

Agri-Fintech Adoption among Smallholder Farmers

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ABSTRACT

Small-scale farmers make up most of India's agriculture, and they have problems like not being able to get formal credit, not knowing how much money they will make, and climate and market risks. Small-scale farmers still rely on informal financial systems, even though digital infrastructure has gotten better. This is a big problem for their growth and long-term success. Agri-Fintech is a new and creative way to offer financial services using digital technologies. It has made it easier for people to get credit, pay bills, and buy insurance. Digital lending platforms and mobile banking have made things run more smoothly and helped farmers make better decisions. Using technologies like AI, satellite images, and the Internet of Things has made small-scale farmers more sustainable. It has gotten better, but it still has problems like the digital divide and low literacy. Agri-Fintech can help make agriculture more sustainable and improve financial inclusion in a big way.

Keywords: *Agri-Fintech, Smallholder Farmers, Financial Inclusion, Digital Agriculture, Rural Development*

1. Introduction

The Indian economy depends heavily on farming. Many of the small and marginal farmers in India grow food on small, scattered plots of land. They have to deal with tough situations like inconsistent income, rising farming costs, limited access to institutional credit, and low insurance coverage. Even though digital payments and financial infrastructure have come a long way, many farmers are still not part of the formal financial system. This is mostly because the formal system is more expensive and takes longer than the informal system. They still use moneylenders, traders, and agents who get a cut of the deal. This has led to the ongoing problem of financial instability and debt among farmers. (ICAR, 2023–24). The government needs to make it easier for the agriculture sector to grow. This can be accomplished by supplying the necessary infrastructure for the agricultural community. This would help the farmers grow more food and make more money. The government should also do things to protect the environment so that the land can be used for a longer time. This would help the farmers grow more food and make more money. (NABARD, 2023). Agri-Fintech is a new, creative solution that combines agriculture finance and digital technologies within this framework. The digital identity of the mobile platform's real-time data and decision-making

features make it easier to get to credits, insurance, and markets faster. It makes the agriculture value chain less dependent on middlemen, more open, and more trustworthy. It also makes it easier to make decisions based on data and that can withstand climate change, since prices and climate can change. This seminar will look at how smallholder farmers in India are using Agri-Fintech and how it could help promote sustainable and technology-driven agricultural development. (NAFIS, 2024)

2. Agri fintech

Agri-Fintech is the use of digital financial technologies that are made just for the agriculture industry and other related fields. It combines finance and technology to make it easier for farmers to get credit, pay for insurance, and access markets. Agri-Fintech was created to fix the problems with traditional rural finance systems, which made farmers depend on traditional lenders who charged high interest rates and took too long to pay up. Before 2010, the level of digital engagement in agriculture was low. Most farmers only had basic phones that they used to send SMS messages with information about the weather and market prices. The move helped farmers learn more about how to use digital technology. (Asif et al., 2023) Aadhaar came out between 2010 and 2015. It helped more people in rural areas get access to financial services, which set the stage for the

growth of Agri-Fintech. But from 2015 to 2020, there was a clear trend: farmers began using digital wallets through UPI, and platforms that offered crop insurance satellite assessment and supply chain finance through data analytics and remote sensing technologies began to offer financial services. Since 2020, the sector has grown quickly, thanks to digital crop insurance satellite assessment and supply chain finance. (Agricultural Census of India, 2021)

2.1 Agri fintech framework

The Agri-Fintech framework is an integrated system that connects finance data markets and risk management tools to support the whole farming value chain. In this case, the framework's core is a digital finance system that includes instant digital lending, micro-credit for buying farming inputs, "buy now, pay later," and automated subsidy payment systems. (Rayhan et al., 2024). These systems help the farming sector's overall liquidity position and cut down on the time it takes to get credit. The framework also has a strong data layer that includes satellite images, IoT, weather, and transactional data. (Razavi & Habibnia, 2024). This data helps create real-time information for credit, insurance, and advisory purposes. Market integration is another important part of the Agri-Fintech framework. This includes online mandis and direct farmer-buyer platforms, which help cut down on the need for middlemen in the market. Also, risk management tools like weather-indexed insurance, pest and disease management, and climate advisory help the farming sector manage its overall risk in terms of both production and income. (SBI Annual Report, 2024)

