

AI-Enabled Strategic Risk Management for Sustainable Inventory and Storage in Rice Supply Chains: A Systematic Review

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ABSTRACT

India's food security is largely dependent upon the supply chain for rice and is therefore subject to numerous risk factors, including climate variability, uncertainty of demand for rice, volatility in price, and loss experience after the harvest. Not only do these types of risks undermine operational effectiveness and the delivery of sustainable results, but they also call for the strategic management of risk. In this regard, the goals of this research project are to provide an examination of the roles played by digital technologies and artificial intelligence (AI) in improving resilience through sustainability-oriented risk management in Indian rice supply chains. Based on frameworks for sustainability and supply chain risk management, the study identifies significant risk factors at the distribution, transportation, storage, and procurement stages. Primary data is collected from stakeholders in India's major rice-producing regions using a standardised questionnaire. These stakeholders include supply chain specialists, millers, warehouse managers, and logistics firms. Quantitative techniques like exploratory factor analysis, structural equation modelling, and regression analysis are used to examine the relationships between AI adoption, risk mitigation capability, sustainability performance, and supply chain resilience. The results demonstrate how AI-enabled technologies like inventory optimisation, quality monitoring, predictive forecasting, and traceability greatly reduce operational and sustainability risks. Coordination and overall performance are improved by strategically integrating AI. The study provides managers and policymakers with practical insights to enhance resilience, reduce post-harvest losses, and promote responsible consumption outcomes. It also adds quantitative evidence on AI-driven sustainable risk management.

Keywords: Artificial Intelligence, Rice Supply Chain, Supply Chain Risk Management, Sustainability, Supply Chain Resilience

