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Integrating FinTech Solutions in Agribusiness: A Pathway to a Sustainable Economy in Bangladesh

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Abstract:

The agribusiness sector in Bangladesh is a crucial part of the national economy, notably influencing employment, food security, and poverty alleviation. Despite its significance, the segment faces several challenges, including limited access to credit, financial inclusion, and inefficiencies in supply chains. Only 30% of small-holder farmers have access to formal monetary services, leading many to rely on informal lenders with high interest rates. Additionally, inadequate infrastructure and significant post-harvest losses hinder the sector's growth. FinTech solutions have the potential to address these challenges by enhancing financial inclusion, reducing transaction costs, and improving supply chain transparency. Digital financial services, such as mobile money platforms and digital lending, can provide smallholder farmers with access to savings, credit, and insurance products through mobile platforms. Blockchain technology and smart contracts can streamline financial transactions, reduce costs, and increase transparency in the supply chain. This paper explores the possibility of FinTech solutions in transforming the agribusiness sector in Bangladesh. By examining case studies and real-world examples, the article highlights the transformative impact of FinTech on the agribusiness sector. It provides recommendations for policymakers, stakeholders, and practitioners to promote the adoption of FinTech solutions in Bangladesh.

Keywords: FinTech, Agribusiness, Financial Inclusion, Supply Chain, Sustainable Development, Economic Growth, Islamic Banking, Islamic Finance, AI & IR

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Introduction

Bangladesh's agribusiness sector is the strength of its economy, contributing about 13.5% of the national GDP and employing nearly 40% of the labor force (World Bank, 2022). The sector involves various actions, including crop, fisheries, livestock, and agro-processing industries. The fertile land, favorable climate, and tradition of agricultural practices have made Bangladesh a significant producer of rice, jute, tea, and fish. Despite its robust contributions, the agribusiness sector remains underdeveloped compared to its potential due to several systemic inefficiencies and challenges. Limited credit and financial services access is a critical challenge in Bangladesh's agribusiness sector. According to the Bangladesh Institute of Development Studies (BIDS, 2021), only 30% of smallholder farmers have access to formal financial services. High collateral requirements, lack of financial literacy, and inadequate credit products tailored to the needs of farmers exacerbate this issue. Consequently, many farmers rely on informal lenders, often at excessive interest rates, which traps them in cycles of liability. Inadequacies, including poor infrastructure, storage facilities, and market access, plague Bangladesh's agribusiness supply chains. Post-harvest failures, projected to range between 15-25% for perishable goods (Food and Agriculture Organization [FAO], 2020), further reduce profitability for farmers. Moreover, the dominance of intermediaries limits farmers' direct access to markets, reducing their share of profits and discouraging investment in modern agricultural practices. The adoption of modern technology in farming and agro-processing remains limited. Farmers often lack access to updated information on weather, crop prices, and best practices. Additionally, mechanization rates are low, particularly among smallholder farmers, due to high costs and limited availability of machinery. FinTech has the potential to revolutionize the agribusiness sector in Bangladesh by addressing some of its most pressing challenges. Digital financial services can enhance financial inclusion by providing smallholder farmers access to credit, savings, and insurance products through mobile platforms (Fintech in Agriculture, 2023). Financial technology (FinTech) has the potential to revolutionize Bangladesh's agribusiness sector by addressing key challenges in financial inclusion, credit access, and supply chain inefficiencies. Mobile banking and digital wallets, such as bKash and Nagad, have already brought millions of unbanked individuals into the formal financial system (Aziz & Naima, 2021)). These platforms can be leveraged to offer designed financial products, such as microloans and crop coverage, directly to farmers without traditional collateral. FinTech solutions, such as digital payment platforms, blockchain technology, and smart contracts, can streamline financial transactions, reduce transaction costs, and increase transparency in the supply chain (Agritech Digest, 2024). Additionally, FinTech can facilitate better market linkages and improve access to market statistics, enabling farmers to make informed assessments and optimize their operations (Forbes, 2023). One notable example of FinTech's impact is mobile money services, which have gained popularity in Bangladesh. These services allow farmers to accept payments, transfer funds, and access credit through their mobile phones, reducing the dependency on traditional banking systems and increasing financial inclusion (Fintech in Agriculture, 2023). Digital lending platforms also play a crucial role by providing farmers with quick and easy access to credit, enabling them to participate in high-quality inputs and improve their efficiency (Agritech Digest, 2024). Blockchain technology is another promising FinTech solution for the agribusiness sector. By providing a secure and visible way to track transactions and verify the authenticity of products, blockchain can help reduce fraud and improve the efficiency of supply chains (Forbes, 2023). Smart contracts, which are self-performing contracts with the terms of the agreement directly written into code, can program and modernize various processes, such as payment settlements and contract execution, further enhancing efficiency and reducing costs (Zahiduzzaman, 2023). This paper aims to explore FinTech solutions' potential in transforming Bangladesh's agribusiness sector. The paper aims to provide a comprehensive analysis of the current challenges faced by the sector, the role of FinTech in addressing these challenges, and the potential benefits of integrating FinTech solutions into agribusiness practices. By examining case studies and real-world examples, the article seeks to highlight the transformative impact of FinTech on the agribusiness sector and provide recommendations for policymakers, stakeholders, and practitioners to promote the adoption of FinTech solutions in Bangladesh. The scope of the paper includes an in-depth examination of the agribusiness landscape in Bangladesh, the current state of FinTech adoption, and the potential benefits and challenges of integrating FinTech solutions. The article will also discuss the role of policymakers, regulators, and stakeholders in promoting FinTech adoption and provide strategies for scaling up FinTech solutions in the agribusiness sector. By addressing