2.2 Why Agri-Fintech Matters for Smallholder Farmers

Small and marginal farmers are more likely to lose money because they own small amounts of land, don't have stable incomes, and don't have much bargaining power. A lot of small and marginal farmers rely on informal sources of credit, such as traders, moneylenders, and input dealers, who charge high interest rates and have bad repayment terms. Without institutional credit, they can't use better inputs like better seeds, fertilisers, irrigation, and technology, which can boost productivity and income levels. (Bhattacharya & Sahoo, 2022). Farmers mostly make money during the growing season, and they don't have enough cash between planting and harvesting. Another risk is that the climate can change a lot, which can have a big effect on how much money they make. The farmers also face price risks because many of them have to sell their crops right after they harvest them, because they can't store them. In this regard, Agri-Fintech can be very helpful in solving the problems mentioned above. (Khan et al., 2024) This is because Agri-Fintech makes it easy to get credit by using digital KYC, digital onboarding, and quick disbursement. Digital payments can make things clearer and cut down on the number of middlemen needed. Digital insurance can also

help farmers deal with risks by making it easier to settle claims quickly. (Ebirim & Odonkor, 2024)

2.4 Key components

Digital finance is also an important part of Agri-Fintech. It includes instant digital lending for microcredit to buy agricultural inputs, as well as "buy now, pay later" and "pay after harvest" options to improve liquidity at the right times in the crop growth cycle. Digital lending platforms use different types of alternative data to figure out if farmers are good credit risks, since they may not have much collateral or credit history. (Manjula, 2021). Also, the digital channel for giving out subsidies can help make sure that money gets to farmers on time by avoiding delays and leaks. The "data component" is the foundation of the entire Agri-Fintech ecosystem. It brings together different types of satellite images, IoT-based sensors that measure soil and weather conditions, crop health data, and transactional data from farms. (Sharma, 2025). Technology enablers also make Agri-Fintech systems work better. Artificial Intelligence and Machine Learning are used a lot in lending and insurance to help make decisions about things like credit risk assessment, predicting crop yields, and pest forecasting. Blockchain technology makes it possible to trace agricultural products from start to finish by making digital records. This builds trust, openness, and responsibility among everyone in the value chain. Sensors, devices, and the Internet of Things make it possible to get real-time information about soil moisture, nutrient levels, and the health of livestock. This makes precision agriculture and the best use of resources possible. Drones and satellite images are also being used to help with crop mapping, damage assessment, and verification. This helps the financial sector lower transaction costs. (Sundararajan, 2025).

3. Government Initiatives and the Digitalization of Agri-Fintech

Government policies are also important for changing Indian agriculture because they help make institutions stronger and give farmers in rural areas better access to financial services. Combining old farming programmes with new financial technology platforms has made rural financial systems work better and be more open. The government's policy changes have made it easier for people to switch from traditional paper-based financial systems to technology-based financial inclusion platforms. These platforms are very helpful for smallholder farmers because they lower transaction costs and make sure that financial services are delivered on time. (Mittal & Tripathi, 2009) The Kisan Credit Card scheme, which started in 1998 and is still the main way that institutions help farmers in India with money, is one of the most important steps taken in this direction. This programme gives rural farmers timely and enough money for a number of things, such as short-term help with crops, managing things after the harvest, and investing in related fields like

dairy, fisheries, and raising livestock. Farmers can get up to Rs 1.6 lakhs in financial help without putting up any collateral and up to Rs 3 lakhs with collateral at a base rate of 7%. They can also get extra interest help if they pay their bills on time. (My Scheme KCC, 2026).

