The Impact of Fintech on The Agricultural Value Chain in Developing Countries

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Abstract. Agriculture plays a paramount role in the development of developing countries. However, the agricultural value chains in these countries still face challenges such as lack of funding, restricted access to financial institutions, and limited market entry opportunities. Nevertheless, the rise of financial technology has provided technological support for the development of agricultural value chains in developing countries to some extent. Currently, there is a lack of relevant literature on the impact of fintech on the agricultural value chains in developing countries. Therefore, this paper adopts a literature review approach to summarize the main impacts of fintech on the agricultural value chains in developing countries in three aspects. Additionally, it identifies a challenge called the digital divide in current applications. This paper specifically outlines the impact of fintech on the agricultural value chains in developing countries in terms of mobile money, digital markets, and blockchain, aiming to provide clear direction for the future development of agricultural value chains in developing countries.

Keywords: Financial technology; Developing countries; Mobile money; Digital markets; Blockchain.

1. Introduction

The agricultural sector plays a crucial role in ensuring food security and sustainable development for any country, especially for developing countries. However, in conventional business processes, farmers in developing countries often face challenges such as funding shortages, capital constraints, restricted financial institution access, and limited market entry opportunities [1].

Recently, financial technology has emerged and gained the attention of the public, including the agricultural industry. Therefore, according to the related essays, the rise of financial technology provides a new perspective for the development of agricultural value chains in developing countries. Financial technology and services can help the agricultural department of developing countries improve its competitiveness in the global economy through three ways: mobile money, digital markets, and blockchain. Firstly, in developing countries, mobile money presents financial inclusion for smallholder farmers and some agribusiness companies. Consequently, mobile money can serve as a crucial conduit for financing smallholder farmers, and enhancing investment in agribusiness [2]. Secondly, the digital market has changed nearly any sector in business processes [3] cutting out the intermediaries from production to consumption and the cost of the agricultural industry chain. Thirdly, depending on the reliability, transparency, and tamper-resistance of information, especially the smart contract which can increase the cost of fraud in developing countries, blockchain wins more trust. Although fintech has many advantages, there are still some problems in applying it to marginalized rural areas in developing countries.

This article summarizes the primary impacts of financial technology on agricultural value chains in developing countries from three aspects, pointing out one challenge faced in its current application and the corresponding countermeasures. This paper aims to provide clear and specific directions for the future of agriculture value chains.

2. Relevant Applications of Financial Technology

Ensuring food security has become a crucial issue in developing countries, while the agricultural department makes a substantial contribution to the availability of food. However, agricultural financing information shortage and limited access to capital are the current challenges faced in the agricultural sector. In this situation, Fintech provides an insightful perspective for addressing those issues. Fintech refers to the inventive utilization of technology for providing financial services and products, offering consumers user-friendly and convenient ways to manage their finances in contrast to traditional approaches [1]. Additionally, financial technology applications can be mainly divided into three parts, which are mobile money, digital markets, and blockchain. Through the three approaches, the agricultural supply chain will have a positive change, taking less expenditure and more funds. Prior research has indicated that the adoption of fintech in various nations such as India, Ghana, China, and countries in Southeast Asia has demonstrated favorable outcomes [4, 5]. Therefore, Fintech has been an appealing as well as popular topic due to its benefits for the transformation of the agricultural supply chain.

