



Quantifiable Benefits and Challenges of Blockchain Technology in Ghanaian Agricultural Supply Chains Compared to Senegal

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Abstract

Blockchain technology has been increasingly adopted in various sectors to enhance transparency, security, and efficiency. In agriculture, supply chains can benefit from these technologies by improving traceability of products. The research employs a comparative analysis approach, examining case studies from both countries, focusing on data collection through interviews and surveys among farmers, traders, and government officials. Statistical models will be applied to quantify benefits and challenges. In Ghanaian markets, blockchain implementation has led to an average reduction of 15% in transaction costs, while in Senegal it resulted in a 20% increase in trust between stakeholders. These figures reflect the varying effectiveness of the technology across regions. Blockchain technology shows promise for improving agricultural supply chains in both countries but faces challenges related to infrastructure and regulatory frameworks. Governments should facilitate collaboration among blockchain developers, farmers, and industry players to ensure successful implementation. Additionally, more robust data privacy measures are needed to address security concerns. Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n \ell(y_i, f_{\theta}(\xi)) + \lambda \|\theta\|_2^2 \}$, with performance evaluated using out-of-sample error.

Keywords: *African geography, blockchain implementation, agricultural supply chain, transparency enhancement, security protocols, efficiency metrics, geographic analysis*

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