these key areas, the article aims to contribute to the continuing discourse on the role of technology in enhancing the sustainability and efficiency of agribusiness in Bangladesh.

The Agribusiness Landscape in Bangladesh

Overview of the Agribusiness Sector in Bangladesh

The agribusiness sector in Bangladesh constitutes a critical component of the national economy, accounting for approximately 13.5% of the Gross Domestic Product (GDP) and providing employment to nearly 40% of the country's workforce (World Bank, 2022). This sector involves many actions, including crop cultivation, fisheries, livestock farming, and agro-processing industries. Bangladesh's fertile soil, conducive climatic conditions, and longstanding agricultural practices have established the nation as a key producer of rice, jute, tea, and fish. However, despite its importance, the sector faces significant structural challenges that impede its full development and efficiency. Agriculture and its allied industries are central to Bangladesh's economic framework. Beyond their substantial contribution to the GDP, these industries play a pivotal role in safeguarding food protection for a rapidly growing population and supporting the livelihoods of rural communities. Notably, the agro-processing industry has demonstrated considerable growth potential, driven by increasing domestic and international demand for value-added agricultural products (World Bank, 2022). The agribusiness value chain in Bangladesh comprises a diverse range of stakeholders, including farmers, input suppliers, intermediaries, processors, exporters, and government institutions. Smallholder farmers form the sector's backbone at the primary production level, while intermediaries serve as key connectors between producers and markets.

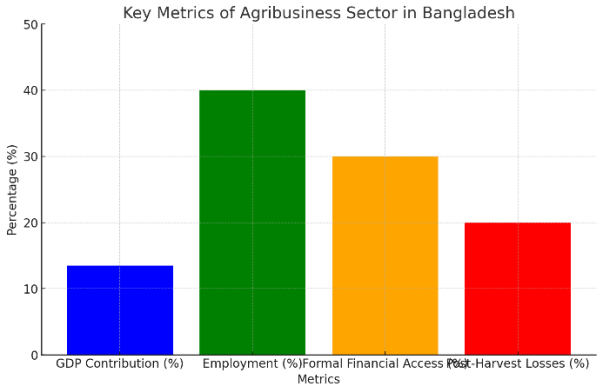

Figure 1: Key metrics of the agribusiness sector in Bangladesh

Agro-processors and exporters contribute significantly to value addition and international trade, while government and non-governmental organizations provide crucial policy support, subsidies, and capacity-building programs. Financial institutions and emerging FinTech enterprises are increasingly important actors, working to bridge gaps in financial inclusion and providing innovative solutions for the sector's challenges.

