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REVIEW ARTICLE

Transforming Pakistan's Agriculture Sector through Fintech: Opportunities for Financial Inclusion and Sustainable Development

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Abstract

This study investigates how fintech solutions can increase financial inclusion for smallholder farmers and other stakeholders in Pakistan's agriculture sector. Using a thematic literature review, the study identifies effective and sustainable fintech solutions and explores the challenges and opportunities for scaling up these solutions. The study found that digital platforms for loans, payments, and market linkages have the potential to provide farmers with greater access to finance and other financial services. To promote financial inclusion, the study recommends that policymakers, investors, and fintech startups prioritize the development of fintech solutions that address the specific needs of smallholder farmers and other underserved communities. These solutions should be designed to promote trust and transparency to ensure their long-term sustainability. The study also calls for greater collaboration between the fintech and agriculture sectors to develop innovative solutions and promote financial inclusion in Pakistan's agriculture sector. The findings of this study have important implications for promoting financial inclusion in Pakistan's agriculture sector, which is a vital contributor to the country's economy. The study provides valuable insights for policymakers, investors, and fintech startups who are interested in leveraging fintech solutions to transform the sector and promote financial access and empowerment for underserved communities.

Keywords: Agri-fintech; financial inclusion; smallholder farmers; agriculture in Pakistan; sustainable development

Introduction

The emergence of Financial Technology (FinTech) and the digital economy has garnered significant interest from businesses, academia, and various public and private entities. FinTech represents a pivotal concept and implementation that have stimulated research across diverse disciplines, including agriculture and farming. In the pursuit of sustainability and enhanced productivity, smart connectivity plays a vital role, facilitated by the digital marketplace. This platform enables novel forms of communication and transactions among the numerous stakeholders engaged in agricultural operations, encompassing consumers, suppliers, farmers, investors, distributors, and others involved in the agricultural business landscape (Anshari et al., 2019).

Agriculture, primarily in developing nations, faces difficulties with typical business processes due to cash shortages, capital problems, restricted access to financial institutions, and a lack of market access. The supply chains in agriculture have numerous layers, from farmers to consumers, adding to the cost of the product (Anshari & Alas, 2015). A digital marketplace that supports FinTech could improve agriculture. Demand shifts will be hastened by the digital market, which will increase consumer interest in foods from various regions. As a result, incorporating FinTech into the digital marketplace might solve the regular problems with farmers' finances and encourage the public to participate in agriculture (Anshari & Lim, 2017).

Moreover, financial inclusion has emerged as a critical factor in promoting sustainable economic growth and reducing poverty, particularly in developing countries like Pakistan (Demirgüç-Kunt et al., 2018). The agriculture sector, which plays a pivotal role in Pakistan's economy, is largely characterized by smallholder farmers, who often face significant barriers to accessing formal financial services (World Bank, 2019). This paper seeks to explore the potential of fintech solutions to increase financial inclusion for these smallholder farmers and other stakeholders in Pakistan's agriculture sector.

In pursuit of the research objective, a thematic literature review methodology was implemented. The current study delves into the identification of effective and sustainable fintech solutions as well as the challenges and opportunities for scaling up these innovations (Creswell et al., 2017). The research sheds light on the transformative potential of digital platforms for loans, payments, and market linkages in increasing access to finance and other financial services for farmers (Buku & Meredith, 2018).

Literature Review

The literature on financial inclusion and the role of fintech in promoting access to financial services for smallholder farmers has grown substantially in recent years. This literature review aims to synthesize the current body of knowledge on the potential of fintech solutions to foster financial inclusion for smallholder farmers and other underserved communities, particularly in the context of Pakistan's agriculture sector. By examining the barriers faced by smallholder farmers in accessing formal financial services, the emergence of fintech solutions, the importance of trust and transparency, and the need for collaboration between the fintech and agriculture sectors, this review provides a comprehensive understanding of the challenges and opportunities for leveraging fintech to enhance financial inclusion in the agriculture sector.

Financial Inclusion and Smallholder Farmers

Financial inclusion, the process of ensuring access to and usage of formal financial services by all individuals and businesses, has been widely acknowledged as a crucial factor in reducing poverty, promoting sustainable economic growth, and enhancing overall wellbeing (Demirgüç-Kunt et al., 2018; Karlan et al., 2016; CGAP, 2020). The significance of financial inclusion is particularly notable for smallholder farmers in developing countries like Pakistan, who often face considerable barriers to accessing formal financial services, including savings, credit, insurance, and payment systems (World Bank, 2019; IFAD, 2019).

