Chapter 11

Blockchain and Smart Contracts in Agriculture

Wisdom Leaf Press
Pages number, 60–64

https://journals.icapsr.com/index.php/wlp
DOI: 10.55938/wlp.v1i2.113

Shailendra Thapliyal[1], Kailash Bisht[1] and Sanjeev Kumar Shah[2]

Abstract

The 1990s word "fintech" refers to a rapidly evolving area that integrates technology with finance, revolutionizing the provision of financial services. Mobile devices, computer software, and digital currencies—such as Bitcoin and Dogecoin—are all utilized during this procedure. Technology has transformed farming methods, yet there are hurdles to wider adoption, especially in obtaining finance. This study examines the growth of fintech companies in the agriculture industry, emphasizing the challenges, opportunities, and changing trends in this field. For small-scale farmers and rural businesses, integrating Fintech and IoT into agriculture is essential since it provides advantages like workforce knowledge, support services, and strategic alliances that assist them access markets, credit facilities, and premium inputs while also increasing profits. The study highlights how, despite variations in access owing to infrastructure availability and educational attainment, a fintech provider has emerged especially for the agriculture industry. Agricultural fintech has encouraging development potential for an increasingly resilient agricultural industry despite barriers such poor infrastructure, education, an absence of competent labor, and regulatory deficiencies. The study presents a digital marketplace paradigm that incorporates FinTech features, particularly payment systems and crowd funding, to enhance agricultural sustainability. By bringing together all relevant parties on one platform—farmers, landowners, investors, and consumers—this model aims to increase transparency, give them greater authority, encourage creativity, and encourage public participation in agricultural activities, all of which will contribute to greater food security and sustainability. The study explores the significance of FinTech, in particular crowdfunding, in the agriculture industry. In addition to promoting greater effectiveness and flexibility in business models, it promotes agri-fintech's function as a mediator between investors and stakeholders and its sustainable financial approaches.

Keywords

Agri-Fintech, Crowdfunding, Digital Financing, Digital Village, Ecological Agriculture Technologies, Farmer Producer Organizations, Sustainable Agriculture Practices

[1]Uttaranchal Institute of Management, Uttaranchal University, Dehradun, India. shailendra@uumail.in
[2]Uttaranchal Institute of technology, Uttaranchal University, Dehradun, Uttarakhand, India. kailash.bisht1911@gmail.com

Corresponding author:
Email id: sanjeevkshah19@gmail.com

1. Introduction

Substantial financial assistance is required in the farming sector for marketing, inputs, and deliverables. Inadequate funding, however, increases production problems and poses threats. Agriculture is a vital industry for developing countries' economic growth, employment, and output; sustainable agricultural techniques are essential for ensuring food security [1]. Significant barriers, like risk exposure and restricted access to cash, smallholder farmers in developing countries. Their options for investing and decision-making are restricted by these constraints. Their inability to invest in more profitable crops or technology is hindered by the absence of affordable credit, borrowing, and savings options as well as stringent qualifying requirements for borrowing [2]. Although agri-tech services support farmers with technology, they have little effect on getting access to finance facilities. Farmers are depending more and more on high-interest private lenders for loans, which worsens economic strain and elevates the risk of suicide and other losses. Fin-tech provides financial services to various kinds of businesses [3]. The financial industry is undergoing transformation as a result of fintech and digitalization. However, additional research is necessary to fully understand its existence and expansion. Considering factors like preferences, influences, challenges, potential future obstacles, and accessibility to agricultural technology [4]. A country's food security relies on its agricultural sector, which has enormous potential due to technological improvements. FinTech, attempts to provide farmers and other entrepreneurs with access to finance in order to promote growth and maximize returns [5]. With a concentration on market-driven integration and value chain growth for enhancing farmers' incomes, capacity building has evolved from agriculture to agribusiness. Technology, skill building, innovative training, market analysis, institutionalized financing, and infrastructural facilities are some of the tools employed to find and support rural businesses [6]. Although land transfers and capital investments in agriculture have benefited from digital financing, agricultural employment has been impacted. Income from agriculture is seriously affected, particularly for profitable crops and farmers with expertise in agricultural skills. This indicates that, particularly in developing countries striving for superior rural development, a broad adoption of digital financing is required for boosting the revenue of larger-scale farmers [7]. Micro, Small, and Medium-Sized Enterprises (MSME) encounter challenges as a result of the substantial shifts in the digital business world. To offer end-to-end solutions, a whole digital ecosystem is required, encompassing operations, management, payments, finance, and accessibility to resources for skill development and knowledge. Businesses need to accomplish this if they want to completely implement digital technologies [8].

