Adopting Blockchain Technology for Agricultural Financing: A Statistical Analysis of Adoption Barriers, Awareness Levels, and Benefits Among Agricultural Stakeholders

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Abstract

A statistical analysis of adoption barriers, awareness levels, and benefits among agricultural stakeholders on the use of blockchain technology for agricultural financing
Abstract
Blockchain technology is transforming agricultural finance by bringing efficiency, traceability, and transparency. The use of blockchain technology by agricultural stakeholders is examined in this study, which focusses on a sample of 100 respondents that includes technology providers, financial institutions, and farmers. The study examines perceived benefits, adoption hurdles, and awareness levels using statistical tools such regression models, chi-square tests, and descriptive analysis in SPSS. Although the results show a low level of awareness (40%) and notable obstacles including high costs and a lack of technical skills, early adopters claim better supply chain efficiency and credit availability. The study offers practical suggestions to improve blockchain adoption and makes recommendations for future lines of inquiry.
Keywords: Blockchain, agricultural financing, adoption barriers, financial inclusion

Introduction

Supporting smallholder farmers requires agricultural funding, yet issues including opaque supply networks, difficulty obtaining credit, and lack of transparency still exist. By enabling smart contracts, digitising and decentralising financial operations, and promoting stakeholder confidence, blockchain technology presents a viable remedy.
In many nations, particularly those with agrarian economies, agricultural finance is essential to economic expansion. It makes it possible for agribusinesses and smallholder farmers to obtain the funding required for technological development, market competitiveness, and operational efficiency. The lack of transparency, high transaction fees, payout delays, and restricted access for marginalised farmers are only a few of the problems with traditional agricultural financing systems. Food security, productivity, and rural poverty are all hampered by these problems.
A game-changing invention that promises to solve these enduring problems is blockchain technology. A decentralised, unchangeable digital ledger that safely logs transactions across several systems is called a blockchain. Beyond supply chain management, its uses in agriculture include digital identities for unbanked farmers, smart contracts for loan agreements, and transparent finance methods. Blockchain can expand financial inclusion, improve stakeholder confidence, and reduce transaction costs by lowering reliance on middlemen.

The integration of blockchain technology into agricultural finance is the main subject of this study; this field is yet relatively unexplored in comparison to its uses in trade and logistics. Blockchain has enormous promise, but adoption is hampered by a number of obstacles, including poor awareness, expensive implementation costs, and technological difficulties. Analysing the advantages enjoyed by early adopters, determining the main obstacles, and assessing stakeholder awareness are all necessary to comprehend the adoption dynamics of blockchain in agricultural funding.
With this research, we hope to clarify how blockchain might revolutionise agricultural finance by resolving bottlenecks and enhancing credit availability. The study offers practical insights into blockchain's potential as a remedy for issues facing the agriculture finance industry by employing statistical techniques and real-

world data. The results also add to the expanding corpus of research on blockchain's potential to promote sustainability and economic resilience in agriculture.

This study looks at how blockchain is being used in agricultural finance, emphasising three main areas:
1. Stakeholders' levels of blockchain awareness.
2. Obstacles to its implementation.
3. Advantages enjoyed by early adopters.

Literature Review

Blockchain in Agriculture

Blockchain has revolutionised a number of industries, most notably agriculture, where it improves traceability and transparency (Zhao et al., 2019). However, little is known about its function in funding, particularly in poor nations.

Obstacles to Adoption

Treiblmaier (2018) points out that two significant barriers to blockchain adoption are high implementation costs and a lack of technical know-how. Moreover, a major obstacle is still the lack of knowledge among rural residents.

Benefits of Blockchain in Financing

Blockchain's advantages in finance
Through transparent lending procedures, blockchain improves access to finance, streamlines transactions, and eliminates middlemen (World Bank, 2021). In the field of agricultural finance, blockchain technology has become a revolutionary force, tackling problems like inefficiency, opaqueness, and restricted credit availability. Although its incorporation into financial institutions is still unexplored, Zhao et al. (2019) emphasised blockchain's potential to improve traceability and trust in agri-food value chains. In a similar vein, Treiblmaier (2018) highlighted that blockchain might help supply chains become more efficient, but cited high costs and scalability problems as the main obstacles. Blockchain-based smart contracts make financing easier for smallholder farmers by automating loan approvals, but adoption is hampered by rural stakeholders' low level of digital literacy, according to Kamilaris et al. (2019). Blockchain's potential to lower transaction costs and do away with middlemen in agricultural trade, hence increasing farmer profitability, was covered by Pandey and Jain (2020).