Smallholder farmers are a critical population, representing the majority of the agriculture sector and contributing to food security and poverty reduction (FAO, 2017; AGRA, 2020). They play an essential role in ensuring the resilience of rural communities and maintaining the stability of local food systems (Lowder, Skoet, & Raney, 2016). However, limited access to credit, insurance, and other financial services inhibits their productivity and growth potential (Pakistan Bureau of Statistics, 2021; Cole, Sampson, & Zia, 2011). Access to financial services is critical for smallholder farmers to invest in productivity-enhancing inputs, manage risks associated with weather and market fluctuations, and access new markets for their products (Wiggins, Keats, & Han, 2016).

Factors such as lack of collateral, low financial literacy, and the absence of a credit history further exacerbate these challenges (Banerjee & Duflo, 2011; Beck, Demirgüç-Kunt, & Martinez Peria, 2007). Additionally, the high transaction costs associated with serving smallholder farmers in remote rural areas often discourage formal financial institutions from extending their services to this population (Gash & Odell, 2013). This results in a significant proportion of smallholder farmers relying on informal sources of finance, such as borrowing from friends, family, or moneylenders, which often entail high interest rates and limited protection mechanisms (Hermes & Lensink, 2007; Guérin, Labie, & Servet, 2015).

The promotion of financial inclusion for smallholder farmers has thus become a significant policy objective for governments, development organizations, and the private sector (UN, 2015; G20, 2017). Numerous studies have demonstrated the potential benefits of financial inclusion for smallholder farmers, including increased investment in agricultural inputs, improved productivity, higher income levels, and reduced vulnerability to shocks (Kaboski & Townsend, 2011; Karlan, Osei, Osei-Akoto, & Udry, 2014). As such, understanding the barriers to financial inclusion faced by smallholder farmers and identifying effective strategies to overcome these obstacles is crucial for promoting sustainable development and poverty reduction in rural areas (Brune et al., 2016; Awotide, Karimov, & Diagne, 2016).

Fintech Solutions for Financial Inclusion

The emergence of financial technology (fintech) has opened new avenues for promoting financial inclusion among smallholder farmers and other underserved communities (Alliance for Financial Inclusion, 2016). Fintech solutions such as digital payments, mobile banking, and peer-to-peer lending platforms have demonstrated the potential to increase access to financial services and improve financial management for marginalized populations (Buku & Meredith, 2018). These innovative solutions also address barriers related to physical distance, cost, and complex documentation, which are often cited as reasons for financial exclusion (Demirgüç-Kunt et al., 2018).

Trust and Transparency in Fintech Solutions

The success of fintech solutions in promoting financial inclusion largely depends on their ability to foster trust and transparency among users (M-Pesa, 2020). Trust is a critical factor in the adoption and usage of digital financial services, particularly for individuals who have limited experience with formal financial institutions (Buku & Meredith, 2018). Transparency, on the other hand, is essential for building confidence in these services and ensuring that they adhere to regulatory requirements and consumer protection standards (Alliance for Financial Inclusion, 2016).

Collaboration between Fintech and Agriculture Sectors

The integration of fintech solutions into the agriculture sector necessitates increased collaboration between the two sectors to develop innovative and context-specific solutions (FAO, 2017). This collaboration can lead to the development of tailored products and services that address the unique financial needs of smallholder farmers, such as weather-based insurance, digital credit services, and market linkages (World Bank, 2019). Such targeted solutions can contribute to greater financial inclusion, enabling smallholder farmers to enhance their productivity, manage risks, and access new markets (UNCTAD, 2018).
The literature highlights the potential of fintech solutions to promote financial inclusion for smallholder farmers in developing countries like Pakistan. The integration of digital platforms for loans, payments, and market linkages can provide farmers with increased access to finance and other financial services. Trust and transparency are key factors in the success and sustainability of these solutions, and greater collaboration between the fintech and agriculture sectors is necessary to develop innovative solutions tailored to the specific needs of smallholder farmers.
The present study is structured into distinct sections aimed at facilitating a systematic exploration of financial inclusion within the agricultural sector. The introduction section demonstrates an overview of financial technology, emphasizing its critical role in strengthening the agricultural ecosystem in Pakistan. The methodology section delineates the research design employed, which involved a meticulous selection of relevant thematic literature review documents. The results section presents the outcomes obtained from comprehensive data analysis conducted within the framework of this research endeavor. Lastly, the conclusion section provides a concise summary of the key findings and their implications. Additionally, the study acknowledges its limitations and proposes recommendations for future research endeavors.