Financial Inclusion and Access to Credit: Only 30% of smallholder farmers have access to formal financial facilities, compelling many to depend on informal lenders who charge prohibitively high interest rates (BIDS, 2021). This issue is further compounded by limited financial literacy and a lack of tailored credit products designed to meet the specific needs of agricultural producers.

Inefficiencies in Supply Chains: The agribusiness supply chains in Bangladesh are hampered by inadequate infrastructure, insufficient storage facilities, and significant post-harvest losses—estimated at 15-25% for perishable goods (FAO, 2020). Additionally, due to the prevalence of intermediaries, limited direct access to markets for farmers reduces their earnings and hinders profitability.

Technological Gaps: The adoption of modern farming and agro-processing technologies remains constrained by high costs, limited availability of equipment, and a lack of access to critical info such as market prices, weather forecasts, and best practices for crop management.

Opportunities

Adoption of FinTech Solutions: Financial technology integration offers significant potential to address challenges in financial inclusion and supply chain inefficiencies. Digital platforms such as bKash and Nagad have already facilitated the inclusion of millions into the formal financial system, and these platforms can be further leveraged to provide microloans, crop insurance, and other customized financial products (Akhter & Khalily, 2020). Expansion of Agro-Processing Industries: With the growing demand for processed agricultural goods in domestic and international markets, there is a substantial opportunity to enhance agro-processing. Investments in infrastructure and technology can drive value addition, boosting the sector's overall economic impact. Policy and Institutional Support: Targeted policies and collaborations between the public and private sectors can play a critical role in fostering technological adoption and improving market access for farmers, ultimately enhancing productivity and profitability.

Integrating FinTech in Bangladesh's Agribusiness

The combination of financial technology (FinTech) in the agribusiness sector in Bangladesh represents a transformative opportunity to address key systemic challenges, including limited access to formal financial services, inefficiencies in supply chains, and high transaction costs. This paper examines the current situation of FinTech adoption in Bangladesh, highlights the potential benefits of its application in the agribusiness sector, and provides examples of context-specific FinTech innovations.

Current State of FinTech Adoption in Bangladesh

Bangladesh has witnessed significant growth in FinTech adoption, driven by factors such as the proliferation of mobile technology, enhanced internet connectivity, and supportive government policies. According to Bangladesh Bank (2021), over 102 million mobile financial services (MFS) accounts exist, indicating widespread accessibility. Services such as bKash, Rocket, and SureCash have become instrumental in facilitating financial transactions across rural and urban areas. Despite this progress, the integration of FinTech in agribusiness remains in its infancy. Smallholder farmers, who form the strength of the agricultural sector, face persistent barriers, including limited financial literacy, inadequate infrastructure, and reliance on informal credit systems (Datta, 2024). Bridging this gap requires targeted FinTech solutions tailored to the unique needs of farmers and agribusinesses.