Additionally, Chang et al. (2021) investigated how blockchain might enhance financial inclusion, especially for rural communities that lack access to banking, and found that pilot programs in developing nations have shown encouraging outcomes. According to Lyu et al. (2020), who looked at stakeholder viewpoints, financial institutions are reluctant to embrace blockchain because of worries about data security and integration with current systems, even if they acknowledge the technology's promise. In their analysis of blockchain's potential to improve supply chain efficiency, Goel et al. (2022) discovered that early adopters reported notable decreases in delays and fraud. In their study of the socioeconomic effects of blockchain-based credit systems, Tiwari and Sharma (2021) showed how these platforms give smallholder farmers access to more equitable interest rates. Likewise, Singh et al. (2022) contended that the openness of blockchain promotes confidence between farmers and and financial organisations, speeding up loan payments. Finally, in order to overcome the technical and infrastructure obstacles to blockchain adoption in agricultural financing, Sinha and Roy (2023) underlined the necessity of public-private collaborations.

Research Objectives

1. To gauge financial institutions' and farmers' awareness of blockchain.
2. To determine the main obstacles to adoption.

3. To assess the advantages early adopters believe they will receive.
4. To offer doable tactics to encourage the adoption of blockchain.

Techniques

Design of Research
Using survey data gathered from 100 respondents, this study takes a quantitative approach and includes the following:
60% are farmers.
20% are financial institutions.
20% are technology providers.

Method of Sampling
Participants were chosen from financial institutions and agricultural cooperatives using convenience sampling.

Data Collection

Utilising a standardised questionnaire, the study focused on perceived benefits, adoption hurdles, awareness levels, and demographic information.

Statistical Tools

SPSS was utilized for the following analyses:

1. **Descriptive Statistics**: Summarize respondent demographics and survey responses.
2. **Chi-Square Test**: Examine relationships between awareness levels and demographic variables.
3. **Regression Analysis**: Identify factors influencing blockchain adoption.

Results and Analysis

1. Descriptive Statistics

Table 1: Respondent Demographics

Variable	Category	Frequency	Percentage (%)
Gender	Male	70	70
	Female	30	30
Educational Level	Primary	25	25
	Secondary	50	50
	Tertiary	25	25

Interpretation: A majority of respondents (70%) were male, and 50% had secondary education, highlighting moderate literacy levels in the sample.

2. Awareness Levels

Table 2: Awareness Levels of Blockchain Technology

Awareness Level	Frequency	Percentage (%)
Not Aware	60	60
Somewhat Aware	30	30
Fully Aware	10	10

Interpretation: 60% of respondents had no awareness of blockchain, indicating the need for education and outreach programs.

3. Barriers to Blockchain Adoption

Table 3: Barriers to Adoption (Likert Scale Analysis)

Barrier	Mean Score	Standard Deviation
High cost of adoption	4.6	0.7
Lack of technical skills	4.4	0.9
Limited infrastructure	4.2	1.0

Interpretation: High costs and lack of technical skills were rated as the most significant barriers, with mean scores above 4.4.

4. Perceived Benefits

Table 4: Benefits of Blockchain Adoption (Early Adopters)

Benefit	Frequency	Percentage (%)
Improved access to credit	15	75
Enhanced supply chain efficiency	12	60
Reduced transaction costs	10	50

Interpretation: Among the 20 early adopters, 75% reported improved credit access, showcasing blockchain's potential to address financing gaps.

5. Inferential Statistics

Chi-Square Test

- **Null Hypothesis**: Awareness levels are independent of educational levels.
- **Result**: $\chi^2(2, N=100) = 12.36, p < 0.05$

Interpretation: Awareness levels significantly depend on educational attainment, with tertiary-educated respondents more likely to be aware of blockchain.

Regression Analysis
Regression Model: Adoption Likelihood (Dependent Variable) vs. Awareness, Cost, and Skills (Independent Variables)

Predictor	Coefficient (β)	p-value
Awareness	0.35	<0.01
Cost	-0.50	<0.01
Technical Skills	0.40	<0.01

Interpretation: Awareness and technical skills positively influence adoption likelihood, while high costs have a significant negative impact.

Discussion

Key Findings for Discussion
1.There is little awareness about blockchain, with notable differences according to educational attainment.
2. The main obstacles are high expenses and a lack of technical expertise.
3. Significant advantages are reported by early adopters, especially in supply chain transparency and financing availability.

Literature Comparison
• Consistent with Treiblmaier's (2018) research on skills and cost obstacles. The study by Zhao et al. (2019) is expanded by concentrating on the function of blockchain technology in funding agriculture.

Implications
To make blockchain solutions simpler, financial institutions and technology providers must work together; policymakers should give priority to blockchain education and smallholder farmers' subsidised adoption.

Suggestions
1. Educational Campaigns: Raise awareness by holding seminars for farmers in rural areas.
2. Subsidised Adoption: Provide funding to support the application of blockchain technology in agriculture.
3. Public-Private Partnerships: Work together to create user-friendly platforms and infrastructure.

In conclusion
The inefficiencies in agricultural funding could be greatly addressed by blockchain technology, but adoption is hampered by poor awareness, high costs, and technical obstacles. In order to increase acceptance and optimise benefits for agricultural stakeholders, this study emphasises the significance of focused interventions. Future studies should examine how blockchain affects agricultural value chains over the long run.

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