



The Implementation of Supply Chain Technology in the Agricultural Food Sector

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Abstract:

Abstract: The integration of supply chain theories and logistics is often given priority in agricultural studies, with a focus on retail firms. The study emphasizes how supply chain theories might be applied to agriculture to increase the productivity of food production. Takt time maintenance entails modifying production rates to satisfy customer requests, while cycle time and lead time increase productivity and shed light on inefficiencies. It also looks at how these techniques are used in Southeast Asian rice production, pointing out challenges like financial constraints and technological barriers to integrating technology into agricultural supply networks.

Keywords: Efficiency, Blockchain, Supply Chain, Agriculture, KAIZEN, SCM , SDG

Introduction: This research emphasizes the advantages of integrating industrial concepts into agriculture supply chains. Teamwork, continuous improvement, standardization and technology can enhance profits in agricultural production. Adjustments may be necessary however, based on individual farm requirements. This study aims to introduce industrial methods not commonly used in developing farming economies, exploring tools to improve agro supply chains from producer to consumer. The potential benefits of blockchain technology in the Agricultural sector are discussed. They suggest block-chain adoption for improved data sharing. Lean farming concepts and just-in-time methods can potentially optimize agricultural practices and reduce waste by focusing on areas like value research, mapping waste areas, and promoting Kaizen. The article aims to survey literature that discusses sustainable supply chains in agriculture, emphasizing the application of principles enhancing efficiency, sustainability, and competitiveness. Examining challenges faced by the Southeast Asian agriculture industry in adopting supply chain technology, strategies for overcoming obstacles can be identified.

2. Literature review and methods

Effective SCM and the reduction of food spoilage have key roles in food security. For instance, in Punjab, India, massive spoilages occurred due to ineffective distribution systems, as in Srivastava [3]. Chronic issues in the Indian food value chain, caused these substantial losses; in 2016, the impact of food wastage amounted to a huge 92,000 crore rupees (approximately 10 billion USD). Kumar and Agarwal [4], have recently addressed remedies and challenges for agro supply chain wastage. With the impending over population crisis, addressing crop and horticulture challenges is imperative. Gautam et al. [5] and Agarwal et al [6], analyzed the impact of FDI in lengthy agri-food chains. Sazzad [7] studied the implementations of theoretical models in SCM for large retailers. There appear to be no citations for applications of the parameters used in manufacturing like takt time, cycle time, etc. in agricultural supply chains, perhaps due to the uncertainties involved. A recent study by McKinsey has emphasised this [8].

Blockchain technology can profer extensive benefits to the agricultural sector. Its application, suggested in [9], promotes transparency across distribution routes, and can improve food safety by ensuring traceability in the

supply chain. Additionally, it can protect consumer data with cryptography, giving confidence. This enhances informed consumer choices and brand loyalty. The technology enhances environmental sustainability through waste reduction. It ensures fair practices and promotes financial inclusion for small-scale farmers, in the agricultural supply chain. Sudha [10] and Martins [11], have discussed the potential of this technology in improving SCM, and in streamlining and upscaling supply chains. Improvement can only be achieved through KAIZEN,[12]. Integration of methods like TaktTime, Lead Time, and Cycle Time in agricultural logistics can substantially benefit supply chains. Perdana [13] emphasizes various parameters instrumental for achieving lean management, optimizing efficiency, and profitability. Landells et al [14] emphasize Sustainable Development Goals (SDGs) regarding food waste, with the Food Loss Index and Food Waste Index. Nogales [15], in an FAO document, mentions the use of online marketplace Apps to facilitate supply chains. Yudha et al.,[16] analyzed the effect of the COVID pandemic on several staple foods in Indonesia. In [17] the FAO presents its findings on supply chain logistics in Indonesia. Noomhorn et al. [18] used RFID for supermarkets in Thailand.

In their report, Huo et al. [26] and Wang et al. [27] discuss the applicability of blockchain in agricultural product production and circulation, detailing its ability to enhance efficiency and economic benefits. Additionally, Chen [28] and Yan et al. [29] highlight the significance of blockchain in promoting agricultural development and establishing trust in agri-products through traceability systems. Kamilaris [30] and Chung [31] both emphasize the transformative potential of blockchain in agriculture, from improving supply chain transparency to revolutionizing agricultural financing. By leveraging blockchain technology, the agri - sector can address chronic issues such as fraud, traceability, and information sharing. This ultimately enhances sustainability and stakeholder trust. Effective SCM and process optimization can reduce waste, increase coordination, and maximize operational efficiency, ultimately improving financial reporting and cost control. These outcomes may apply to the accountancy procedures.