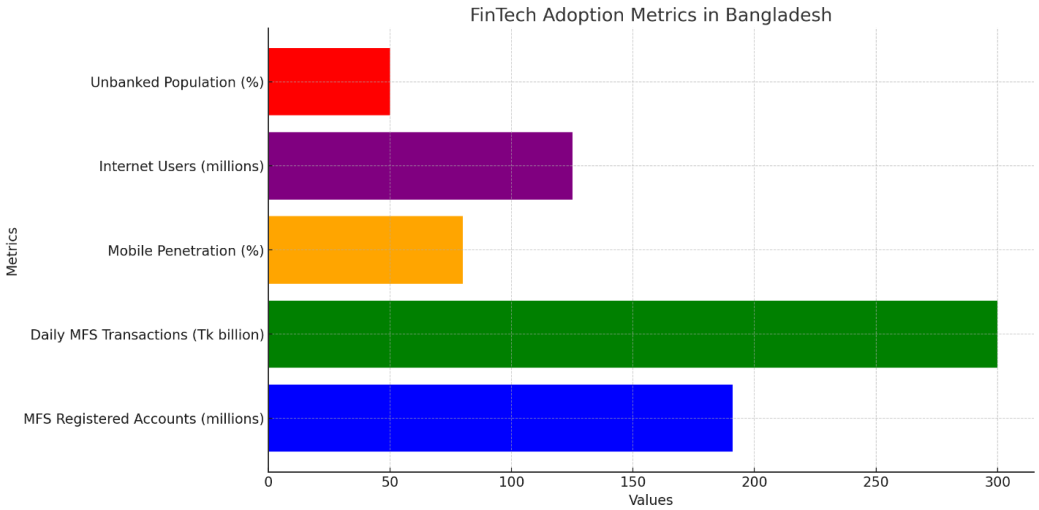

Figure 2: Fintech adoption metrics in Bangladesh

Potential Benefits of FinTech for Agribusiness

The application of FinTech in the agribusiness sector can address several critical arguments and unlock new opportunities for financial inclusion and operational efficiency.

Improved Access to Finance

Access to formal financial services remains a significant barrier for smallholder farmers in Bangladesh. FinTech solutions, such as digital lending platforms, can mitigate this challenge by providing micro-loans through alternative credit scoring mechanisms. These platforms use mobile data and behavioral analytics to assess borrowers' creditworthiness, enabling financial institutions to serve unbanked and underbanked populations. Additionally, crowdfunding platforms can provide farmers with a direct source of capital, allowing them to bypass traditional financial intermediaries.

Reduced Transaction Costs

FinTech solutions significantly reduce transaction costs, particularly for smallholder farmers who often operate on narrow profit margins. Mobile money services such as bKash and Rocket allow farmers to make payments, receive funds, and manage transactions securely and efficiently, minimizing dependence on cash-based systems. FinTech also reduces the cost of remittance transfers, a critical financial inflow for many rural households reliant on overseas income (Hasan et al., 2023).

Increased Transparency

Transparency is a key concern in agricultural value chains, where inefficiencies and corruption can undermine farmers' profitability. FinTech innovations such as blockchain technology and smart contracts enhance accountability by enabling secure, immutable transaction records and automating payments once contractual conditions are met (Rayhan et al., 2024). These technologies strengthen stakeholders' trust and ensure equitable benefits distribution across the value chain.

Enhanced Market Linkages

FinTech facilitates improved market access for farmers by enabling direct connections to buyers and reducing reliance on intermediaries. Digital platforms provide actual-time information on market prices, demand trends, and logistical options, empowering farmers to make informed decisions (Islam et al., 2021). Additionally, supply chain management tools streamline production and distribution processes, ensuring timely delivery of goods and improved profitability.

Examples of FinTech Innovations Tailored to Bangladesh

Several FinTech innovations have been developed or adapted to meet the specific needs of Bangladesh's agribusiness sector:

Mobile Financial Services (MFS)

Mobile money platforms such as bKash, Rocket, and SureCash have become critical tools for financial inclusion Hossain, I. (2023). Farmers use these services to make payments for inputs, receive subsidies, and conduct peer-to-peer transactions. These platforms increase security and efficiency by reducing reliance on physical cash (Bangladesh Bank, 2021).

Digital Lending Platforms

Platforms like Shujog and Ujjiban offer micro-loans to smallholder farmers, leveraging mobile technology to overcome the limitations of traditional credit systems. Using non-traditional credit scoring methods, these platforms extend financial services to previously unbanked populations, fostering inclusive economic growth (Uddin & Mohiuddin, 2020).

Supply Chain Management Tools

Digital platforms such as Krishi Network and AgriBazaar enable farmers to connect directly with suppliers, buyers, and logistics providers. These platforms provide real-time data on market conditions, supply chain efficiencies, and pricing trends, facilitating better decision-making and improved market access (Prodhan et al., 2024)

The integration of FinTech into Bangladesh's agribusiness sector holds considerable potential to address longstanding challenges such as financial exclusion, high transaction costs, and supply chain inefficiencies. While existing innovations such as mobile financial services, digital lending platforms, and supply chain management tools have shown promise, their full potential remains untapped. To maximize the impact of FinTech in this sector, further efforts are needed to address barriers such as limited digital literacy and rural infrastructure. By leveraging FinTech effectively, Bangladesh can drive inclusive growth and enhance the productivity and profitability of its agribusiness sector.

