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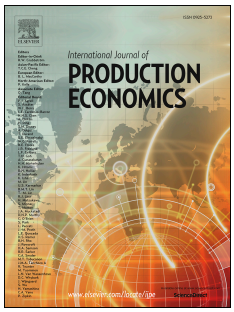

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Robust and Resilient Strategies for Managing Supply Disruptions in an Agribusiness Supply Chain

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Abstract

Agribusiness supply chains involve more sources of uncertainty than typical manufacturing supply chains due to attributes such as long supply lead-times, seasonality, and perishability. Therefore, it is critical but challenging to mitigate risks in agribusiness supply chains. However, the extant literature includes limited quantitative research on robust and resilient strategies for agribusiness supply chain risk management, particularly when perishability is explicitly modeled. In this paper, we investigate the effectiveness of a mixed set of robust and resilient strategies for managing rare high-impact harvest time and yield disruptions. We develop a two-stage stochastic programming model, which integrates an exponential perishability function, to conduct our analysis. The model maximizes the expected profit by selecting optimal risk management strategies and making tactical supply chain planing decisions. The model is applied to a numerical case study of a real-world kiwifruit supply chain. The results suggest that a mixed combination of robust and resilient strategies are most effective for mitigating supply-side disruption risks. Furthermore, as perishability increases, risk management strategies provide a greater relative improvement in the expected profit.

Keywords:
Agribusiness supply chain, Risk management, Robust, Resilient

1. Introduction

During the past two decades, supply chain risk management has attracted considerable attention for several reasons [13]. First, globalization has increased the length and complexity of supply chains, and consequently their exposure and vulnerability to risks. Second, the lean management philosophy has been widely adopted in supply chains. It has made supply chains more vulnerable under adverse events due to the removal/reduction of redundancies. Finally, many supply chains have been severely disrupted by catastrophic events including the September 11 terrorist attacks in 2001 and the Fukushima nuclear disaster in Japan in 2011. As a result, more and more businesses have recognized the importance of supply chain risk management [41, 43, 13].