



**DIGITAL INCLUSION IN THE RURAL BANKING SECTOR:
SYSTEMATIC LITERATURE REVIEW ON ENHANCING FINANCIAL
ACCESS FOR FARMERS IN THE DEVELOPING COUNTRIES**

K.N.N. Silva

P.H.N. Rasanjalee

SLJBF 08.01.02: pp. 21-42

ISSN 2345-9271 (Print)

ISSN 2961-5348 (Online)

DOI: <https://doi.org/10.4038/sljbf.v8i1.65>

Abstract

Digital banking has emerged a transformative force bridging gaps in financial inclusion and empowering rural economies in developing countries. This research explores the adoption of digital banking among rural population in developing countries. A systematic literature review was conducted and PRISMA method was used in this study. This research examined the case studies from regions like South Asia, Africa, and Latin America. Key barriers such as limited digital literacy, inadequate technological infrastructure, socio economic disparities and regulatory challenges are identified and analyzed. The study explores the impact of innovative financial solutions, including Ai driven services, Unstructured Supplementary Service Data based banking for non-smart phone users, and Blockchain technologies for secure transactions through literature review. It also highlights the significance of community-based approaches, such as digital banking cooperatives and training initiatives through farmer organizations, in empowering rural farmers. Policy driven interventions, including government subsidies, financial literacy programs and public-private partnerships are highlighted as essential strategies to foster digital inclusion. By examining successful models such as M-Pesa in Kenya and agricultural fintech solutions in Latin America, this research demonstrate how digital banking can uplift rural economies, improve agricultural productivity and ensure economic resilience for farmers. The findings emphasize the need for collaborative efforts between governments, industry stakeholders and local communities to harness digital banking as a tool for sustainable development in the rural banking sector.

Keywords: Agriculture, Digital banking, Financial Inclusion, Literacy, Rural Development

K.N.N. Silva

(Corresponding Author)

Department of Agricultural Economics, Faculty of Agriculture,
University of Ruhuna, Sri Lanka

Email: nadee@agri.ruh.ac.lk

Tel: +94717553936

 <https://orcid.org/0000-0002-8539-2490>

P.H.N. Rasanjalee

Department of Agricultural Economics, Faculty of Agriculture,
University of Ruhuna, Sri Lanka

Email: hewaagenadeesha023@gmail.com

Tel: +94775728931

 <https://orcid.org/0009-0008-1143-0539>

1. INTRODUCTION

1.1. Background of Study

Financial inclusion can be introduced as the procedure of ensuring access to proper financial products and services wanted by individuals and business at affordable costs in a fair and transparent manner. It includes a wide range of financial services, including savings, credits, insurance and payment systems, which are vital for economic growth and development (Ozili, 2020).

Financial inclusion plays an important role in rural development by providing the necessary financial resources and services to rural people, which can lead to enhanced living standards and economic growth. Access to financial services enables rural households to save, investing income- generating activities, and smooth consumption, hence decreasing poverty levels (Mishra et al., 2024). Financial inclusion empowers rural populations by providing them with the means to participate in economic activities, access credit for entrepreneurial ventures, and improve their livelihoods (Shah & Ali, 2022). Access to credit and insurance helps farmers invest in better inputs, adopt modern farming techniques, and manage risks, leading to increase agricultural productivity and income (Adhikari et al., 2021). Financial inclusion facilitates the development of rural infrastructure, such as roads, electricity and water supply by mobilizing savings and investments from the rural population (Koomson et al., 2024).

Financial inclusion promotes social inclusion and reduces inequalities in rural areas by providing financial services to marginalized and underserved populations (Mishra et al., 2024).

1.2. Significance of the study

Digital banking solutions have arisen as a transformative force in the agricultural sector, particularly for small holder farmers. These solutions include a range of financial services delivered through digital platforms, including mobile banking, digital wallets, and online lending platforms. The significance of digital banking solutions for smallholder farmers lies in their ability to enhance financial inclusion, improve access to credit and promote sustainable agricultural practices.

2. LITERATURE REVIEW

2.1. Financial inclusion

Digital banking solutions play a crucial role in promoting financial inclusion among smallholder farmers. By leveraging mobile technology and digital platforms, financial institutions can reach remote and underserved areas, providing farmers with access to essential financial service. This includes savings accounts, payment systems, and insurance products, which are critical for managing financial risks and improving economic stability (Ozili, 2020).

One of the primary challenges faced by smallholder farmers is limited access to credit. Traditional banking systems often view smallholder farmers as risk borrowers due to the lack of collateral and formal credit history. Digital banking solutions address this issue by utilizing alternative data sources, such as transaction history and mobile usage patterns, to access credit worthiness. This enables financial institutions to offer tailored loan products that meet the specific needs of smallholder farmers (Adhikari et al., 2021).

Digital banking solutions enhance the efficiency and productivity of smallholder farmers by providing them timely access to financial resources. For example, mobile banking platforms enable farmers to receive payment for their produce directly in to their digital wallets, reducing the need for cash transaction and minimizing the risk of theft. Additionally, digital platforms facilitate the purchase of agricultural inputs such as seeds and fertilizers, through online marketplaces, ensuring that farmers have access to high quality inputs at competitive price (Koomson et al., 2024).

Digital banking solutions also play a vital role in risk management for small holder farmers. Insurance products delivered through digital platforms help farmers mitigate the impact of adverse weather conditions, pests and diseases. By providing coverage for crop losses and livestock mortality, digital insurance products enhance the resilience of smallholder farmers and promote sustainable agricultural practices (Mishra et al., 2024).

Digital banking solution improves market access for smallholder farmers by connecting them with buyers and suppliers through digital platforms. This reduces the reliance on intermediaries and ensure that farmers receive fair prices for their produce. Additionally digital platforms provide farmers with real time market information, enabling them to make informed decisions about and where to sell their produce (Shah & Ali, 2022).