4. How Leading Platforms Are Transforming Smallholder Agriculture

Some of India's biggest companies are using new financial technologies to help small and marginal farmers, who make up almost 85% of the farming population, with their problems. These platforms are trying to cut down on reliance on traditional middlemen and informal credit systems by using digital technologies. (DFS Annual Report, 2024–25)

4.1 Samunnati

Samunnati is one of the most important value-chain finance platforms, and it is now a major player in India's value-chain finance services. The platform offers tailored financial services, such as credit support services and working capital receivable finance, to Farmer Producer Organisations. Samunnati offers market linkage services in addition to financial services. These services help farmers get better inputs and prices. The platform is now very big, working with over 6,000 farmer collectives, covering over 1.5 million farmers, and operating in 28 states. (Samunnati, 2026).

4.2 Ninjacart

It has changed the way fresh produce is delivered by using a technology-based business-to-business model. This business model gets rid of the need for several middlemen in the supply chain to move agricultural goods from farms to stores. This process also makes sure that the produce is bought based on the real demand that is predicted using advanced data analysis tools. This makes sure that the farmers get money up front for the crops, which they can sell in the market. This helps the farmer's cash flow even before the crops are picked. Also, the clear pricing model makes sure that the farmer gets a bigger share of the money that consumers actually pay for the food. Ninjacart has also helped over 200,000 farmers sell their goods, which has cut down on losses after harvest by 20–30% (Ninjacart, 2026).

4.3 Stellapps

Stellapps has been a leader in digitalising the dairy supply chain by using the Internet of Things and fintech technologies. The company has made a number of apps, such as mooPay, which lets people pay dairy farmers directly and also offers microloans and insurance. The smartAMCU system lets procurement centres test the quality of milk in real time, and the company's Smart Moo IoT platform lets you keep track of the health of cattle and chilling units. MooMark lets you keep an eye on the dairy supply chain, which helps keep the quality of the milk high

and cuts down on spoilage. Stellapps now works with more than 3 million dairy farmers, and it makes sure that the farmers can see how much they are being paid every day. (Stellapps, 2026)

5. Challenges related to Agri fintech

Agri-Fintech is growing very quickly in India, but smallholder farmers are having trouble using it because of a number of problems. One of the biggest problems is the digital divide, which makes it hard for farmers to get online because not everyone has access to the internet, smartphones are not very common, and electricity is not always available. The farming community also has a hard time with literacy because they don't know how to use computers or money, which makes it hard for them to use apps that aren't available in their native languages. Data is also a big problem for farmers. (Ediagbonya & Tioluwani, 2022). Fintech platforms have a hard time figuring out how creditworthy farmers are and coming up with the right insurance products because they don't have reliable data on farm-level and financial history. Another problem is that economic scalability is a worry because it costs a lot to get new customers and farmers don't always make money, which makes them less willing to pay. Another factor is that behavioural factors also play a role, since some farmers are still getting loans from non-traditional sources because they trust them, know them and have social ties with them. (Pothula, 2023).

6. The Future of Agri-Fintech

Agri-Fintech's future would be to create digital ecosystems where farmers, banks, insurers and markets could all work together on one platform. This would be done with a number of digital tools, such as AI, IoT, blockchain, drones and satellites. The financial services would be precise financing based on data that is up-to-date. To make sure the supply chain is open and trustworthy, blockchain would be used. To make sure that small farmers are also part of this digital revolution, more attention should be paid to digital literacy and localised AI. (Li, 2025)

7. Conclusion

Agri-fintech makes it easier for farmers to get credit and sell their goods by combining technology, finance, and agriculture. Digital platforms like mobile banking, e-markets, and AI-based lending platforms make finances more stable and cut out middlemen. Satellite images and the Internet of Things (IoT) are two examples of technologies that make climate-smart farming possible. But problems like poor connectivity, low digital literacy and rules make things harder. There are also gaps between men and women. So, it's important to improve digital literacy and connectivity. Agri-fintech could make farming more open and stronger, especially for small and under-represented farmers, thanks to new technologies like blockchain.

