

Logistics Optimization of Perishable Products Using Artificial Intelligence: Implications for Efficiency in the Colombian Agroindustry

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Abstract

This study explores the problem of food waste across the supply chain, emphasizing its economic, environmental, and social consequences, particularly in a context where nearly 30% of global food production is lost. In response, the circular economy is presented as a framework that promotes more efficient use of resources and waste reduction. Within this perspective, Artificial Intelligence (AI) emerges as a valuable tool for improving the performance of logistics systems. Specifically, in the management of perishable products, AI supports more accurate demand forecasting, better inventory control, and more efficient route planning, helping to reduce losses and strengthen the sustainability of supply chains.

The findings show that using multiple linear regression models improves demand planning accuracy, which in turn reduces waste and optimizes inventory levels. Similarly, applying Dijkstra's algorithm for route optimization leads to shorter delivery times and lower transportation costs. Together, these approaches contribute to improved operational efficiency and greater business profitability. However, the study also highlights important challenges, particularly for small and medium-sized enterprises, such as limited access to data, technological infrastructure, and specialized skills. In this regard, the development of hybrid approaches that combine traditional methods with advanced AI techniques, such as deep learning and reinforcement learning, appears as a promising path forward. Overall, the study underscores the potential of AI to enhance the sustainability and resilience of supply chains, while opening new directions for the development of more adaptive and intelligent logistics systems.