2.2. Existing challenges in traditional banking access for rural communities

Access to traditional banking services in rural communities is often limited due to various structural, economic, and social barriers. These challenges hinder the financial inclusion of rural populations and restrict their ability to participate fully in economic activities.

One of the primary challenges is the lack of physical banking infrastructure in rural areas. Many rural communities do not have access to bank branches or ATMs, making it difficult for residents to access financial services. This issue is exacerbated by the closure of rural bank branches due to cost cutting measure by financial institutions (Federal Reserve, 2019).

The cost of accessing banking services is often higher for rural residents. Travel expenses to reach the nearest bank branch, coupled with the opportunity cost of time spent travelling can be prohibitive. Additionally, traditional banks may charge higher fees for services in rural areas due to lower transaction volumes (Consumer Financial Protection Bureau, 2022).

Financial literacy levels are generally lower in rural communities, which can limit the effective use of banking services. Many rural residents may not be aware of the financial products and services available to them or may lack the knowledge to use these services effectively (Ozili, 2020).

Rural residents often face difficulties in accessing credit due to the lack of collateral and formal credit history. Traditional banks may view rural borrowers as high risk, leading to higher interest rates or outright denial of credit application. This limits the ability of rural residents to invest in income generating activities and improve their economic well-being (Mishra et al., 2024).

The adoption of digital banking solutions is often lower in rural areas due to limited internet connectivity and technological infrastructure. This digital divide prevents rural residents from accessing online banking services and mobile payment systems, further exacerbating financial exclusion (Shah & Ali, 2022).

Socio – cultural factors, such as distrust of formal financial institution and preference for informal financial systems, can also hinder access to traditional banking services. Rural residents may rely on community – based savings groups or informal money lenders, which

may not offer the same level of security and benefits as formal banking services (Adhikari et al., 2021).

2.3. Analyzing the role of digital banking in improving financial accessibility for farmers

Digital banking solutions have also been shown to significantly reduce the financial vulnerability of rural households. For example, a study conducted in China found that digital payment significantly reduced the financial vulnerability of rural households by encouraging them to hold commercial insurance, engage in non-farm employment, and expand their family social networks (Xu & Zhang, 2025).

Study in Tanzania revealed that digital finance adoption led to improvement in farmer's income, access to digital financial services, investment in agricultural inputs and diversification of income sources (Kipilimba, 2024).

A study in Ghana highlighted that ownership of mobile money account improved the likelihood of farmers joining in farmer- based organizations, structured markets and off-farm work, hence enhancing their economic opportunities (Ankrah et al., 2023).

According to the review of digital financial inclusion for smallholder farmers in Nigeria, financial inclusion initiatives cannot address the specific needs of smallholders due to barriers in estimating their creditworthiness, low level of financial and digital literacy, and inadequate infrastructure (Otitoju et al., 2023)

2.4. Evaluating existing digital financial services (DFS) adoption in rural areas

Digital financial services (DFS) can be introduced as a way of enhancing the financial inclusion in rural areas by providing access to essential financial products and services. However, the adoption of DFC in rural areas faces several challenges and varies across different regions.

2.5. Challenges in DFS adoption

Low level of digital literacy can be introduced as one of the primary difficulties to DFC adoption in rural areas. There is a lack of necessary skills to use digital financial services effectively by many rural residents. This comprises understanding how to operate mobile apps, digital wallets, and online payments systems (Rathore et al., 2023).

There is a limitation in the availability of reliable internet connectivity and digital infrastructure in rural areas. This limitation holds back the ability of rural resident to access and use digital financial services. This barrier can be overcome by Investing in digital infrastructure in rural areas (Salleh et al., 2024).

Trust in digital financial services is another significant challenge. Rural residents hesitate to adopt DFC due to their concern about security, privacy and the reliability of digital transactions. This issue can be addressed by building trust through financial education and partnerships with local institution (Shetty et al., 2023).

The lack of awareness on the benefits and availability of digital financial services will be a reason for low adoption rates. Many rural residents have no awareness on the financial products and services that are reachable through digital platforms (Rathore et al., 2023).

2.6. Opportunities for enhancing DFC adoption

Digital literacy and awareness among rural populations can be improved by providing targeted financial education programs. For that purpose, training on how to use mobile banking apps, digital wallets and other digital financial services can be included (Salleh et al., 2024). Furthermore, building trust and promoting the adoption of digital financial services can be achieved by working together with local institutions, such as community organizations and cooperatives. Dissemination of information and provide support to rural residents can be facilitated by these partnerships (Shetty et al., 2023).

Spending in digital infrastructure, such as increasing internet connectivity and improving mobile networks coverage, is essential for enabling access to digital financial services in rural areas. This can help bridge the digital divide and promote financial inclusion (Rathore et al., 2023). Moreover, adoption of digital financial services can be improved by Evolving financial products that are tailored to the precise needs of rural populations. This include offering microloan, insurance products and savings accounts that are accessible through digital platforms (Salleh et al., 2024).

2.7. Research Gap and Justification

Despite the increasing adoption of digital banking, rural farmers in many developing countries still face low digital literacy, poor infrastructure and limited trust in digital transactions. Previous research has primarily focused on urban digital banking and fintech solutions with limited attention to rural farmer-specific financial needs. There is a need to explore policy frameworks, financial literacy programs, and technological interventions that can improve adoption rates in rural farming communities. Therefore, the main objectives of this review are to analyze the role of digital banking in improving financial accessibility for farmers, to evaluate existing digital financial services (DFS) adoption in rural areas and to identify key barriers and enabling factors for digital inclusion.

3. METHODOLOGY

3.1. Conceptual framework

PRISMA guidelines (Preferred Reporting Items for Systematic Review and Meta-Analyses) was used to conduct the systematic literature review (Liberati et al., 2009). This method contains three main steps: identification, screening, selection. (Figure 1). Search term, criteria, databases and extraction were determined at the identification step. The web of science was used as the database for collecting research studies related to the research objectives. Articles and websites were searched on 4th of March 2025. About 70 research articles and websites were resulted. When considering the step 2 screening, it includes the usage of multiple inclusion and exclusion criteria.