Ethical Finance and Islamic Banking in Agribusiness

Applying ethical finance and Islamic banking principles in the agribusiness sector holds significant potential to promote sustainability, inclusivity, and socio-economic development. Ethical finance emphasizes responsible investment practices that align with environmental, social, and governance (ESG) standards. Similarly, Islamic banking is rooted in Shariah principles, promoting fairness, risk-sharing, and public welfare.

Principles of Ethical Finance and Islamic Banking

Ethical finance emphasizes collectively responsible financing practices that consider the broader impacts of financial activities on the environment and society. It aims to promote sustainable development by aligning financial decisions with ESG goals, including poverty reduction, environmental conservation, and equitable economic growth.

Islamic banking, a key subset of ethical finance, is guided by Shariah law, which prohibits interest (riba), too much uncertainty (gharar), and financings in unethical sectors such as gambling and alcohol production. Core principles of Islamic banking include risk-sharing, profit-and-loss-sharing arrangements, and asset-backed financing (Andespa et al., 2024). Islamic finance instruments, such as Murabaha (cost-plus financing), Mudarabah (profit-sharing), and Salam (advance purchase contracts), align well with the financing needs of the agribusiness sector, which often requires flexible and partnership-based financial arrangements.

Relevance of Ethical Finance and Islamic Banking to Agribusiness

Ethical finance and Islamic banking offer a viable framework for addressing the challenges the agribusiness sector faces in improving countries like Bangladesh.

Financial Inclusion

Many smallholder farmers in Bangladesh lack access to formal financial facilities due to high interest rates, rigid loan terms, and the dominance of informal credit systems (Tripoli & Schmidhuber, 2018). Islamic banking principles, which emphasize profit-sharing and fairness, provide an alternative to exploitative lending practices. Ethical finance prioritizes equitable resource allocation, ensuring that marginalized groups, including rural farmers, access affordable financial services.

Risk Mitigation

Agribusiness is risky due to price volatility, random weather conditions, and pest infestations. Islamic finance instruments such as Takaful (Islamic insurance) provide farmers with risk-sharing mechanisms that align with Shariah principles. These mechanisms ensure that risks are distributed equitably among participants, reducing the financial burden on individual farmers.

Promoting Sustainable Practices

Ethical finance frameworks encourage investment in environmentally sustainable agricultural practices. For example, financing mechanisms tied to ESG criteria can incentivize farmers to adopt renewable energy, water conservation technologies, and organic farming methods. Islamic banking also supports sustainability by prohibiting investments that harm the environment or exploit vulnerable populations.

Case Studies of Ethical Finance and Islamic Banking in Bangladesh

Several initiatives in Bangladesh demonstrate the potential of ethical finance and Islamic banking to support the agribusiness sector:

Islami Bank Bangladesh Limited (IBBL)

IBBL has been a pioneer in promoting Shariah-compliant financial services in Bangladesh. The bank offers agricultural financing schemes such as Bai-Muajjal (deferred payment contracts) and Murabaha to support farmers in purchasing seeds, fertilizers, and equipment. These schemes align with Islamic principles by avoiding interest-based transactions while providing farmers access to affordable credit.

BRAC's Ethical Financing Initiatives

BRAC, a leading development organization in Bangladesh, has implemented ethical financing programs targeting smallholder farmers. BRAC offers low-interest loans and capacity-building services through its microfinance arm to promote sustainable agricultural practices. These programs integrate ESG criteria to ensure financing supports environmental conservation and social equity (Hossain, 2023).

Challenges and Opportunities in Integrating Ethical Finance, Islamic Banking, and FinTech

Challenges

Lack of Awareness and Financial Literacy: Many farmers are unfamiliar with Islamic banking principles and ethical finance frameworks, limiting their adoption (Rayhan et al., 2024).

Infrastructure Gaps: Inadequate digital and physical infrastructure in rural areas hinders the delivery of FinTech-enabled ethical finance solutions.

Regulatory Barriers: The absence of comprehensive regulatory frameworks for FinTech and Islamic banking integration poses challenges for scaling such initiatives.