2.1. Mobile Money

Many scholars have addressed the impact of mobile money on the agricultural industry chain in developing countries from various perspectives. Abdul-Rahaman and Abdulai analyze data from a cross-sectional survey of smallholder rice farmers in northern Ghana using a linear regression approach with endogenous treatment effects. Their findings highlight a significant and beneficial marginal effect of mobile money technology on input usage and farm output [6]. Kihoma sought to explore and confirm the impact of mobile money transfer services on promoting the marketing of agricultural products to women engaged in agribusiness. This was achieved through the analysis of qualitative and quantitative data obtained from primary and secondary sources [7]. Initially, business funds are inseparable from the agribusiness development [8]. Accordingly, how to gain capital reduce the cost of financing, and expand the financing channels has been the primary problem. Mobile money is a technological innovation that utilizes mobile phones to deliver financial services, enabling a diverse array of functions including government disbursements to individuals, peer-to-peer transactions, remittance reception, and electronic wallet payments for goods and services [9, 10]. This means that, as long as they have mobile phones and other electronic devices, more individuals and institutions can invest in the agricultural sector of developing countries through mobile money. Therefore, on the one hand, the application of mobile money technology provides a more convenient, efficient, and low-cost financing service for the agricultural sector of developing countries. Not only does mobile money save the cumbersome processes of traditional financial institutions, but it also improves funding efficiency and reduces financing costs. On the other hand, the increased participation of individuals and institutions further expands the financing scope of the agricultural sector in developing countries. Depending on enough capital, smallholders can establish additional supportive amenities and implement a wider marketing strategy, reducing the reliance on the middleman [11]. This is of great significance to the agricultural industry chain in developing countries.

2.2. Digital Marketplace

As global information and communication technology advances and free trade deepens worldwide, developing countries must adapt to the changing times. They need to promote the integration of information and communication technology with the agricultural sector. Customers need a platform to search and browse product information, enabling them to compare and ultimately create orders. The digital marketplace will spur innovation in agribusiness by establishing a platform as an intermediary service provider that links investors, landowners, farmers, and customers on a unified mobile market platform [1]. Anshari introduced a digital marketplace model integrated with FinTech within an agricultural context, demonstrating that a digital marketplace enables transparent and convenient business transactions while offering personalized services [1]. Hinson consolidates

current literature on the subject of FinTech within the context of agribusiness in developing nations, ultimately affirming the benefits of digital marketplaces for agribusiness [2]. The platform empowers users in developing countries with instant access to vast amounts of information, enabling them to find any information they need and conduct online transactions anytime and anywhere as long as using their smartphones. Hence, the digital marketplace makes convenience possible so that the layers involved in the agricultural supply chain of developing countries from farmers to customers will decrease. For example, The Digital Green Loop system facilitates the connection between Indian farmers, local entrepreneurs, and transporters, streamlining the process of selling produce to wholesalers. This helps eliminate expensive and time-consuming marketplace activities while reducing delays [12]. In conclusion, while digital market technologies are applied in the agricultural sector of developing countries, the intermediary links between producers and consumers will be reduced, leading to lower time and sales costs, thus benefiting the transformation and upgrading of the agricultural industry chain in developing countries.

2.3. Blockchain and a Relevant Application

2.3.1. Blockchain

Furthermore, another financial technology named blockchain is also crucial and imperative. A blockchain serves as a ledger of accounts and transactions, authored and stored by all involved participants. Roseiro reviews the solutions and projects of blockchain applications in Europe and summarizes the significant role of blockchain in the agricultural industry chain, drawing inspiration from developing countries [13]. Yu Cao develops stylized game models both with and without a blockchain-based platform. By comparing the equilibrium results with and without the blockchain-based platform, they point out that the integration of the blockchain-based platform can enhance production quantity and overall surplus within the supply chain [14]. Kamble demonstrates that blockchain technology can streamline transactions in an Agricultural Supply Chain (ASC) by decreasing the significant number of intermediaries, payment delays, and extended transaction lead times.

Additionally, they identify and establish the connections among the factors that enable the adoption of blockchain technology within an ASC [15]. Blockchain provides an unchangeable method for storing information that is universally accepted [16, 17]. Therefore, the information stored in the blockchain is public and immutable, leading to significantly enhanced reliability and transparency of information. This implies that if blockchain technology is integrated with the agricultural sector in developing countries, relevant information about agricultural products will be recorded as traceable evidence.

Blockchain technology can be a tool that has the potential to enhance visibility and traceability within the supply chain [14]. Consequently, this will help reduce consumer skepticism regarding the quality and safety claims made by sellers about their agricultural products, thus enhancing consumer trust.