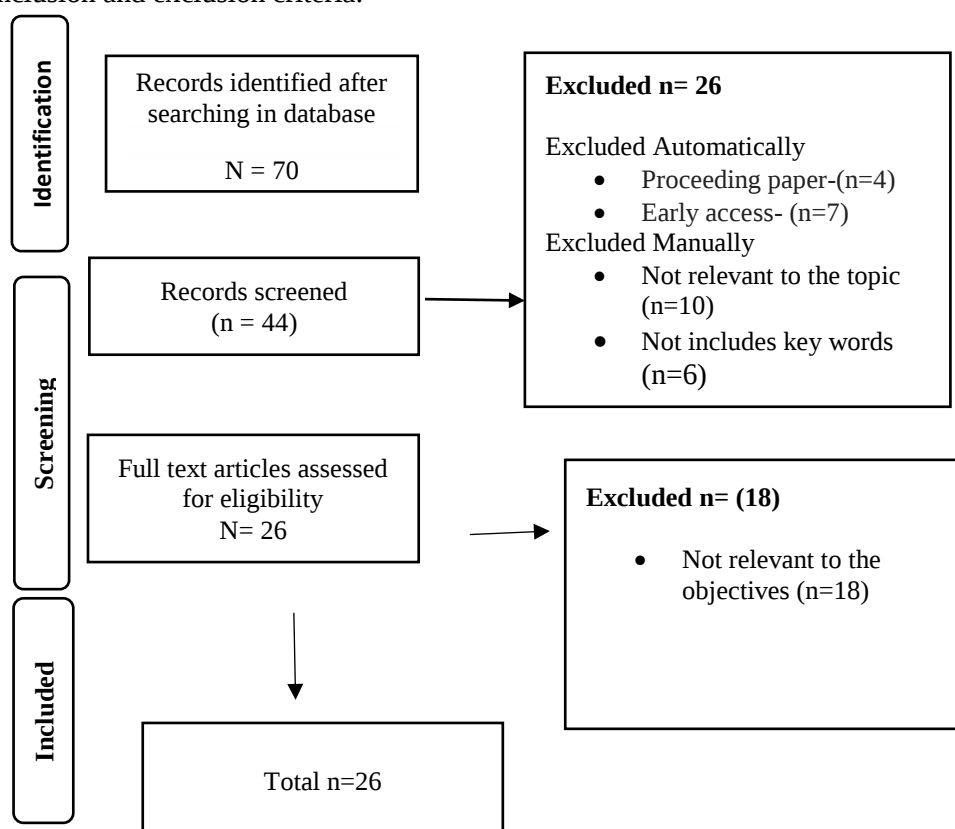


Figure 1: PRISMA framework for the literature review conducted for enhancing financial access for farmers in the developing countries

Digital inclusion in the banking sector can be introduced as the process of ensuring that all individuals and businesses, regardless their socio-economic status or geographic location, have access to and can effectively use digital financial services. This comprises access to mobile banking, digital banking platforms, online payment system and other digital financial tools. Digital inclusion aims to link the digital divide and promote financial inclusion by leveraging technology to provide affordable, accessible and user-friendly financial services (Varuni, 2022).

Key aspects of digital inclusion

Accessibility

Digital inclusion ensures that digital financial services are accessible to all segment of society, including those in remote and underserved areas. This involves expanding internet connectivity, improving mobile network coverage and providing user friendly digital platforms (Fernando & Disanayaka, 2024).

Affordability

Digital financial services must be affordable to ensure that they are within the reach of all individuals and businesses. This includes reducing transaction fees, interest rates, and other costs associated with accessing digital financial services (Anton & Nucu, 2024).

Digital literacy

Digital inclusion also focuses on improving digital literacy among users. This involves providing education and training on how to use digital financial services effectively, ensuring that users can navigate digital platforms and make informed financial decisions (Varuni, 2022).

Trust and security

Building trust in digital financial services is crucial for digital inclusion. This involves ensuring the security and privacy of digital transaction, protecting users from fraud, and providing reliable and transparent services (Salleh et al, 2024).

Mobile banking

Mobile banking refers to the use of a mobile device, such as a smartphone or tablet, to perform banking activities. This includes checking accounts balance, transferring funds, paying bill and applying for loans, all through a mobile banking app provided by the financial institution (Kohil et al., 2024).

Internet banking

Internet banking, also known as online banking, involves conducting financial transactions through a bank's website. It allows user to access their accounts, transfer funds, pay bills, and manage investments using a computer or other internet – enabled devices (Lin et al., 2020).

Digital wallets

Digital wallets also known as e-wallets, are software – based systems that store user's payment information and passwords for various payment methods and websites. They allow users to make electronic transaction using their mobile device or computers (Khan & Abideen, 2023).

4. RESULTS AND DISCUSSION

Table1: Existing Digital Banking Models for Rural Areas

Existing Digital Banking Models for Rural Areas	Country
M- Pesa	Kenya
BKash	Bangladesh
GCash	Philippines

4.1. Digital Financial Service (DFS) for Rural Farmers

Digital financial service (DFS) for rural farmers encompass a range of financial products and services delivered through digital platforms, such as mobile banking, digital wallets and online lending platforms. These services aims to enhance financial inclusion by providing rural farmers with access to essential financial resources, including saving accounts, credit, insurance and payment systems. DFS can significantly improve the economic stability and productivity of rural famers by offering convenient, cost effective, and secure financial solutions (Denyes et al., 2018).