References:

- Asif, M., Khan, M. N., Tiwari, S., Wani, S. K., & Alam, F. (2023). The impact of fintech and digital financial services on financial inclusion in India. *Journal of Risk and Financial Management*, 16(2), 122. <https://doi.org/10.3390/jrfm16020122>
- Bhattacharya, R., & Sahoo, A. (2022). The impact of digital payment systems on rural financial inclusion in India. *Journal of Rural Finance*, 17(1), 47–61. <https://doi.org/10.1108/JRF-09-2021-0071>
- Ebirim, G., & Odonkor, B. (2024). Enhancing global economic inclusion with fintech innovations and accessibility. *Accounting Research Journal*, 6(4), 648–673. <https://doi.org/10.51594/farj.v6i4.1067>
- Ediagbonya, V., & Tioluwani, C. (2022). The role of fintech in driving financial inclusion in developing and emerging markets: Issues, challenges, and prospects. *Technological Sustainability*, 2(1), 100–119. <https://doi.org/10.1108/TECHS-10-2021-0017>
- Government of India, Ministry of Finance, Department of Financial Services. (2025). *DFS annual report 2024–25*. <https://financialservices.gov.in/beta/en>
- Government of India. (2021). *Agricultural census of India 2021*. Ministry of Agriculture & Farmers Welfare. <https://www.agriwelfare.gov.in/>
- Indian Council of Agricultural Research. (2024). *Annual report 2023–24*. <https://icar.org.in/>
- Khan, N. M., Negrut, L., Abban, J., Cismas, L. M., & Siddiqi, M. F. (2024). Constraints to agricultural finance in underdeveloped and developing countries: A systematic literature review. *International Journal of Agricultural Sustainability*, 22(1). <https://doi.org/10.1080/14735903.2024.2329388>
- Li, S. (2025). How financial technology can enhance inclusive finance. In *Advances in Economics* (pp. 110–121). https://doi.org/10.2991/978-94-6463-874-5_15
- Manjula, M. (2021). The smallholder in the agriculture market reforms in India. *Economic and Political Weekly*, 56(15), 22–26.
- Mittal, S., & Tripathi, G. (2009). Role of mobile phone technology in improving small farm productivity. *Agricultural Economics Research Review*, 22(6), 451–459.
- National Bank for Agriculture and Rural Development. (2023). *FPO study*. <https://www.nabard.org/EngDefault.aspx>
- National Bank for Agriculture and Rural Development. (2024). *All India rural financial inclusion survey (NAFIS)*. <https://www.nabard.org/EngDefault.aspx>
- Ninjacart. *Ninjacart*. Retrieved March 25, 2026, from <https://ninjacart.com>
- Pothula. (2023). Review and analysis of FinTech approaches for smart agriculture in one place. *Journal of Agricultural Science and Technology (JAGST)*, 22(1), 60–69.
- Rayhan, M. J., Alom, M. M., Rahman, S. M. M., Islam, K. M. A., Hafiz, N., Mamun, A. A., & Saif, A. N. M. (2024). FinTech solutions for sustainable agricultural value chains: A perspective from smallholder farmers. *Business Strategy & Development*, 7(2). <https://doi.org/10.1002/bsd2.358>
- Razavi, H., & Habibnia, A. (2024). The rise of AI in Middle Eastern fintech with case studies from the UAE and Turkey. In *FinTech and artificial intelligence in modern finance* (pp. 259–297). IGI Global. <https://doi.org/10.4018/979-8-3693-1561-3.ch010>
- Samunnati. *Samunnati*. Retrieved March 25, 2026, from <https://samunnati.com>
- Sharma, A., Mohan, A., Johri, A., & Asif, M. (2025). Determinants of financial technology (FinTech) adoption by farmers. *Social Sciences & Humanities Open*, 11, 101370. <https://doi.org/10.1016/j.ssaho.2025.101370>
- Stellapps. *Stellapps official website*. Retrieved March 25, 2026, from <https://stellapps.com>
- Sundararajan, V. (2025). Digital financial inclusion: Trends and implications. *Economic & Political Weekly*, 60(16), 34–39.

