

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 392-396

Received: 24-05-2026
Accepted: 28-06-2026

Indexed Journal
Peer Reviewed Journal

Agri-fintech in India: Transforming farmers livelihood via innovation and financial inclusion

¹Aditi Agarwal and ²Nirdesh Kumar Singh

¹Research Scholar, College of Agribusiness Management, G.B. Pant University of Agriculture & Technology, Pantnagar, U.S. Nagar, Uttarakhand, India

²Assistant Professor, College of Agribusiness Management, G.B. Pant University of Agriculture & Technology, Pantnagar, U.S. Nagar, Uttarakhand, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7e.3884>

Corresponding Author: Aditi Agarwal

Abstract

The integration of financial technology (FinTech) into the agricultural sector, commonly referred to as Agri-Fintech, is rapidly transforming the economic landscape of India. With a predominantly agrarian economy, India faces unique challenges in its agricultural sector. The FinTech innovations offer promising solutions to these prevalent issues by enhancing financial inclusion, fostering innovation and improving the livelihoods of farmers. This study identifies the key trends, use of Artificial Intelligence (AI), digital payment systems, role of AgriStack as an extension of Agri-Fintech providing data-driven scalable and inclusive solutions for agriculture, blockchain, opportunities and challenges of agri-fintech in the country by reviewing papers between the years 2015-2025 and by synthesizing existing literature review and industry reports to provide gainful insights. This paper concludes that Agri-FinTech is not merely a financial innovation but an institutional mechanism capable of fostering inclusive and sustainable rural development. The integration of financial technologies into agricultural systems through initiatives by the government and agritech startups has the potential to reduce information asymmetries, promote financial literacy, lower transaction costs and enhance financial risk management for farmers, particularly smallholder farmers.

Keywords: Agri-fintech, AI, digital payment systems, Agristack, Blockchain, Agritech Startups

Introduction

Agriculture is the backbone of India's economy, employing approximately 50% of the workforce and contributing around 17-18% to the GDP of the country (Sharma *et al.*, 2024) ^[24]. Many sectors declined during Covid-19, yet agriculture and its allied sectors were the only ones that remained resilient providing positive growth of 3.9 per cent (2021–2022) in India's Gross Value Added (GVA) (Pathak, 2023) ^[21]. The Periodic Labour Force Survey (PLFS) reported that within the country's labour force in 2021-22 (July-June), the farm sector employed 45.5%. It shows the sector's key job creation role especially in farm areas through agriculture and related work. However, this crucial sector faces baffling challenges as its contribution to GDP sharply declined from 43% to 18% from the year 1970 to 2018, thus indicating structural inefficiencies and limited

access to formal financial services.

Although, Fintech increases access to loans, mobile payments, transfers, insurance and other financial services making it easier to reach underserved users in rural areas through digital channels (Pradhan *et al.*, 2021; Nenavath & Mishra, 2023) ^[22, 19], but many farmers in India are still dependent on local moneylenders that lend money on excessive high compounding interest rates (Sharma *et al.*, 2024) ^[25]. However, Digital finance is likely to reduce the persistence of poverty in general in rural areas when ICT spreads through the banking sector (Das & Chatterjee, 2023) ^[7]. This shift includes Agri-startups that provide easy access to loans and creating integrated pathways along the farm value chain (Singhal & Gupta, 2020). Below is a table highlighting the role of some Agri-fintech companies in transforming the Indian agriculture ecosystem:

Application Domain	Role of Agri-Fintech	Supporting Literature
Credit and Risk Management	AI and farm data enable borrower risk profiling for credit and insurance decisions.	CropIn's Smart Risk, uses remote sensing, machine learning and AI for farm-level and regional risk assessment (Ganguly <i>et al.</i> , 2017) ^[10] .
Insurance Claims	Satellite imagery and blockchain improve claim verification, transparency and settlement efficiency.	Satellite analytics provide independent data for indemnity decisions and faster claims settlement (Nagendra <i>et al.</i> , 2022) ^[17] .
Agricultural Input Access	Digital platforms facilitate access to advisory services, inputs and farm machinery.	AgroStar, enables farmers to access advisory services, agricultural inputs and machinery through mobile applications and missed-call services (Ganguly <i>et al.</i> , 2017) ^[10] .