When consider the key benefits of DFS, DFS provide rural farmers with access to financial services without the need for physical bank branches, overcoming geographic barriers. Digital platforms reduce transaction costs, making financial services more affordable for rural farmers. DFS enable quick and easy transaction, improving the efficiency of financial operations for rural farmers. Digital insurance products help farmers mitigate risks associated with adverse weather conditions, pests and diseases (Denyes et al., 2018).

Existing Digital Banking Models for Rural Areas

Mobile banking refers to the use of mobile devices, such as smart phones and tablets, to access and perform banking services. This includes checking account balances, transferring funds, paying bills and even applying for loans. Mobile banking applications are designed to provide users with convenient, on-the-go access to their financial information and services (Kohil et al., 2024).

When consider the key features of the mobile banking, it allows users to perform banking transactions anytime and anywhere, eliminating the need to visit a physical bank branch (Munga, 2010). Advanced security features, such as biometric authentication and encryption, are implemented to protect users' financial information (Kohil et al., 2024). Mobile banking apps are designed to be intuitive and easy to use, making it accessible to a wide range of users (Galhena & Gamini, 2023).

M- Pesa

M- Pesa is a mobile banking service that allows users to store and transfer money through their mobile phones. Launched in Kenya by Safaricom in 2007, M- Pesa has expanded to several African countries such as Tanzania, Mozambique and Ghana. It provides services such as money transfer, bill payments and access to credit and savings. M-Pesa has significantly improves financial inclusion by providing banking services to the unbanked population (Investopedia, 2023).

BKash

BKash is a mobile financial service in Bangladesh that offers a wide range of services, including money transfers, bill payments and mobile recharges. Launched in 2011, bkash has become one of the most popular mobile banking services in Bangladesh, with millions of users. It aims to provide convenient and affordable financial services to the unbanked and under banked populations (bKash, 2025).

GCash

GCash is a mobile wallet service in the Philippines that allows users to pay bills, transfer money, and make purchases using their mobile phones. Lunched by Globe Telecom, GCash has become a widely used mobile banking service in the country. It offers various financial services, including savings accounts, loans, and insurance, making it a comprehensive financial solution for its users (GCash, 2025).

Table 2: Digital Payment Platform

Digital payment platforms	Country
Paytm	Indian
Wave money	Myanmar

Digital payment platforms

Digital payment platforms have had a profound impact on rural a new level of convenience and efficiency. They enable farmers to receive payments for their produce instantly and securely, eliminating the challenges associated with cash payments, such as delays, theft and loss. Furthermore, these platforms have opened up new opportunities for farmers to access financial services such as loans, insurance, and savings which were previously inaccessible due to their remote locations or lack of formal banking infrastructure. Digital platforms have also facilitate the growth of agri-tech startups that leverage fintech to provide innovative solutions to farmers, such as farm management software, precision farming tools, and market linkages. This has not only improved farm productivity but also enhanced market access to farmers (Scott, 2024).

Despite the number of benefits, digital payment platforms also present some challenges. These include network connectivity issues, especially in remote areas, lack of digital literacy among farmers and security concern (Scott, 2024).

Paytm

Paytm, an acronym for pay through mobile is an Indian multinational financial technology company that specialize in digital payments and financial services. Founded in 2010 by Vijay Shekhar Sharma, Paytm offers a wide range of services, including mobile payments, bill payments, money transfers and online shopping. The platform allows users to make payments using UPI, QR codes, and other digital methods. Paytm also provides financial services such as micro credit and buy now, pay later options (Paytm, 2023).

Key features of the Paytm are versatility, user experience and security. Paytm offers a wide array of services, from mobile recharges to online shopping. The platform is designed for ease of navigation, even for new comers to digital payments. Robust security measures, such as two factor authentication, ensure the protection of users' financial data (Paytm, 2023).

Paytm has significantly improved financial inclusion in India by providing banking services to the unbanked populations and facilitation cashless transactions (Paytm, 2023).

Wave money

Wave Money is a leading mobile financial service provider in Myanmar, offering a range of digital payment solutions. Launched in 2015, Wave Money provides services such as money transfers, bill payments and mobile recharges through its Wavepay mobile wallet. The platform has over 11.5 million users and operate through a network of more than 60,000 agents and 200,000+ merchants (Wave Money, 2024).

Key features of the Wave money are accessibility, security and Convenience. Wave Money enables users to make everyday transactions, send money, and pay bills securely, bypassing the need for physical banks. The platform employs advanced

security features such as the “One Wallet, One Device” feature, which ensures that the account can only be accessed from one device at a time. Users can link their bank accounts or MPU cards to transfer funds easily in and out of the wallet (Wave Money, 2024).

Agent banking

Agent banking, also known as agency banking, is a model where banks extended their services through third party agents, such as local retailers, post offices or small businesses. These agents act as intermediaries between the bank and the customers, providing basic banking services such as deposits, withdrawals, money transfer and bill payments. The primary goals of agent banking is to increase financial inclusion by reaching underserved and unbanked populations, particularly in rural and remote areas (Investopedia, 2021).

When consider the key features of the agent banking, one of the key feature is accessibility. Agent banking brings banking services closer to customers, eliminating the need to travel long distances to bank branches. Other feature is cost effectiveness. It reduces the operational costs for banks by leveraging existing retail infrastructure. Last feature is convenience. Customers can access banking services at convenient locations and times, often beyond regular banking hours (Digipay Guru, 2024).

Agent banking has significantly improved financial inclusion by providing banking services to underserved populations. It has also enabled banks to expand their reach without the high costs associated with setting up new branches (Payset, 2023).

Branchless Banking

Branchless banking refers to the provision of banking services without the need for physical branch. This model leverages digital technologies, such as mobile banking, internet banking and ATMs, to deliver financial services to customers. Branchless banking aims to increase financial inclusion by providing accessible and convenient banking services to underserved and rural populations (Software Mind, 2023).