Opportunities

FinTech Integration: FinTech innovations such as mobile financial services, blockchain technology, and digital lending platforms can enhance the accessibility and efficiency of ethical finance and Islamic banking services.

Market Expansion: Ethical finance and Islamic banking can attract socially conscious investors and institutions, driving capital toward sustainable agribusiness initiatives.

Policy Support: The government of Bangladesh's focus on digital transformation and financial inclusion provides a conducive environment for integrating ethical finance and Islamic banking with FinTech solutions.

Ethical finance and Islamic banking provide a robust framework for addressing the challenges faced by Bangladesh's agribusiness sector. By emphasizing fairness, sustainability, and risk-sharing, these financial systems align closely with the needs of smallholder farmers and rural communities. While challenges such as financial literacy and infrastructure gaps remain, integrating ethical finance and Islamic banking with FinTech solutions offers a transformative pathway for promoting comprehensive and sustainable development in the agribusiness sector.

Pathway to a Sustainable Economy

The evolution of a sustainable economy requires innovation across multiple sectors, with agribusiness playing a pivotal role. FinTech solutions provide a transformative pathway to achieving sustainability in agribusiness by improving financial inclusion, reducing inefficiencies, and promoting environmentally and socially responsible practices. This paper explores how FinTech solutions can contribute to a more sustainable agribusiness sector, examines the role of policymakers and stakeholders in promoting adoption, and discusses strategies for scaling up FinTech in agribusiness.

FinTech Solutions for a Sustainable Agribusiness Sector

FinTech has the potential to address critical sustainability challenges in agribusiness by leveraging digital tools and technologies to enhance efficiency, inclusivity, and transparency.

Enhancing Financial Inclusion

Smallholder farmers, who comprise a significant percentage of the agribusiness workforce in developing countries, often face barriers to accessing recognized financial services. FinTech solutions, such as mobile financial services (MFS) and digital lending platforms, can overcome these challenges by providing affordable and accessible financial products. For instance, platforms like bKash and Nagad in Bangladesh enable farmers to access credit, make payments, and obtain remittances through mobile phones, reducing dependence on informal financial systems.

Promoting Sustainable Practices

FinTech tools can incentivize sustainable agricultural practices by linking financing to environmental, social, and governance (ESG) criteria. For example, digital platforms can provide loans or subsidies to farmers who adopt renewable energy technologies, water-saving irrigation systems, or organic farming methods. Blockchain technology can also promote sustainability by enabling transparent supply chains, ensuring farmers and producers adhere to ethical and sustainable practices (Rayhan et al., 2024).

Improving Market Access and Efficiency

Digital marketplaces and supply chain management platforms improve market linkages by connecting farmers directly with buyers, reducing reliance on intermediaries, and minimizing post-harvest losses. Real-time data on market prices and demand trends empowers farmers to make informed decisions, optimizing production and reducing waste. Additionally, smart contracts and digital payment systems streamline transactions, enhancing efficiency across the value chain (Montesclaros & Teng, 2023)

The Role of Policymakers, Regulators, and Stakeholders

The successful adoption of FinTech in agribusiness depends on the coordinated efforts of policymakers, regulators, and stakeholders.

Policymakers

Policymakers play a crucial part in creating an enabling environment for FinTech adoption. Developing supportive policies and regulatory frameworks can encourage innovation while protecting consumers. For example, incentives such as tax breaks for FinTech startups, subsidies for digital infrastructure development, and grants for sustainable agricultural initiatives can accelerate adoption.

Regulators

Regulatory authorities ensure that FinTech solutions operate within a secure and transparent framework. In agribusiness, regulators must tackle challenges such as data privacy, cybersecurity, and financial fraud.

Establishing clear guidelines for digital lending, mobile payments, and blockchain technology can build trust among stakeholders and encourage widespread adoption.

Private Sector and Development Organizations

Public-private partnerships (PPPs) and collaborations with development organizations are essential for scaling FinTech in agribusiness. Private companies bring technological expertise and innovation, while development organizations provide funding and capacity-building support. Joint initiatives can adopt challenges such as digital knowledge and infrastructure gaps, ensuring that FinTech solutions reach underserved rural communities.