Farm Mechanization	Pay-per-use models improve access to agricultural machinery while reducing the amount of capital investment.	Trringo, enables farmers to rent tractors on demand instead of purchasing machinery (Pandia <i>et al.</i> , 2019) ^[20] .
Market Linkages	Digital platforms enhance price discovery and market access through real-time information and online trading.	MyAgriGuru provides real-time market prices, while online agricultural trading expanded during and after the COVID-19 pandemic (Ganguly <i>et al.</i> , 2017; Upendra <i>et al.</i> , 2021) ^[10, 26] .

Source: Authors compilation based on academic papers

Objectives

- 1. To understand the concept and current state of Agri-Fintech in India.
- 2. To identify the opportunities and challenges of Agri-Fintech in India in fostering innovation and financial inclusion.

Research Methodology

This study is conceptual and descriptive in nature, relying entirely on secondary data sources to achieve its stated objectives. The methodology involves a systematic review of existing academic sources from recognized academic databases, official regulatory publications including PIB, NABARD, RBI and industry reports. The study is qualitative in nature, it highlights and combines the existing academic literature with reference to the development, ecosystem, technological enablers and applicability of Agri-FinTech in the context of Indian agriculture.

Innovation in Agri-FinTech

FinTech provides a way to deliver formal financial services in rural areas with limited infrastructure and locations, such as mobile banking, digital wallets and online microcredit (Yadav *et al.*, 2024) ^[27].

Using AI technology, companies are developing platforms that are bridging the gap by providing banking, credit, insurance and investment services to rural population in India. Traditional banks and other lenders typically do not serve this demographic or provide adequate financial solutions. Machine learning (ML) tools that utilize various data sources (e.g., satellite imagery, weather patterns, soil health) are also able to generate insights based on a farmer’s individual circumstances, allowing both the farmer and financial institutions to make better-informed decisions about future investments (Das, 2024) ^[6].

Here is an example of a company - The "Grain Bank Model", a product of the AgriTech startup Ergos, founded in the year 2012 provides farmers with a comprehensive range of post-harvest logistics solutions through easy access from their homes using advanced technologies. It enables farmers to convert their grains into tradeable digital assets. This model uses advanced technology to enable farmers to determine when and how much to sell and at which price, resulting in increased earnings for the producers and empowering farmers by providing services like credit facilities, warehousing and market linkages (Kumari & M, 2024) ^[13].

As per the study by (Farukh *et al.*,2025) results show that fintech has provided major benefits for rural entrepreneurs in terms of providing them with additional means of accessing financing and protecting their businesses through insurance. Farmers have been benefited by better financial management and increasing their business because of the availability of these new methods for doing business. As well as the availability of mobile payment systems and

internet-based lending services being the two most used types of services due to their ease of use and user-friendliness, hurdles continue to exist for the use of fintech as most rural entrepreneurs lack the necessary digital literacy to adopt these new technologies, furthermore, there are also issues concerning the availability of infrastructure to support the use of fintech (Farukh *et al.*,2025).

Substantial government initiatives have played an instrumental role in inclusion of individuals to access digital financial services. Initiatives like the India Stack, consisting of Aadhaar, e-KYC and Digi Locker along with UPI and PMJDY, have led to tremendous growth in Digital Financial Services in India (Fareeda & Jayasree, 2025) ^[8]. As of 2023, there are over 500 million Jan Dhan accounts opened, ranking among the fastest-growing accounts and more than 10 billion transactions per month are being processed through UPI, marking India as a massive adopter of Digital Technology (Fareeda & Jayasree, 2025) ^[8]. The AgriStack platform has emerged as a data-driven innovation in the Agri-FinTech ecosystem. It is a Digital Public Infrastructure (DPI) of the Digital Agriculture Mission of India, which was approved by the Government of India in September 2024 with a total investment of ₹2,817 crores (Press Information Bureau, 2025). There are three federated registries maintained by the state governments/union territories i.e., Farmers Registry, Geo-referenced Village Maps and Crops Sowed Registry, these provide details about farming, land holdings and crops sowed (Press Information Bureau, 2025). By facilitating a secure, consent-based and interoperable data exchange it helps in providing effective agricultural services, enhancing access to institutional finance to farmers and fostering innovation in the ecosystem of India’s Agri-FinTech.

