# Monitoring and Ensuring the Availability of Fresh Produce

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## Abstract

Climate change poses an increasing threat to the stability of grocery supply chains, particularly in ensuring the consistent availability of fresh produce. As global food security depends heavily on reliable access to fruits and vegetables, this research develops a predictive model and alerting system to anticipate supply disruptions. Using a design science approach, the proposed artifact is prototypically applied to real-world data from the European tomato supply chain.

Employing a mixed-methods methodology—combining literature review, expert validation, and advanced statistical modeling—the study identifies key influencing factors such as temperature, solar radiation, precipitation, energy prices, and soil moisture. These, along with over 80 additional input parameters, inform the development of the GROW model. The machine learning-based prediction model (XGBoost) achieves over 90% accuracy in forecasting export volumes. An integrated alerting system highlights potential bottlenecks through deviation analysis and severity classification.

The system is operationalized via a Tableau dashboard that visualizes historical trade trends, future projections, and real-time alerts. Designed for scalability, the methodology supports broader commodity applications and enhances strategic sourcing decisions, particularly within open-book procurement frameworks.

## Keywords

Supply Chain Intelligence, Climate Risk, Fresh Produce, Machine Learning, Forecasting, Alerting System.