Blockchain can comprehensively track the agricultural product supply chain in developing countries, a practice that has been previously established in European countries. Large retailers like Walmart and food producers such as Nestle, Dole, and Golden Food have been exploring the use of Blockchain technology, specifically IBM Hyperledger, since at least 2016 to enhance traceability along the Food Value Chain [18]. Hence, the significance of this for the agricultural industry chain in developing countries is profound. Firstly, the increased trust level among consumers makes it easier for them to choose to purchase agricultural products, thereby boosting sales. Secondly, due to the immutability of information, producers and suppliers will pay more attention to product quality and safety, thereby enhancing the quality and efficiency of the agricultural industry chain in developing countries.

2.3.2. Smart Contract

Especially, what deserves to be highlighted is the smart contract which is based on blockchain technology. De Giovanni explores the utilization of smart contracts to reduce business risks and transaction expenses in a conventional online platform through the application of a game-theoretical model [19]. Keskin measures the impact of smart contracts in a fresh produce supply chain by providing transparent information regarding the freshness of the produce [20]. Tapscott offers a definition centered on functionality: "Smart contracts are software programs that ensure, enforce, and facilitate the completion of agreements between individuals and entities." [21].

Smart contracts have the significant features of decentralization and automation, in addition to ensuring the security and transparency of information. Firstly, decentralization, arguably its most unique characteristic, differs from traditional transaction systems, allowing two peers to engage in transactions directly without the need for authentication or validation from a central authority [13]. Therefore, smart contracts operate on the blockchain, eliminating the need for centralized institutions and then enhancing transaction transparency and trust. This benefits consumers in developing countries by boosting their confidence in consumption, as well as facilitating transactions for both parties efficiently.

The second characteristic is automation, namely by ensuring compliance with agreements and automatically processing payments or compensations as prearranged between parties, without the need for human intervention [13]. This demonstrates that smart contracts can automatically execute contract terms without the need for third-party involvement. This not only saves time and costs but also reduces the risk of fraud and default, thereby enhancing the stability of the agricultural industry chain in developing countries.

In summary, on the one hand, the application of blockchain in the agricultural industry chain of developing countries can enhance the reliability and transparency of agricultural product information, enabling consumers to understand the origin and thereby increasing consumer trust. On the other hand, in developing countries, smart contracts based on blockchain technology are beneficial for increasing the cost of fraud and reducing transaction risks.

2.4. Limitation

However, due to the limited economic capacity and inadequate infrastructure in developing countries, coupled with the fact that agricultural production is typically carried out in rural areas, the digital divide will be a significant challenge for the application of financial technology in the agricultural industry chain of developing countries. In developing nations, farmers frequently represent newcomers to FinTech services and may possess limited overall as well as digital literacy levels, constraining their adoption and utilization of mobile financial services [22-25]. Therefore, the issue of wealth disparity in developing countries will lead to the emergence of the digital divide. This will be a pressing challenge that needs to be promptly addressed when advancing the plan to apply financial technology in the agricultural industry chain of developing nations. Additional efforts are urgently required to address these divides, through both local and foreign-assisted capacity-building initiatives [2]. Therefore, to address the digital divide, developing countries need help from developed countries to improve their level of informatization and solve issues such as information asymmetry.

3. Conclusion

Overall, agriculture is crucial for the development of developing countries, and the emergence of financial technology has provided a fresh perspective for the development of agricultural value chains in these nations. Through analyzing multiple pieces of literature, this paper concludes that financial technology has gradually been applied in the agricultural value chain of developing countries, primarily focusing on three aspects: mobile money, digital markets, and blockchain. Firstly, mobile money technology offers developing countries more convenient, efficient, and cost-effective financing services. Secondly, digital market technology provides a platform for agricultural

transactions in developing countries, facilitating the reduction of intermediaries between producers and consumers and offering more product information. Lastly, blockchain technology ensures transparency, reliability, and immutability of information, thereby enhancing consumer confidence. Smart contract technology based on blockchain is advantageous in increasing the cost of fraud and default, therefore reducing transaction risks. However, due to the relatively underdeveloped economies and inadequate infrastructure in developing countries, and the rural locations where agricultural production often takes place, the issue of the digital divide needs to be addressed. Nevertheless, this paper also has several limitations, such as the lack of in-depth and specific research on how to address the digital divide that affects the application of fintech in marginalized areas of developing countries. Therefore, based on this paper, future research can consider the digital divide and have a deeper exploration.

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