Challenges

With a predominantly agrarian economy, India faces unique challenges in its agricultural sector, including low productivity, market volatility and limited access to formal financial services to millions of farmers (Pooja *et al.*, 2023). While Agri-FinTech has great potential as a technology that can transform agriculture as well as an entire country's economy, the process of implementing this technology is disrupted due to the digital divide between urban and rural areas throughout India. One of the biggest issues affecting the use of Agri-FinTech in rural areas is low financial literacy and poor infrastructure (Fareeda & Jayasree, 2025) ^[8]. Access to formal credit remains incomplete because many Indian farmers are still marginalized by poor implementation, limited inclusivity and low digital adoption (Hiranya & Joshi, 2025) ^[11]. The barriers such as cybersecurity concerns and data privacy risks are eroding customer trust and confidence in digital financial systems (Jindal *et al.*, 2025) ^[12]. The major barriers to the adoption of financial technology are perceived risk, untrustworthiness, lack of perceived benefit, social

influences, lack of awareness, cash-oriented culture, lack of financial literacy, perceived ease of use and lack of financial literacy (Bakhshi *et al.*, 2024) ^[3].

Opportunities and Future Scope

The potential of Agri-FinTech within India is vast, providing ample opportunities for further progress and new ideas in the market. This sector is projected to grow to \$150 billion by the year 2025, driven by ongoing developments in technology and a continued commitment to supportive infrastructure (Fareeda and Jayasree, 2025) ^[8]. The increased collaborations between FinTech startups, traditional banks and investors can lead to development of a more dynamic and inclusive financial ecosystem in the country (Jindal *et al.*, 2025) ^[12].

According to NABARD, 2026 ^[18] there is sharp decline in the dependence of rural households on non-institutional credit sources from 93% in 1951 to 16% in 2026, reflecting the growing penetration of formal financial services and creating a conducive environment for Agri-Fintech innovations in the agricultural financial ecosystem.

Smartphones serve as a multi-purpose device providing the means to retrieve, store, display, and execute transactions and commerce. As digital marketplaces, that incorporate FinTech technologies into their systems, smartphones allow users to conduct many kinds of agricultural transactions conveniently and quickly, regardless of physical location or time of day (Anshari *et al.*, 2019) ^[2].

In order to address the gaps that exist in the implementation of agricultural policies, tailored credit products, targeted

training programs for farmers are needed to address the funding shortfalls that exist in the Indian agri-economy. In addition to these initiatives, other types of agricultural policy modifications, such as establishing a one-stop credit centre for farmers, developing a complete evaluation framework for projects and providing incentives to support farmers who practice sustainable agricultural techniques should also be considered (Hiranya & Joshi, 2025) ^[11]. All the e-NAM platforms should be mandated by the government of India to implement the use blockchain technology in order to facilitate transparent and traceability in transactions from farm gate to customer (Choudhary, 2025) ^[5].

Overall, the Digital Agriculture landscape is quite bright in India, however the following factors will determine the likelihood of achieving this outcome - cost-effective technology, convenient access and use of technologies, readily available support for technology maintenance, timely response and redress of grievances and supportive policies. In addition to these considerations, continuing development and improvement of agriculture and its technologies through collaborative efforts of the public and commercial sectors with a focus on last-mile delivery and local issues will be a vital component in enabling Digital Agriculture in positively impacting the livelihoods of farmers of India (Balkrishna *et al.*, 2023) ^[4].

Findings

Below are the Key Findings of Some Research Papers:

Author	Year	Title	Methodology	Findings
Sharma <i>et al.</i> ,	2024 ^[24]	Determinants of fintech adoption in agrarian economy: Study of UTAUT extension model in reference to developing economies	Responses were collected from 362 farmers from 6 districts of Uttar Pradesh and UTAUT model and stratified sampling. Smart PLS4, SEM & mediation tools were used.	The key findings of this research include that Social Influence, Performance Expectancy, and Convenience are the primary factors that influence the Behavioural intentions to adopt fintech products which ultimately lead to its actual adoption. It demonstrates the importance of the Fintech industry's role in supporting Sustainable Agriculture in Developing Countries.
Das	2024 ^[6]	Bridging India's Financial Divide: The Power of Artificial Intelligence and Machine Learning	Conceptual analysis with case examples	AI/ML is bridging financial divide by improving decision making by upto 35-40% through personalized financial products.
Hiranya & Joshi	2025 ^[11]	Bridging the psychological and policy gaps: Enhancing farmer access to agricultural credit in India	Qualitative methodology, 7 focus groups were created with 9-12 participants in each group, at Dakshina Kannada district, India, Participants were farmers, bankers, government officials, and NGO	Poor accessibility, limited inclusivity and low digital adoption remain key challenges. Addressing these issues requires targeted credit schemes, farmer training, simplified digital systems, and supportive policy measures for sustainable agriculture.
Farukh <i>et al.</i> ,	2025	Analyzing the role of Fintech Innovations in Advancing Agricultural Entrepreneurship in India	Quantitative methodology, structured online questionnaire from 400 agri-entrepreneurs across India, Descriptive statistics & regression model were used.	Mobile based payments are widely used by rural entrepreneurs, improved access to credit & insurance, barriers include low digital literacy & infrastructure
Agrawal	2025 ^[1]	The Impact of Digital Payment Systems on Financial Inclusion in Rural Areas	Mixed approach with data collected from 200 rural respondents using structured questionnaire.	Growth in the use of smartphones, UPI & AEPs (Aadhaar enabled payment services) in rural India, Infrastructural, digital literacy in vernacular languages, cybercrimes persist highlighting the need of targeted policies & cyber security.