Methodology

A systematic literature review is a “rigorous, explicit, and transparent method”. For the current study, a thematic literature review was employed. In a thematic literature review, the writer arranges and analyzes previously published research studies in accordance with themes or conceptual frameworks that, in the writer's view, are crucial to comprehending the subject. For the current study, three themes were established to structure the literature review i.e. access to financial technology, awareness of financial technology, and financial support.
To conduct the comprehensive review, a targeted selection of keywords was utilized to develop an outline for the collection of relevant publications that formed the basis of the present review. Prominent scholarly databases, including Google Scholar, Crossref, and Scopus, were employed as primary resource engines. Consequently, this thematic systematic review encompasses the entirety of the data identified through a meticulous search across the aforementioned databases. These databases were chosen due to their extensive coverage of findings derived from the initial scoping search. By employing the specified keywords, all publications incorporating finance, financial inclusion, agriculture, smallholder farmers, agriculture in Pakistan, and fintech-agriculture in the abstracts, titles, and keywords were identified.

To ascertain the inclusion or exclusion of studies in the final dataset, a thorough examination of the abstracts was conducted, and in cases where categorization was uncertain, the entire texts were scrutinized. The primary criterion for inclusion or exclusion was the presence of a clear connection between agriculture and finance. This evaluation enabled the identification of a substantial volume of pertinent research; however, it necessitated the exclusion of some significant and captivating research publications. Notably, certain previously identified relevant results from a preliminary scoping search were deemed hesitant for incorporation due to the lack of transparency in its search mechanism, thus hindering easy replication.

Table:1

S. No	Title of Research paper	Author (s)	Year	Key Findings
		Access to Financial Technology		
1.	Role of ICT & Fintech in Indian Agriculture	More & Aslekar	2022	Smallholder farmers and other rural firms can greatly benefit from having access to digital technology since it allows them to obtain support, create strategic partnerships, and access training, and financial, and legal services.
2.	A Proposed Shariah-Compliant Fintech Model as An Alternative Financing Product to Tackle Food Security Challenges in Malaysia	Azganin, et al.,	2021	This study offers a comprehensive shariah investment procedure and structures of the fintech industry, which can assist policymakers to create necessary policies that regulate Crowdfunding and smart contracts activities.
3.	DIGITAL PLATFORMS IN THE NEW WORLD OF DIGITAL AGRICULTURAL BUSINESS	Kolmykova, et al.,	2021	This strategy for the agricultural sector's digital transformation will help to qualitatively restructure all organizational and production operations, which will eventually lay the groundwork for improving efficiency and lowering risk across the whole agricultural industry.

4.	FINTECH AND DIGITAL MARKETPLACE: TURNING MINDFULNESS ACTIVITIES OF ASIAN COUNTRIES	SUMITHRA	2023	The FinTech era occurs to strengthening, advances horticultural opportunities in rural areas, extraordinary levels of creation in industrialization, and contributes to maintainability, public pay, and neediness reversal.
5.	CHALLENGES AND OPPORTUNITIES IN EMPLOYING THE FINANCIAL TECHNOLOGIES BY PACS IN INDIA- A SWOT ANALYSIS	Naithani, et al.,	2022	fintech will help them not only expand their products and membership base but also ease the targeted distribution of services by the government with E-rupi being the latest addition
6.	Examining how digital marketplace adoption and fintech adoption contribute to the sustainability of selected small agribusinesses in Metro Manila: A multiple case study approach	Chan, et al.,	2022	Adoption of digital marketplace and FinTech contributed to the overall agribusiness sustainability
7.	Fin- Tech in Indian Agricultural Sector	Kanagavalli, et al.,	2021	The digitalization of agriculture will cause a significant shift in farming and food production over the coming years
8.	The effects of financial inclusion on agricultural productivity in Nigeria	Fowowe	2020	financial inclusion, irrespective of how it is measured, has exerted positive and statistically significant effects on agricultural productivity.
9.	Who drives the digital revolution in agriculture? A review of supply-side trends, players and challenges	Birner, et al.,	2021	Digital agriculture technology has the potential to create an agricultural revolution, making crop and livestock production more efficient and more environmentally friendly and contributing to higher productivity.
10.	Digitalization of Agri-Cooperatives in the Smart Agriculture Context. Proposal of a Digital Diagnosis Tool	Ciruela-Lorenzo, et al.,	2020	The digitalization process based on smart technologies (IoT, robots, AI, BD, and Blockchain) is transforming the agricultural sector and promoting sustainability in different ways.