2. Financial Innovations for Farmers

Fintech, which was first launched in the 1990s, became well-known to investors and entrepreneurs in 2014 because of its ease of application, security, and transparency. Fintech, a technology-driven approach to financial products and services, is transforming consumer access to and utilization of these services. Crowdfunding, smartphone payments, and blockchain technologies are all included [9]. FinTech and digital markets may work together to transform funding and distribution networks, which will significantly boost the sustainability of agriculture. Digital markets facilitate the seamless integration of creative financial approaches into the agricultural ecosystem, while FinTech provides farmers with accessible finance alternatives through digital payment systems and crowdfunding [10]. Through agri-fintech, technological advances may improve agriculture's financial and communication skills, boosting profitability. This scalable technology-based approach addresses farmers, Farmer Producer Organizations (FPOs), and other stakeholders with partnerships, data, and market connections [11]. Analyzing the

possible mutual benefits of agritech and FPOs, with a particular emphasis on how FPOs assist agritech be adopted in the context of the enormous influence that information technology advancements have on several sectors, including agriculture [12]. By reducing resource and ecological strain, sustainable agriculture practices (SAPs), could boost revenue and production. Their adoption by smallholder farmers in rural regions is impeded by constrained credit availability in traditional financial markets, which may have an impact on their acceptance [13]. Notwithstanding risks and unpredictability, digital financial inclusion could boost farmers' entrepreneurial activity. There is, however, a shortage of data about farmers' subjective psychological moods, consumption, and influence on entrepreneurial initiatives [14]. Banking and financial services have been transferred to digital platforms through fintech, which highlights the value of imparting digital financial literacy (DFL). Still, there are noteworthy disparities, particularly amongst poorer groups. For the benefit of individuals and society as a whole, traditional financial literacy is insufficient. It is still quite challenging to bridge these discrepancies [15]. Environmental preservation and food security depend heavily on ecological agriculture technologies (EATs). By integrating online platforms and rural economies, the “digital village” approach promotes sustainable agriculture. Research on how farmers' web-based participation influences EAT adoption at the micro level, however, is insufficient [16]. Among the drawbacks to digitalization in agriculture include low levels of digital literacy, poor infrastructure, exorbitant costs, unstable legal frameworks, and restricted access to services in rural and developing countries. Fintech, Internet of Things (IoT), and data analytics, however, are crucial for enhancing productivity and operational efficiency. IoT technologies that support large dataset analysis and well-informed decision-making includes radio frequency identification (RFID) and cloud computing [17]. Artificial intelligence (AI) technologies are transforming financial services, particularly in emerging markets, by automating operations and utilizing extensive data sources to address challenges like high costs for rural and low-income customers. However, achieving financial inclusion requires responsible adoption, competitive market environments, and ongoing infrastructure investment [18]. Supply networks can be made more efficient by AI, and agri-food and supply chains can benefit from blockchain technology. Real-time monitoring and effective data collection are made possible by AI-driven agricultural environments. In addition to supporting certification programs and ensuring the sustainability, quality, and safety of branded goods, blockchain technology could ensure transparency and confidence in the expanding market for agricultural products [19]. Fintech firms are concentrating on digital financial inclusion in an effort to integrate low-income workers, impoverished women, young people, and small enterprises into the mainstream of the finance sector. Through chatbots, AI optimizes risk identification, management, and mitigation furthermore, it also fortifies cybersecurity and fraud detection systems and minimizes information asymmetry [20].

