and rural livelihoods. Early studies emphasized the role of mobile phones in improving information access, communication, and innovation within rural communities, identifying key adoption drivers such as mobility, social influence, and perceived usefulness. As smartphone penetration increased, research shifted focus to the usability and impact of agricultural applications, revealing that mobile apps now provide farmers with critical services—including weather updates, market information, pest management, and direct sales opportunities.

Empirical evidence highlights that social networks significantly influence adoption rates, with network centrality and household smartphone density boosting the likelihood of uptake. The integration of digital tools has enabled smallholder farmers to access government services, plan production, and participate in e-commerce, although challenges like digital literacy and connectivity persist. The COVID-19 pandemic further accelerated digital adoption, as farmers increasingly relied on smartphones and digital platforms for marketing their produce and maintaining supply chains. Overall, the literature underscores that rapid smartphone adoption is reshaping Indian agriculture by enhancing access to information, improving market participation, and fostering economic opportunities for rural populations.

THE ROLE OF SMARTPHONES IN BRIDGING THE DIGITAL DIVIDE

Smartphones have become a central tool for improving digital access in rural India (Department of Telecommunications, 2022; NITI Aayog, 2021). As mobile internet usage continues to grow, smartphones offer farmers a direct gateway to online marketplaces, agricultural advice, and even financial services (Press Information Bureau, 2022; National Institute of Agricultural Extension Management, n.d.). The increasing affordability of smartphones, coupled with the widespread availability of low-cost mobile data, has made it possible for farmers in rural areas to connect with the digital world (Mehta, 2024).

In rural regions, many farmers face the challenge of limited access to physical retail outlets and agricultural suppliers. Ecommerce platforms enable them to bypass these geographical barriers, offering a wide range of agricultural products at competitive prices (Kumar et al., 2020; Tupe, 2024). More importantly, these platforms give farmers access to specialized products that they might not find in local markets (Patel & Gupta, 2024).

The digital divide, however, still persists in many parts of rural India. While urbanized villages with better infrastructure benefit from smartphone penetration, remote and underdeveloped areas still struggle with poor internet connectivity and limited access to smartphones (Department of Telecommunications, 2022; Mehta, 2024). Nevertheless, the government's Digital India initiative has been pivotal in addressing some of these concerns (Press Information Bureau, 2024; NITI Aayog, 2021). Through programs aimed at enhancing digital literacy, providing internet access in remote areas, and subsidizing digital devices, the government is helping to create an environment where farmers can take advantage of ecommerce opportunities (Ministry of Electronics and Information Technology, 2024; National Institution for Transforming India, 2023).

Moreover, smartphones provide farmers with easy access to financial services, such as digital payments and mobile banking (Reserve Bank of India, 2024; Mehta, 2024). Mobile wallets like Paytm, PhonePe, and Google Pay have made it easier for farmers to make transactions securely without needing access to physical banks or cash (Mehta, 2024). These services are essential in building trust and

confidence among farmers, making them more likely to engage in online purchases (Singh & Singh, 2022).

Smartphones have also been instrumental in breaking down the language barriers that often hinder the adoption of technology in rural areas. Many ecommerce platforms now offer multilingual interfaces, making it easier for farmers who speak regional languages to navigate the platforms and understand product details (National Institute of Agricultural Extension Management, n.d.; Kumar & Sharma, 2024).

CHALLENGES IN ECOMMERCE ADOPTION FOR FARMERS

Though smartphones and online marketplaces provide solutions of hope, Indian farmers still face a number of challenges. One of the major hurdles is the poor level of digital literacy in rural India (NITI Aayog, 2021; Singh & Singh, 2022). The majority of farmers have no experience with the internet, or even accessing ecommerce websites (Shukla & Kumari, 2023; Mehta, 2024). Despite smartphones, the absence of knowledge regarding online transactions, the fear of being cheated, and limited technological capabilities hinder many from leveraging ecommerce (Kumar et al., 2020; Subhash & Agarwal, 2024).

Additionally, internet access is still a major concern in rural India. While cities have high-speed internet, rural areas continue to suffer from slow or patchy connectivity (Department of Telecommunications, 2022). This impacts the user experience on online shopping sites, hindering farmers from getting transactions done or accessing timely updates (Patel & Gupta, 2024).

Trust is also a key driver. Most farmers remain hesitant to buy agricultural inputs online because they are concerned about product authenticity, quality, and timely delivery (Tupe, 2024). The belief that buying online is unsafe, particularly for valued items such as machinery, is a significant disincentive (Singh & Singh, 2022; Kumar et al., 2020).

The other challenge is the payment system complexity. While mobile wallets and digital payment systems such as UPI have simplified payments, there remains a considerable section of the rural population without bank accounts or access to mobile payment services (Reserve Bank of India, 2024). The payment security issue also continues to pose significant challenges to farmers who are not familiar with online financial transactions (Mehta, 2024).

To solve these issues, proper training and support must be imparted to farmers. Government and private sector partnerships can go a long way in enhancing digital literacy and establishing faith in ecommerce platforms (Press Information Bureau, 2024; National Digital Literacy Mission, 2024; NITI Aayog, 2021).

GOVERNMENT INITIATIVES AND FUTURE PROSPECTS

The government of India has launched various schemes to enhance digital literacy and internet penetration in rural India (Press Information Bureau, 2024; National Digital Literacy Mission, 2024). Schemes such as PMGDISHA (Pradhan Mantri Gramin Digital Saksharta Abhiyan) focus on providing basic digital literacy to rural citizens so that farmers can use digital means for transactions, ecommerce websites, and overall digital literacy (Ministry of Electronics and Information Technology, 2024; Reddy & Mishra, 2024).

In addition, initiatives like the Digital India initiative and BharatNet target enhancing internet accessibility in rural areas (Department of Telecommunications, 2022; Press Information Bureau, 2022). In improving internet connectivity in rural areas, these programs are addressing one of the most important ecommerce adoption hurdles (NITI Aayog, 2021).

The prospects for India's e-agribusiness are bright, especially with the on-going increase in smartphone penetration (Kumar et al., 2020; Mehta, 2024). As digital tools gain more acceptance among farmers, ecommerce platforms will keep on innovating and addressing the unique needs of rural consumers (Subhash & Agarwal, 2024). The synergy among the government, technology companies, and agricultural bodies will be instrumental in making ecommerce a sustainable solution for farmers in India (National Institution for Transforming India, 2023).

CONCLUSION

Growing smartphone penetration in rural India is having a revolutionary impact on agriculture. Though there are issues of low digital literacy, internet connectivity, and trust, the future of ecommerce transforming agricultural procurement by farmers is certain. Smartphones provide farmers a chance to skip the traditional supply chain, see a wider variety of products, and make better-informed purchases. With the sustained efforts of the government towards enhancing digital literacy and internet penetration, and the expansion of mobile-based ecommerce platforms, the prospects for e-agribusiness in India appear to be very promising. Yet, it is

necessary to address ongoing challenges that prevent full-scale adoption and ensure that every farmer, irrespective of educational background or physical location, is able to leverage the digital revolution.

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