When consider the key features of branchless banking, branchless banking utilizes mobile and internet banking to offer services such as deposits, withdrawals, transfers and bill payments. They employs local agents or retailers to facilitate banking transaction, acting as human ATMs. It reduces the need for physical branches, lowering operational costs for banks (Digipay Guru, 2024).

Branchless banking has played a crucial role in enhancing financial inclusion by providing banking services to remote and underserved areas. It has also enabled banks to reach a larger customer base without the high costs associated with traditional branch networks (SDK Finance, 2021).

Success of Mobile Money in Kenya: M-Pesa

Safaricom in Kenya in 2007 launched M-Pesa, it is one of the most successful mobile money services globally. The name “M-Pesa” is derived from “M” for mobile and

“Pesa”, meaning money in Swahili. M-Pesa allows users to store and transfer money using their mobile phones, providing a variety of financial services, including bill payments, money transfer, and access to credit and savings.

Key Features and Success Factors

Accessibility and Convenience

M-Pesa has considerably improved financial inclusion in Kenya by providing reachable and appropriate financial services to the unbanked and under banked populations. Users can perform transactions through their mobile phones, without visiting physical bank branches. This is beneficial for rural farmers who often face challenges in visiting traditional banking services (Investopedia, 2023).

Agent Network

One of the important success factors of M-Pesa is its widespread agent network. M-Pesa agents facilitate cash-in and cash-out transactions. This network of agents make sure that users can easily convert e-cash to real cash and vice versa, making the service extensively available even in distant areas (Harvard Business School, 2015).

Security and Trust

M-Pesa has built a status for security and trust, which has been crucial for its widespread adoption. The platform uses robust security measures, including PIN verification and encryption, to protect users’ financial information. Additionally, the support from Safaricom, a well-established telecom provider, has helped to build the trust among users (Harvard Business School, 2015).

Economic Impact

M-Pesa has had a deep economic impact on Kenya. It has allowed millions of people to participate in the formal financial system, leading to improved savings and investment. A study by MIT revealed that M-Pesa lifted 2% of Kenyan households out of poverty by providing them with a secure and convenient way to save and transfer money. (Business Insider Africa, 2022).

Social Impact

M-Pesa has also had a major social impact, particularly on women. The platform has allowed women to save money securely by reducing the need to travel long distances to deposit money or access their savings. This has improved their financial freedom and enhanced their general well-being (Observer Research Foundation, 2023).

Digital Payment Adoption in South Asia: India and Bangladesh India Unified Payment Interface (UPI)

India has practiced an important transformation in its digital payment landscape, primarily driven by the Unified Payment Interface (UPI). It has launched by the

National Payments Corporation of India (NPCI) in 2016. UPI has become the leading force in the country's digital payment ecosystem. It allows users to link multiple bank accounts to a Single mobile application, enabling unified and prompt money transfers, bill payments and merchant transactions (NPCI, 2020).

Key Features and Success Factors

Accessibility and Convenience

UPI provides a user-friendly interface. Hence users can perform transactions using their smartphones. It supports various payments methods, including QR codes, mobile numbers, and virtual payment addresses (VPAs), making it reachable to a varied range of users (NPCI, 2020).

Interoperability

UPI's interoperability allows users to link multiple bank accounts and perform transaction across different banks and payment platforms. This has considerably improved the adoption of digital payments in India (PwC, 2024).

Government Initiatives

The Indian government has played a crucial role in promoting digital payments through initiatives such as Digital India, Jan Dhan Yojana, and demonetization. These initiatives have encouraged the adoption of digital payment methods among the rural population (Statista, 2023).

Economic Impact

UPI has had a deep economic impact by promoting financial inclusion and reducing the dependence on cash transactions. It has enabled millions of people, including rural farmers, to access formal financial services (NPCI, 2020).

Bangladesh: Mobile Financial Services (MFS)

Bangladesh has made important steps in digital payment adoption through Mobile Financial Services (MFS). Launched in 2011, bKash is one of the leading MFS providers in the country, offering a wide range of services, including money transfers, bill payments, and mobile recharges. MFS has played a crucial role in enhancing financial inclusion and providing accessible financial services to the unbanked population (LightCastle Partners, 2022).

Key Features and Success Factors

Accessibility and Convenience

MFS platforms like bKash provide accessible and convenient financial services to users through their mobile phones. This has been particularly beneficial for rural farmers who often face challenges in accessing traditional banking services (LightCastle Partners, 2022).

Agent Networks

The extensive agent networks of MFS providers ensure that users can easily convert e-cash to real cash and vice versa. This network of agents, often local retailers, facilitates cash-in and cash-out transactions, making the service widely accessible even in remote areas (Dhaka Tribune, 2025).

Government Support

The Bangladesh government has supported the growth of digital payments through the growth of digital payments through regulatory frameworks and initiatives aimed at promoting financial inclusion. This includes the introduction of digital payment systems for government services and subsidies (Dhaka Tribune, 2025).

Economic Impact

MFS has had an important economic impact by providing financial services to the unbanked population, leading to increased savings and investment. It has also facilitated the growth of small business and improves the overall economic well-being of rural communities (LightCastle Partners, 2022).

Agricultural Fintech Solutions in Rural Economies: Latin America

Agricultural fintech solutions have emerged as a transformative force in rural economies across Latin America. These solutions leverage digital technologies to provide financial services tailored to the needs of smallholder farmers, enhancing financial inclusion, productivity, and economic resilience.

Agrolend

Agrolend is a Brazil-based fintech company that provides working capital loans to small- and medium-sized farmers. The company raised nearly \$100 million in 2022 to support family agriculture and promote the adoption of higher –quality agricultural inputs, such as biological fertilizers and crop protection products. Agrolend’s capital helps farmers improve their productivity and economic stability, contributing to the overall growth of rural economies in Brazil (AgFunderNews, 2023).