3. Recommendations

Our study of the literature available on the past and present Agri-fintech utilized in agriculture sector has helped us to propose following recommendations for future Agri-tech financial sector.

- In order to maximize agriculture's potential for digital transformation, the government must keep promoting the digital economy's expansion and its contribution towards the creation of resilient agriculture.
- To bridge the digital discrepancy, especially in rural regions, policymakers must encourage improvements to the digital infrastructure. The qualitative development of the agricultural sector will be enhanced by putting regulations in place for new financial services and increasing access to agricultural financing.

- Digital financing is more appealing to farmers since it provides financial benefits for cash crops. Local governments should respect farmers' preferences and market demands while optimizing agricultural production arrangements. This strategy guarantees food security and enables farmers maximize their revenue levels at the same time.
- With its expansion and more inclusive legal frameworks, fintech technology is anticipated to become increasingly common in everyday transactions. This indicates that it's necessary to reevaluate market and strategy decisions by providing chances for financial institutions to work with fintech firms. Supply and value chains, evolving fintech trends, and national regulatory frameworks should be the main topics of research.
- Promoting public awareness, supporting financial literacy and inclusion programs, and strengthening IT infrastructure are some suggestions to enhance fintech implementation in agriculture. This will assist fintech companies and the government recognize more fintech consumers, particularly farmers.
- AI optimizes risk detection, information asymmetry, customer assistance, and fraud detection, which has a significant impact on digital financial inclusion. It is advised that governments, non-financial organizations, and financial institutions employ AI technologies to mitigate barriers and maximize advantages when assisting marginalized populations in engaging in the traditional financial system.
- According to the findings, AI should be extensively employed in the financial and non-financial sectors to promote the involvement of those who were once kept out of the financial system.

Conclusion

By modifying production characteristics among large-scale farmers, digital money can have an impact on agricultural revenue. Whereas agricultural capital is the strongest, the agricultural worker has a weaker function. This implies that in order to increase their revenue, farmers who embrace digital money are more inclined to make significant investments in agriculture. Financial resources for agricultural industrialization are made available through digital finance. Fintech services are challenging for farmers to obtain because of absence of technological expertise. The primary objectives of solutions should be to eradicate exploitative behaviors, build trust, define terminology, improve access, and match services to requirements. Fintech financial services are offered as substitutes for traditional methods of resolving these problems. Agricultural business transactions may be facilitated from any location with the assistance of AgroPay, a digital marketplace equipped with FinTech attributes. Leveraging crowdfunding and mobile smart phones, it makes it effortless for investors to choose and fund agricultural products. Similar to previous FinTech projects, customers may view price details, compare items, and make payments. Agribusiness stakeholders should be drawn to this platform. Concerns about digital financial inclusion are becoming more prevalent, especially for lower socio-economic groups. Artificial Intelligence (AI) is revolutionizing digital financial inclusion by utilizing data from social networks and internet platforms to mitigate information asymmetry. This bridges the information gap between financial organizations and individuals by producing an abundance of personal data. Even while AI in Industry 4.0 has raised some eyebrows, it is significantly boosting digital financial inclusion. AI is being employed by fintech companies to bring women, young people, low-income earners, and small enterprises into the mainstream of the financial industry. AI is an essential tool for risk identification, information asymmetry reduction, fraud detection, and cybersecurity protocols.