Conclusion and Future Recommendations

Agri-FinTech is booming in India's agriculture sector, tech is opening up new avenues to solve lingering issues for farmers that have been persisting in the Indian economy for decades. Agri-FinTech promotes financial inclusion by

offering easy access to digital payment systems and digital platforms and leveraging cutting edge technologies (AI, ML, Blockchain Tech etc.) to facilitate precision farming and establish both backward and forward market linkages. These technologies are empowering farmers and improving

their livelihoods. Initiatives like the “Grain Bank Model” represent how farmers can multiply their capacities to control their own resources and earn more money. Overall, the convergence of Agri-Fintech innovations with Agritech companies and AgriStack's digital public infrastructure presents a promising pathway towards building a more inclusive, transparent and data-driven agricultural finance ecosystem capable of addressing persisting challenges in credit access, insurance, market connectivity and financial risk management.

Although, there is significant progress in Agri-fintech in India there are certain barriers associated to it that are prevailing in the market. These challenges include digital divide, low literacy levels, poor infrastructural facilities (network connectivity), cyber security concerns, resistance from farmers to adopt new technologies, however through continued backing from policy-makers, expansion of public-private partnerships, Agri-FinTech has a unique potential to promote sustainable development of rural areas in India.

Future research could focus on longitudinal studies examining the sustained impact of Agri-FinTech interventions on the farmers income stability, productivity, financial inclusion and resilience to climate shocks, promoting sustainable agricultural practices through how these technologies can be aligned with ecological sustainability metrics, such as carbon footprint reduction, water conservation and biodiversity preservation and evaluating the socio-behavioural dimensions related to adoption of technology amongst farmers including trust, digital literacy and gender-based disparities in access to financial technologies in the agriculture.