Innovatech Project

The Innovatech project, funded by the International Fund for Agricultural Development (IFAD) and implemented by Germany’s Sparkassenstiftung für International Zusammenarbeit, aims to develop digital agricultural (AgriTech) and financial (FinTech) solutions for smallholder farmers in Latin America and the Caribbean. The project focuses on providing access to financial and non-financial markets and services for farmers in Bolivia, El Salvador, Guatemala, Haiti, Honduras, and Mexico. Innovatech aims to benefit 9000 households by enhancing productivity, commercialization, and financial sustainability through broader access to digital financial services (Innovatech, 2022).

Terra Magna

Terra Magna is another fintech company in Latin America that provides agricultural loans and flexible financing solutions for farmers. The company focusses on risk assessment and offers innovative financial products to support smallholder farmers. Terra Magna's services help farmers access the necessary capital to invest in their agricultural activities, leading to increased productivity and economic growth (AgFunderNews, 2023).

Impact on Rural Economies

Agricultural fintech solutions have had a reflective impact on rural economies in Latin America. By providing access to financial services, these solutions have enabled smallholder farmers to invest in better agricultural inputs, adopt modern farming techniques, and improve their overall productivity. This has led to increased income levels, enhanced economic resilience and improved livelihoods for rural communities. Additionally, fintech solutions have facilitate grater market access for farmers, allowing them to sell their produce at better prices and expand their customer base (Innovatech, 2022).

4.2. Barriers to Digital Banking Adoption in Rural Areas

Technological Challenges

One of the significant barriers to digital banking adoption in rural areas is the limited penetration of smartphones. Many rural residents do not own smart phones, which are essential for accessing digital banking services. The high cost of smartphones and the lack of awareness about their benefits contribute to this issue. Without smartphones, rural residents cannot use mobile banking apps, digital wallets, or other digital financial services, limiting their access to the formal financial system (Rathore et al., 2023).

Another critical barrier is the poor internet and mobile network infrastructure in rural areas. Reliable internet connectivity is essential for accessing digital banking services, but many rural regions lack the necessary infrastructure. This includes limited coverage of mobile networks and slow internet speeds, which hinder the use of online banking platforms and mobile banking apps. The lack of investment in digital infrastructure in rural areas exacerbates this issue, making it challenging for rural residents to adopt digital banking services (Salleh et al., 2024).

Socio economic barriers

One of the primary socio-economic barriers to digital banking adoption in rural areas is the low level of digital literacy and lack of awareness. Many rural residents are not familiar with digital technologies and do not possess the necessary skills to use digital banking services effectively. This includes understanding how to operate mobile banking apps, digital wallets,

and online payment systems. The lack of awareness about the benefits and availability of digital banking services further exacerbates this issue, leading to low adoption rates (Rathore et al., 2023). Gender disparities in digital finance adoption present another significant barrier. Women in rural areas often face additional challenges in accessing and using digital banking services compared to men. These challenges include limited access to mobile devices, lower levels of digital literacy and socio cultural norms that restrict women's financial independence. Research indicates that women are less likely to have digital accounts and use digital financial services, which hinders their economic empowerment and financial inclusion (Ozsuca, 2024).

Trust and security concerns are critical barriers to the adoption of digital banking services in rural areas. Many rural residents are hesitant to use digital financial services due to fears of fraud, data breaches and identity theft. The perceived risks associated with digital transactions, such as the loss of personal and financial information, deter individuals from adopting digital banking solutions. Building trust through robust security measures, such as encryption and biometric authentication, and educating users about safe usage practices are essential to overcoming these barriers (Josyula, 2024).

Regulatory and Policy Constraints

One of the significant barriers to digital banking adoption in rural areas is the inconsistency in policies related to fintech and digital payments. Regulatory frameworks often vary across regions, creating confusion and uncertainty for both financial service providers and users. Inconsistent policies can hinder the development and deployment of digital banking solutions, as financial institutions may be reluctant to invest in areas with unclear or unstable regulatory environments. This inconsistency can also lead to a lack of standardization in digital payment systems, making it difficult for users to adopt and trust these services (Salleh et al., 2024).

High transaction costs associated with digital banking services can be a significant barrier to adoption in rural areas. Many rural residents have limited financial resources, and the additional costs of using digital banking services can be prohibitive. These costs may include fees for transactions, account maintenance, and mobile data usage. Financial institutions need to find ways to reduce these costs to make digital banking more accessible and affordable for rural populations (Bouyon, 2018).

Effective collaboration between the government and the private sector is crucial for the successful adoption of digital banking in rural areas. However, limited collaboration can hinder the development and implementation of digital financial services. Governments need to create an enabling environment by providing necessary infrastructure, regulatory support, and incentives for private sector investment. At the same time, private sector entities need to work closely with the government to ensure that digital banking solutions are tailored to the needs of rural populations and are accessible to all (Chandrasekara, 2025).

4.3. Opportunities and Strategies for Enhancing Digital Inclusion

Technological innovations

AI-driven financial services

Artificial intelligence (AI) has the potential to revolutionize financial services by making them more accessible, efficient and personalized. AI-driven financial services can automate routine tasks, provide data-driven insights, and enhance customer experiences. For example, AI can be used for credit scoring, fraud detection, and personalized financial advice. By leveraging AI, financial institutions can offer tailored financial products to underserved populations, including rural farmers, thereby promoting financial inclusion (Acropolium, 2025).

Blockchain for transparent and secure transactions

Blockchain technology offers a decentralized and tamper-proof ledger for recording transactions, making it ideal for secure and transparent financial services. Blockchain can reduce fraud, enhance trust and streamline processes by eliminating intermediaries. For rural farmers, Blockchain can provide secure and transparent access to financial services, such as loans, insurance and payments. By ensuring the integrity of transactions, Blockchain can build trust among rural populations and encourage the adoption of digital financial services (Devlane, 2024).