Awareness of Financial Technology

11.	Fintech and crowdfunding as tools for financing the reproduction process in agricultural activities	Eskiev	2021	The digital marketplace concept of crowdfunding brings together every participant (farmers, landowners, investors, and consumers) in a space that can foster openness, empowerment, resourcefulness, and community involvement in agriculture.
12.	Fintech in sub-Saharan Africa	Ndung'u	2022	fourth Industrial Revolution, driven by fintech, has the potential to propel the continent to higher levels of savings, investments, employment, and inclusive growth, provided an appropriate legal and regulatory framework is put in place
13.	Review and analysis of FinTech approaches for smart agriculture in one place	Pothula	2023	FinTech could promote agricultural sustainability. The financial sector is critical in allowing agriculture to contribute to economic growth and poverty reduction.
14.	Emergence of Agri Fintech for Inclusive Growth	Kumar	2021	The development of technology has had a significant impact on the adoption of better farming practices that utilize fewer resources while producing more.
15.	The Role of Finance in Navigating Agriculture through Agri-FinTech	Pothula	2022	Agri-FinTech can only benefit if they recognize this potential and embrace it properly
16.	Sustaining Performance of Wheat–Rice Farms in Pakistan: The Effects of Financial Literacy and Financial Inclusion	Raza, et al.,	2023	Increased trust in financial services is essential for improving sustainable performance in the agricultural sector.

17.	Machine Learning Applications for Precision Agriculture: A Comprehensive Review	Sharma, et al.,	2020	Precision agriculture is empowering the farmers with technology intending to get optimum outputs with precise inputs. IoT-enabled smart sensors, actuators, satellite images, robots, and drones are some of the key technological revolutions that boosted the agriculture industry.
18.	Making Smallholder Value Chain Partnerships Inclusive: Exploring Digital Farm Monitoring through Farmer-Friendly Smartphone Platforms	Agyekumhene, et al.,	2020	Co-designing a platform interface was significant in improving farmer ability to comprehend and use smartphone-based platforms for communicating farm conditions and their needs with value chain partners.
	Financial Assistance			
19.	Does FinTech credit scale stimulate financial institutions to increase the proportion of agricultural loans?	Mohsin, et al.,	2022	The FinTech Credit scale can raise the proportion of loans for agriculture in financial institutions.
20.	Islamic P2P Crowdfunding (IP2PC) Platform for the Development of Paddy Industry in Malaysia: An Operational Perspective	Azganin, et al.,	2021	Paddy farmers in Malaysia will have access to an alternate means of funding through Islamic P2P crowdfunding, which will help them fulfill their financial needs and fund their small businesses.
21.	Proposed waqf crowdfunding models for small farmers and the required parameters for their application	Azganin, et al.,	2021	With the help of the proposed crowdfunding, poor farmers would be able to meet their needs and contribute to the economic growth of their nation.
22.	Use of Financial Technology for Agricultural Financing Through Islamic Financial Institutions	Maryam & AHAMAD	2021	Financial technology with value chain financing emerged as a viable alternative that can tackle financing issues by integrating small farmers and other stakeholders with IFIs.