References

1. Agrawal A, Patel S. The impact of digital payment systems on financial inclusion in rural areas. *International Scientific Journal of Engineering and Management*. 2025;4(6):1-9. doi:10.55041/ISJEM04389.
2. Anshari M, Almunawar MN, Masri M, Hamdan M. Digital marketplace and FinTech to support agriculture sustainability. *Energy Procedia*. 2019;156:234-238. doi:10.1016/j.egypro.2018.11.134.
3. Bakhshi P, Agrawal R, Mendon S, Frank D, Spulbar C, Birau RM, Filip RD. Barriers in adoption of FinTech by street vendors and hawkers in India using interpretive structural modeling. *Business: Theory and Practice*. 2024;25(1):231-240. doi:10.3846/btp.2024.19208.
4. Balkrishna A, Pathak R, Kumar S, Arya V, Singh S. A comprehensive analysis of the advances in Indian digital agricultural architecture. *Smart Agricultural Technology*. 2023;5:100318. doi:10.1016/j.atech.2023.100318.
5. Choudhary B. Tech innovations: balancing food security, economic growth, and sustainability, with special reference to India. *International Research Journal on Advanced Engineering and Management*. 2025;3(4):1421-1427. doi:10.47392/IRJAEM.2025.0231.
6. Das S. Bridging India's financial divide: the power of artificial intelligence and machine learning. *International Journal for Multidisciplinary Research*. 2024;6(5). doi:10.36948/IJFMR.2024.V06I05.29801.
7. Das S, Chatterjee A. Impacts of ICT and digital finance on poverty and income inequality: a sub-national study from India. *Information Technology for Development*. 2023;29(2):378-405. doi:10.1080/02681102.2022.2151556.
8. Fareeda M, Jayasree M. FinTech innovations for inclusive growth in India: can the promise be realized? *International Research Journal on Advanced Engineering and Management*. 2025;3(6):2618-2624. doi:10.47392/IRJAEM.2025.0435.
9. Gandhi DAMPB, Parejiya A. The power of AI in addressing the challenges faced by Indian farmers in the agriculture sector: an analysis. *Tuijin Jishu/Journal of Propulsion Technology*. 2023;44(4):4753-4777.
10. Ganguly K, Gulati A, von Braun J. Innovations spearheading the next transformations in India's agriculture. *SSRN Electronic Journal*. 2017. doi:10.2139/ssrn.3000345.
11. Hiranya J, Joshi H. Bridging the psychological and policy gaps: enhancing farmer access to agricultural credit in India. *Acta Psychologica*. 2025;255:104890. doi:10.1016/j.actpsy.2025.104890.
12. Jindal S, Bansal Y, Bhol SG. Securing data privacy in the FinTech industry: India's roadmap to Viksit Bharat@2047. In: *Proceedings of the 2025 12th International Conference on Computing for Sustainable Global Development (INDIACom)*. New York: IEEE; 2025. p. 1135-1140. doi:10.1109/INDIACom63850.2025.10961587.
13. Kumari S, Vineeth M. Ergos: redefining storage infrastructure and market access for small farmers in India. *Emerald Emerging Markets Case Studies*. 2024;14(4). doi:10.1108/EEMCS-02-2023-0039.
14. Ministry of Agriculture & Farmers Welfare. Digital Agriculture Mission: tech for transforming farmers' lives. Press Information Bureau, Government of India; 2024.
15. Ministry of Agriculture & Farmers Welfare. Provision of market facility under DAM. Press Information Bureau, Government of India; 2025.
16. Ministry of Finance, Government of India. Economic Survey 2025-2026. New Delhi: Department of Economic Affairs; 2026.
17. Nagendra N, Narayanamurthy G, Moser R, Hartmann E, Sengupta T. Technology assessment using satellite big data analytics for India's agri-insurance sector. *IEEE Transactions on Engineering Management*. 2024;71:6425-6437. doi:10.1109/TEM.2022.3159451.
18. National Bank for Agriculture and Rural Development. Rural credit market conditions in India: findings of NABARD All-India Survey of Rural Households (conducted during February 2026). Mumbai: NABARD; 2026.
19. Nenavath S, Mishra S. Impact of green finance and FinTech on sustainable economic growth: empirical evidence from India. *Heliyon*. 2023;9(5):e16301. doi:10.1016/j.heliyon.2023.e16301.
20. Pandia S, Sharma R, Shukla N, Sharma R. Digitalisation in agriculture: roads ahead. *International Journal of Current Microbiology and Applied Sciences*. 2019;8(12):1877-1885. doi:10.20546/ijcmas.2019.812.219.

21. Pathak H. Transforming the agri-food sector in India for achieving the Sustainable Development Goals. *Anthropocene Science*. 2023;2(1):1-4. doi:10.1007/s44177-023-00044-6.
22. Pradhan RP, Arvin MB, Nair M, Hall JH, Bennett SE. Sustainable economic development in India: the dynamics between financial inclusion, ICT development, and economic growth. *Technological Forecasting and Social Change*. 2021;169:120758. doi:10.1016/j.techfore.2021.120758.
23. Roy S, Banerjee A, Chatterjee P. Machine learning and artificial intelligence method for FinTech credit scoring and risk management. *International Journal of Business Analytics*. 2024;11(1):1. doi:10.4018/IJBAN.347504.
24. Sharma A, Kumar R, Singh P. Impact of financial technology (FinTech) on the restructuring of the agrarian economy: a comprehensive systematic review. In: *Proceedings of the 2024 IEEE Conference on Computational Intelligence and Communication Technology (CCICT)*. New York: IEEE; 2024. p. 258-263. doi:10.1109/CCICT₆2777.2024.00049.
25. Sharma A, Mohan A, Johri A, Asif M. Determinants of fintech adoption in agrarian economy: study of UTAUT extension model in reference to developing economies. *Journal of Open Innovation: Technology, Market, and Complexity*. 2024;10(2):100273. doi:10.1016/j.joitmc.2024.100273.
26. Upendra RS, Ahmed MR, Kumar T, Prithviraj S, Khan AS. Indian agricultural sector present and post-pandemic condition. *Indian Journal of Agricultural Research*. 2021;55(5):567-573. doi:10.18805/IJARE.A-5709.
27. Yadav M, Jadon P, Agarwal B, Rastogi S. Improving bank performance in rural India through financial inclusion, sustainability, and fintech. In: *Proceedings of the 2024 2nd International Conference on Signal Processing, Communication, Power and Embedded System (SCOPE)*. New York: IEEE; 2024. p. 1-5. doi:10.1109/SCOPE₆4467.2024.10990890.