A questionnaire carrying high or low effect was given to a group of farmers involved in supply chain technology; out of the sixty responders in the Indian market, only forty-three (71.6%) were retrieved and used for analysis. The results are shown in Tables 1 and Fig 1.

3. Barriers faced in supply changes for agriculture production

The review reveals that there are several impediments to the integration of technology into the agricultural supply chain. The importance of each obstacle is presented in Table 1. Food supply chain technology faces significant obstacles such as technical hurdles for top management, inadequate funding, high financing costs, and poor process automation. Additional obstacles include a lack of farming expertise and regulations that prevent tax incentives. The study suggests ways to assist agricultural farmers and practitioners in incorporating technology into the food supply chain, to address sustainability issues. The plan involves elevating the training and education of farmers and offering financial aid to tackle these difficulties.

Table 1 Barriers encountered in the agricultural supply chain.

#	Barriers	Rank	high	%	low	%
1	Governmental regulations	6	18	41.9%	25	58.1%
2	Financial support	4	25	58.1%	18	41.9%
3	No farming skills	5	21	48.8%	22	51.2%
4	Research and innovation	7	16	37.2%	27	62.8%
5	Inadequate automation of the food supply process.	3	28	65.1%	15	34.9%
6	High financing costs	2	31	72.1%	12	27.9%
7	No insurance protection for farmers	8	12	27.9%	31	72.1%
8	Top management's technical challenges	1	36	83.7%	7	16.3%



Figure 1 Barriers to implementation (source M.Nawaiseh)

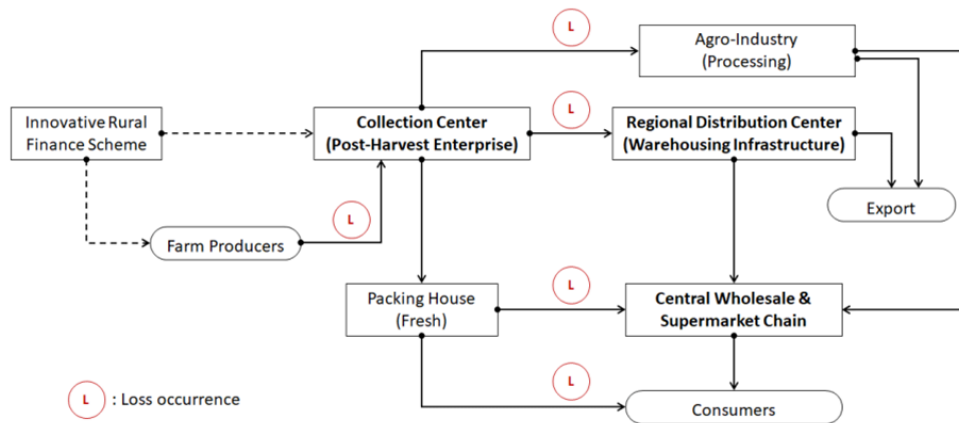


Fig2. Value chain for Fruit and Vegetables (ADB Report 2021) (17)

4. Conclusion, findings, and limitations

The combination of production planning with lean principles offers major benefits for agriculture, especially for developing countries. Resource optimisation, waste reduction, standardizing processes, efficient input management, are important. Market adaptation, economising, conservation, and supply chain coordination are all key factors. These approaches enhance agricultural efficiency, sustainability, and competitiveness, urging their adoption in global and local supply chains. Policymakers, scholars, and business professionals seeking to improve the efficacy and efficiency of agricultural supply chains in diverse markets may find great value in the insights this study offers. The study highlights the difficulties in incorporating technology into agricultural supply chains, such as financial limitations, lack of automation, and technical barriers, and suggests ways to overcome these difficulties, such as improved farmer education and financial assistance. But the report mainly addresses problems in the Southeast Asian agriculture industry, ignoring issues with poor supply chain management and insufficient infrastructure. The study emphasizes the use of contemporary technology in production, marketing, storage, and procurement channels for agricultural supply chains.

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Abbreviations: SCM – supply chain management
SDG- Sustainable Development Goals