23.	Financing Sustainable Agriculture in Sub-Saharan Africa: A Review of the Role of Financial Technologies	Mapanje, et al.,	2023	The technologies can help to increase the effectiveness of financing smallholder agriculture and more people will be able to embrace sustainable agricultural practices.
24.	A STUDY ON FIN- TECH IN INDIAN AGRICULTURAL SECTOR	Reddy, et al.,	2020	Farmers are facing financial problems in the agricultural sector. With the help of Fintech financial problems can reduce by providing credit facilities to farmers
25.	The Role of Islamic Crowd Investing for Sustainable Agriculture in Indonesia	Sari & Kassim	2021	Financial technology, such as Islamic crowd-investing has an important role not only in terms of funding but also in achieving sustainable agriculture.
26.	Can digital financial inclusion effectively stimulate technological Innovation of agricultural enterprises? A case study on China	Zhu & Li	2021	Digital financial inclusion plays a significant role in promoting the technological innovation efficiency of agricultural enterprises.
27.	Does Digital Finance Increase Relatively Large-Scale Farmers' Agricultural Income through the Allocation of Production Factors? Evidence from China	Song, et al.,	2022	Digital finance has a substantial positive influence on relatively large-scale farmers' agricultural income.

Findings

In the current research study, a comprehensive thematic literature review was done to investigate the transformation of Pakistan's agriculture sector through fintech and opportunities for financial inclusion and sustainable development. The overview examines the possible changes and opportunities for Pakistan's agriculture. The study also intended to understand how the use of fintech would impact and improve smallholder farmers as a whole and significant shift in agriculture.

According to the findings, the emergence and widespread implementation of fintech might result in a number of significant effects on agriculture productivity. The review's findings indicate that fintech might have a huge impact and can foster openness, empowerment, resourcefulness, and community involvement in agriculture.

The comprehensive literature review provides valuable insights into the potential effects of the emergence and widespread adoption of fintech. The collective findings from these studies indicate that fintech has the capacity to positively impact the agricultural sector. Research suggests that digital agriculture technology holds the potential to catalyze an agricultural revolution by enhancing the efficiency and environmental sustainability of crop and livestock production, ultimately contributing to increased productivity. As the digitalization of agriculture continues to gain momentum, significant shifts in farming practices and food production are expected in the coming years.

Fintech, including the recent addition of E-rupi, not only enables agricultural entities to expand their product offerings and customer base but also facilitates the targeted distribution of government services. Additionally, the ongoing digitalization process, driven by intelligent technologies such as the Internet of Things (IoT), robotics, artificial intelligence (AI), big data (BD), and blockchain, is profoundly transforming the agricultural sector and promoting sustainability in various ways. Precision agriculture, for instance, empowers farmers by leveraging technology to achieve optimal outputs with precise inputs. IoT-enabled smart sensors, actuators, satellite imagery, robots, and drones are among the key technological advancements that have revolutionized the agriculture industry.

As long as financial assistance is concerned, the utilization of FinTech credit platforms has the potential to increase the allocation of loans for the agricultural sector within financial institutions. A research study conducted in 2021 revealed that the implementation of crowdfunding mechanisms can enable impoverished farmers to address their financial requirements and contribute to the economic development of their respective countries. It is widely acknowledged that farmers encounter significant financial challenges within the agricultural industry. Through the integration of FinTech solutions, these financial difficulties can be mitigated by offering credit facilities to farmers.

Conclusion

The above-mentioned thematic literature review provides a clear picture that framers will highly benefit from the provision of digital assistance. They will be able to adopt sustainable agricultural practices as a result of the technology's potential to boost the effectiveness of funding smallholder agriculture. Moreover, farmers, landowners, investors, and consumers with digitalization will bring together an environment that can promote openness, empowerment, inventiveness, and involvement of the community in agriculture through the digital marketplace concept of crowdfunding.

The findings of this study hold significant implications for the promotion of financial inclusion in Pakistan's agriculture sector, a cornerstone of the nation's economy (Pakistan Bureau of Statistics, 2021). As a valuable resource for policymakers, investors, and fintech startups, this paper offers insights into harnessing the power of fintech solutions to revolutionize the sector and promote financial access and empowerment for underserved communities (UNCTAD, 2018).

The paper offers recommendations for policymakers, investors, and fintech startups to prioritize the development of solutions tailored to the specific needs of smallholder farmers and other underserved communities (Alliance for Financial Inclusion, 2016). It emphasizes the importance of trust and transparency in the design of these solutions to ensure long-term sustainability (M-Pesa, 2020). Furthermore, the study calls for increased collaboration between the fintech and agriculture sectors to jointly develop innovative solutions that can drive financial inclusion in Pakistan's agriculture sector (FAO, 2017).

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