ORCID iDs

Shailendra Thapliyal https://orcid.org/0009-0002-6212-2057
Kailash Bisht https://orcid.org/0000-0003-3659-2012
Sanjeev Kumar Shah https://orcid.org/0000-0002-9978-5842

References

1. Kumar N. (2021). Emergence of Agri Fintech for Inclusive Growth. *Co-Editors*, *390*.
2. Basu S., Oo K. P., Aung L. L., Moyes T., Toth R., de Brauw A. (2020). Agricultural Value Chain Finance in Myanmar. *report published by the International Food Policy Research Institute, Washington, DC*.
3. Reddy P. M. K., Kumar A. R. (2019). A STUDY ON FIN-TECH IN INDIAN AGRICULTURAL SECTOR. *Journal of Critical Re-views*, *7*(4), 2020.
4. Rufaidah F., Karyani T., Wulandari E., Setiawan I. (2023). A review of the implementation of financial technology (Fintech) in the indonesian agricultural sector: issues, access, and challenges. *International Journal of Financial Studies*, *11*(3), 108.
5. Widiastuti T., Sukmana R., Mawardi I., Indrawan I. W. (2018). The role of financial technology for the agricultural sector in Indonesia: Case study of I-Grow FinTech company. In *Increasing Management Relevance and Competitiveness* (pp. 509–514). CRC Press.
6. Nain M. S., Singh R., Mishra J. R., Sharma J. P., Singh A. K., Kumar A. ... Suman R. S. (2019). Maximising farm profitability through entre-preneurship development and farmers' innovations: feasibility analysis and action interventions.
7. Song K., Tang Y., Zang D., Guo H., Kong W. (2022). Does digital finance increase relatively large-scale farmers' agricultural income through the allocation of production factors? Evidence from China. *Agriculture*, *12*(11), 1915.
8. Buteau S. (2021). Roadmap for digital technology to foster India's MSME ecosystem—opportunities and challenges. *CSI Transactions on ICT*, *9*(4), 233–244.
9. Kabra A., Jadhav B. (2023). FINTECH AND BEYOND. *The Online Journal of Distance Education and e-Learning*, *11*(1).
10. Anshari M., Almunawar M. N., Masri M., Hamdan M. (2019). Digital marketplace and FinTech to support agriculture sustainability. *Energy Procedia*, *156*, 234–238.
11. Pothula S. R. (2023). The Role of Finance in Navigating Agriculture through Agri-FinTech. *Authorea Preprints*.
12. Ganeshkumar C., Sivakumar A., Venugopal B. (2023). Industry 4.0-Based Agritech Adoption in Farmer Producer Organization: Case Study Approach. In *Digital Transformation and Industry 4.0 for Sustainable Supply Chain Performance* (pp. 245–256). Cham: Springer International Publishing.
13. Zhao P., Zhang W., Cai W., Liu T. (2022). The impact of digital finance use on sustainable agricultural practices adoption among smallholder farmers: An evidence from rural China. *Environmental Science and Pollution Research*, *29*(26), 39281–39294.
14. Chen W., Chang D., Tai X. (2023). Digital financial inclusion, Chinese farmers' entrepreneurship well-being and selfconfidence: evidence from rural China. *Pakistan Journal of Agricultural Sciences*, *60*(1).
15. Liew T. P., Lim P. W., Liu Y. C. (2020). Digital financial literacy: A case study of farmers from rural areas in Sarawak. *International Journal of Education and Pedagogy*, *2*(4), 245–251.
16. Yang C., Ji X., Cheng C., Liao S., Obuobi B., Zhang Y. (2024). Digital economy empowers sustainable agriculture: Implications for farmers' adoption of ecological agricultural technologies. *Ecological Indicators*, *159*, 111723.
17. More A., Aslekar A. (2022, March). Role of ICT & Fintech in Indian agriculture. In *2022 International Conference on Decision Aid Sciences and Applications (DASA)* (pp. 900–904). IEEE.
18. Biallas M., O'Neill F. (2020). Artificial intelligence innovation in financial services.
19. Alam M. A., Ahad A., Zafar S., Tripathi G. (2020). A neoteric smart and sustainable farming environment incorporating blockchain-based artificial intelligence approach. *Cryptocurrencies and Blockchain Technology Applications*, 197–213.
20. Mhlanga D. (2020). Industry 4.0 in finance: the impact of artificial intelligence (ai) on digital financial inclusion. *International Journal of Financial Studies*, *8*(3), 45.