USSD-Based Banking Solutions for Non-Smartphone Users

Unstructured Supplementary Service Data (USSD) technology enables mobile banking services without the need for internet connectivity or smartphones. USSD – based banking solutions allow users to perform basic banking transactions, such as checking account balances, transferring funds, and paying bills, using simple feature phones. This technology is particularly beneficial for rural populations who may not have access to smartphones or reliable internet connectivity. By providing a cost-effective and accessible banking solution, USSD technology can significantly enhance financial inclusion in rural areas (Bajaj Finserv, 2024).

Policy Interventions

Government Subsidies for Digital Banking Infrastructure

Government subsidies can play a crucial role in enhancing digital inclusion by supporting the development of digital banking infrastructure. These subsidies can be used to improve internet connectivity, expand mobile network coverage and establish digital banking facilities in rural areas. By reducing the financial burden on financial institutions, government subsidies can encourage the deployment of digital banking services in underserved regions, thereby promoting financial inclusion (Digital Sri Lanka 2030, 2024).

Financial Literacy Programs for Rural Farmers

Financial literacy programs are essential for empowering rural farmers to effectively use digital banking services. These programs can provide education on basic financial concepts, digital banking tools and benefits of financial inclusion. By enhancing financial literacy, rural farmers can make informed decisions, manage their finances better and confidently use digital banking services. Financial literacy programs can be delivered through workshops, training sessions, and digital platforms tailored to the needs of rural communities (RFILC, 2024).

Public – Private Partnerships for Fintech Expansion

Public- private partnerships (PPPs) can considerably enhance digital inclusion by leveraging the strengths of both sectors. These partnerships can facilitate the development and deployment of fintech solutions in rural areas. Government can provide regulatory support and incentives, while private sector entities can bring innovation, technology, and expertise. PPPs can help reduce the costs of infrastructure projects, improve the efficiency of service delivery, and foster innovation in digital financial services. Successful examples of PPPs in fintech include the development of national payment networks and digital identity solutions (Muzenda, 2024).

Community Based Approaches

Digital Banking Cooperatives

Digital banking cooperatives are community based financial institutions that leverage digital technologies to provide banking services to their members. These cooperatives operate on a not –for-profit basis. Digital banking cooperatives can offer a range of financial services to underserved populations in rural areas by pooling resources and leveraging digital platforms. This approach improves financial inclusion by providing reachable and reasonable banking services according to the needs of the community (Nanosoft Global, 2024).

Training Programs through Farmer Organizations

Training programs conducted through farmer organizations play an important role in enhancing digital inclusion among rural farmers. These programs provide education on financial literacy, digital financial services, and the use of digital tools for agricultural practices. By leveraging the existing networks and trust within farmer organizations, these training programs can effectively reach a large number of farmers and equip them with the knowledge and skills needed to adopt digital banking services. This approach not only promote financial inclusion but also enhances the general productivity and sustainability of agricultural practices (CSIAP Sri Lanka, 2024)

Localized Fintech Solutions Tailored for Rural Economies

Localized fintech solutions are planned to address the particular financial needs and challenges of rural economies. These solutions influence local knowledge and resources to create tailored financial products and services that are reachable and appropriate to rural populations. Examples include mobile payment systems, microloans, and insurance products that supply to the unique needs of rural farmers. Financial service providers can enhance financial inclusion and support the economic development of rural communities by providing localized fintech solutions (Xprizo, 2024).

5. CONCLUSION

Digital inclusion in the rural banking sector has proven to be a transformative approach to enhancing financial access for farmers in developing countries. By leveraging innovative technologies such as AI driven financial services, Blockchain for secure transactions and USSD – based banking solutions rural populations are increasingly able to overcome traditional barriers to financial services. This advancement empowers farmers to save, invest, and manage risks effectively, leading to improved agricultural productivity and economic resilience. Community based approaches including digital banking cooperatives and localized fintech solutions have further strengthened the integration of digital banking in to rural economies. Additionally, policy interventions such as government subsidies for digital infrastructure, financial literacy programs and public private partnerships have played an important role in fostering digital inclusion.

Despite these successes, challenges such as limited digital literacy, inadequate infrastructure and trust issues persists. Addressing these obstacles requires collaborative efforts among governments, industry stakeholders and local communities. Tailored strategies such as developing localized digital tools and enhancing digital literacy are essential to bridging the digital divide and ensuring equitable financial access. Digital inclusion also contributes to the sustainable economic development of the country.

References

- Adhikari, A.M.C.P., Herath, H.M.T.S., & Kannangara, S.D.P.P. (2021). The impact of financial inclusion on rural development in Sri Lanka. *Proceedings of the 18th International Conference on Business Management*. <https://doi.org/10.31357/icbm.v18.5819>.
- Ankrah, D. A., Asante, B.O., Prah, S., & Boateng, F.K. (2023). Impact of digital financial inclusion on the participation in farmer-based organizations, structures market, and off-farm work in Ghana. *Journal of International Development*. <https://doi.org/10.1002/jid.3863>.
- Acropolium. (2025). Top AI Application in Finance for 2025: [Benefit &Success Stories]. Retrieved from [Acropolium](#).
- Bouyon, S. (2018). Cost and value in banks: A model fit for the digital era? *European Credit Research Institute*. Retrieved from ECRI.
- Bajaj Finserv. (2024) NUUP –National Unified USSD payments: Guide, Benefits and How it Works. Retrieved from Bajaj Finserv
- Business Insider Africa. (2022). M-Pesa: Kenya’s mobile money success story celebrates 15 years. Retrieved from [Business Insider Africa](#).
- Consumer Financial Protection Bureau. (2022). Data spotlight: Challenges in rural banking access. Retrieved from [https:// www.consumerfinance.gov/data-spotlight-challenges-in-rural-banking-access/](https://www.consumerfinance.gov/data-spotlight-challenges-in-rural-banking-access/).
- Chandrasekara, D.E. (2025). SL should connect sectors, institutions for digital transformation. *The Sunday Times, Sri Lanka*. Retrieved from [Sunday Times](#)
- CSIAP Sri Lanka. (2024). Climate Smart Farmer Training School at Thirappane. Retrieved from [CSIAP](#).
- Denyes, L., Leshner, N. Martinez, M., McNutt, H., & Nakhai, M. (2018). Digital financial services for agriculture: Handbook. International Finance Corporation (IFC).
- Devlane. (2024).The role of Blockchain in secure online transactions. Retrieved from Devlane
- Digital Sri Lanka 2030. (2024) National Digital Economy Strategy 2030. Retrieved from [MoT](#).
- Dhaka Tribune. (2025). HSBC highlights emerging trends in payments, treasury management solutions in Bangladesh. Retrieved from [Dhaka Tribune](#).
- Federal Reserve. (2019). Perspectives from Main Street: Bank branch access in rural communities. Retrieved from <https://www.federalreserve>