Strategies for Scaling Up FinTech Solutions in Agribusiness

The following strategies can facilitate the expansion of FinTech in agribusiness and contribute to a sustainable economy:

Public-Private Partnerships (PPPs)

PPPs are vital for mobilizing resources and expertise to develop and implement FinTech solutions. For instance, partnerships between FinTech companies, agribusiness firms, and government agencies can enable the deployment of digital tools tailored to farmers' needs. These collaborations can also support research and development (R&D) initiatives to innovate and localize technologies (Rahman et al., 2022).

Capacity Building

Digital and financial literacy programs are critical for empowering farmers to adopt FinTech solutions effectively. Training sessions, workshops, and awareness campaigns can bridge knowledge gaps, ensuring smallholder farmers understand and utilize digital platforms. Development organizations and local cooperatives can be key in delivering these capacity-building initiatives.

Infrastructure Development

Expanding digital infrastructure, including internet connectivity, mobile networks, and digital payment systems, is essential for scaling FinTech solutions in rural areas. Policymakers must prioritize investments in rural infrastructure development to ensure that underserved communities can access digital financial assistance. Innovative approaches such as solar-powered mobile networks and satellite-based internet services can address infrastructure challenges in remote areas (Bhat et al., 2021). FinTech solutions can potentially revolutionize agribusiness by enhancing financial inclusion, promoting sustainable practices, and improving market efficiency. However, the successful integration of FinTech in agribusiness requires coordinated efforts from policymakers, regulators, and stakeholders. By leveraging strategies such as public-private partnerships, capacity building, and infrastructure development, Bangladesh can scale up FinTech solutions to drive sustainable growth in its agribusiness sector and contribute to a broader evolution to a sustainable economy.

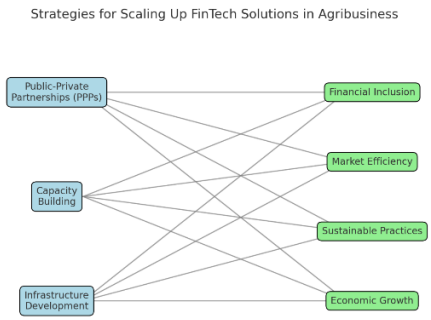

Figure 3: Strategies for scaling up fintech solutions in agribusiness

Conclusion

The agribusiness sector is vital to Bangladesh's economy, contributing notably to employment, food security, and poverty alleviation. Despite its significance, the sector faces challenges such as limited access to credit, financial inclusion, supply chain inefficiencies, and significant post-harvest losses. Only 30% of smallholder farmers have access to formal financial services, often relying on informal lenders with high interest rates. FinTech solutions can address these challenges by enhancing financial inclusion, reducing transaction costs, and improving supply chain transparency.

Digital financial services, such as mobile money platforms and digital lending, provide smallholder farmers access to credit, savings, and insurance products through mobile platforms. Blockchain technology and smart contracts can streamline transactions, increase transparency, and reduce costs. For instance, platforms like bKash and Nagad enable millions to perform financial transactions, boosting investments in agricultural inputs, productivity, and incomes. A study found that farmers using digital financial services achieved 20% higher yields and 15% lower post-harvest losses. Supply chain inefficiencies, such as ineffective infrastructure and intermediary dominance, lead to high business costs and low returns for farmers. FinTech solutions, like blockchain-based supply chain management, can enhance transparency, traceability, and efficacy, ensuring fair pricing and informed decisions. These innovations foster agro-processing industries, agritech startups, and rural entrepreneurship, boosting GDP, creating jobs, and reducing poverty. Integrating Weather-indexed crop insurance mitigates financial risks from extreme weather events, benefiting farmers and strengthening agricultural resilience.

However, barriers like limited digital literacy, inadequate infrastructure, and regulatory challenges hinder FinTech adoption. Addressing these requires investments in digital infrastructure, capacity building, and supportive policies through collaboration among policymakers, private stakeholders, and development organizations. FinTech's integration in agribusiness has transformative potential, enhancing financial inclusion, reducing inefficiencies, and promoting sustainability.

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