.gov/publications/november-2019-bank-branch-access-in-rural-
communities.htm.

- Fernando, L.M.R., & Disanayaka, K. (2024). The impact of digital financial inclusion on banking sector stability: Evidence from developing countries. *Sri Lankan Journal of Banking and Finance*, 7(1), 51-66. <https://doi.org/10.4038/sljbf.v7i1.53>.
- Galhena, B. L., & Gamini, W.D. (2023). Factors influencing mobile banking adoption: Case from non-banking financial institute sector in Sri Lanka. *Journal of Business Studies*, 5(2), 33905. Retrieved from [IRJMETs](#).
- Harvard Business School. (2015). M-Pesa: a Mobile Money success story from Kenya. Retrieved from [Harvard Business School](#).
- Investopedia. (2023). what is M-Pesa? Definition, How the Service Works, and Example. Retrieved from [Investopedia](#)
- Josyula, H.P. (2024). Consumer perception and adoption of digital payment methods: A study on trust and security concerns. *Educational Administration: Theory and Practice*. Retrieved from
- Kohil, K., Kashyap, M., Kuruva, M.B., & Tiwari, S. (2024). Mobile Banking: A bibliometric analysis. *Journal of Financial Services Marketing*, 29, 1396-1413. <http://doi.org/10.1057/s41264-024-00267-7>.
- Koomson, I., & Villano R. A. (2024). Financial inclusion and sustainable rural development. In *Sustainable Development Goals Series*. Springer. <https://link.springer.com/book/10.1007/978-981-97-6132-6>.
- Kipilimba, T.F. (2024). The impact of digital finance on smallholder farmers' income in Iringa Municipality. *International Journal of Multidisciplinary Research and Growth Evaluation*, 5(6), 248-258. https://www.allmultidisciplinaryjournal.com/uploads/archives/20241111192921_E-24-103.1.pdf
- Khan, W.A., & Abideen, Z.U. (2023). Effect of behavioral intention on usage behavior of digital wallet: The mediating role of perceived risk and moderating role of perceived service quality and perceived trust. *Future Business Journal*, 9, 73. <https://doi.org/10.1186/s43093-023-00242-z>.
- LightCastle Partners. (2022). Digital Payment Landscape in Bangladesh. Retrieved from [LightCastle Partners](#).
- Lin, W.R., Wang, Y.H., & Hung, Y.M. (2020). Analyzing the factors influencing adoption intention of internet banking: Applying DEMATEL-ANP-SEM approach. *PLOS ONE*, 15 (2), e0227852. <https://doi.org/10.1371/Journal.pone.0227852>.

- Muzenda, M. (2024). Public- Private Partnerships for building Financial Innovation. Retrieved from Ghazan Global.
- Mishra, D., Kandpal, V., Agarwal, N., & Srivastava, B. (2024). Financial inclusion and its ripple effects on socio-economic development: A comprehensive review. *Journal of Risk and Financial Management*, 17(3), 105. <https://doi.org/10.3390/jrfm17030105>.
- Nanosoft Global. (2024). Building a Digital Banking experience for Co-operatives. Retrieved from Nanosoft.
- Ozili, P.K. (2020). Financial inclusion research around the world: A review. *Forum for Social Economics*. <https://doi.org/10.2139/ssrn.3515515>.
- Observer Research Foundation. (2023). Kenya's mobile money story and the runaway success of M-Pesa. Retrieved from Observer Research Foundation.
- Rathore, R., Shah, S., & Kathatala, T. (2023). A study on the level of digital financial service inclusion among the rural area. *International Research Journal of Modernization in Engineering Technology and Science*, 5 (2), 33905. Retrieved from IRJMETs
- RFILC.(2024). Financial Education for farmers. Retrieved from RFILC
- Salleh, M.Z.M., Abdullah, A., Nawi, N. C., Din, N. M., Zakaria, M.N., Muhammad, M.Z., Merican, R.M.A.R., & Radyi, S.A.M. (2024). Adoption of fintech among rural communities: Challenge and solutions. In *Artificial Intelligence (AI) and Customer Social Responsibility (CSR)* (pp.725-732). Springer. Retrieved from Springer.
- Shetty, S.K., Birau, R., Ninulescu, P.V., Filip, R.D., & Lupu, G.A.M. (2023). Acceptance and adoption of digital financial inclusion by the rural population of India: A case study. ResearchGate. Retrieved from ResearchGate.
- Scott, A. (2024). The fintech field: Mobile payments and digital wallets for farmers. *HusFarm*. Retrieved from HusFarm.
- Shah, S.M., & Ali, A. (2022). A survey on financial inclusion: Theoretical and empirical literature review. *Munich Personal RePEc Archive*. https://mpa.ub.uni-muenchen.de/116327/1/MPRA_paper_116327.pdf.
- Xprizo. (2024). How FinTech is revolutionizing rural economies. Retrieved from Xprizo.
- 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, 39281-39294. <https://doi.org/10.1007/s11356-022-18939-z>.