


# Chapter 8

## Data–Driven Strategies for Reducing Food Waste and Advancing Sustainable Food Systems

**Kukatlapalli Pradeep Kumar**

 <https://orcid.org/0000-0002-8893-4312>

*Christ University, Bangalore, India*

**A. Nesan Daniel**

*Christ University, Bangalore, India*

**K. Sarath Chandra**

*Christ University, Bangalore, India*

**Tharun Jeevakanth**

*Christ University, Bangalore, India*

**Parthiv Saha**

*Christ University, Bangalore, India*

### **ABSTRACT**

*Food waste is a major global issue that affects the environment, economy, and society. About 1.3 billion tons of food, or one-third of what is produced worldwide, is wasted each year. This worsens food insecurity, increases greenhouse gas emissions, and depletes resources. As the population grows, the pressure on food systems increases. We need new strategies to reduce waste across supply chains. Using historical and real-time data, like sales trends, seasonal demand changes, consumer habits and*

DOI: 10.4018/979-8-3373-3957-3.ch008

Copyright © 2026, IGI Global Scientific Publishing. Copying or distributing in print or electronic forms without written permission of IGI Global Scientific Publishing is prohibited. Use of this chapter to train generative artificial intelligence (AI) technologies is expressly prohibited. The publisher reserves all rights to license its use for generative AI training and machine learning model development.

*outside factors like weather, the study suggests a data-focused approach to improve decision-making for everyone involved, including producers, retailers, and food services. The results show that predictive analytics helps to make proactive changes to orders, stock distribution, and promotion plans, which reduces overproduction and spoilage. Data-driven solutions can be scaled up and highlight their potential to connect economic goals with sustainability efforts. It provides useful insights for policymakers, businesses, and community groups to support circular food systems.*

## **INTRODUCTION**

Food waste is one of the biggest sustainability challenges today. In 2022, 1.05 billion tonnes of food were wasted worldwide, which is 19% of all food available to consumers. This shocking amount occurs alongside severe food insecurity, as 783 million people go hungry, and a third of the global population faces food insecurity. The environmental effects are also concerning, with food loss and waste causing 8-10% of global greenhouse gas emissions, nearly five times the total emissions from the aviation industry.

The traditional way of dealing with food waste has not been enough to tackle this global issue. As supply chains grow more complex and consumer demands change rapidly, the need for proactive, data-driven solutions is crucial. Predictive analytics has become a key tool that helps organizations move from measuring waste in the past to preventing it across the entire food supply chain. By using both historical and real-time data—like sales trends, seasonal patterns, consumer behavior, and factors such as weather—predictive analytics provides new chances to improve decision-making for producers, retailers, and food service providers.

Combining machine learning algorithms with methods like time series forecasting allows organizations to simulate demand scenarios and see how they affect inventory efficiency. This data-focused approach marks a major shift toward proactive supply chain management, where decisions rely on predictive insights rather than reactive measures. As the global population keeps growing and pressure on food systems increases, innovative uses of predictive analytics are essential for merging economic goals with sustainability efforts while moving towards circular food systems.

26 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/data-driven-strategies-for-reducing-food-waste-and-advancing-sustainable-food-systems/394455](http://www.igi-global.com/chapter/data-driven-strategies-for-reducing-food-waste-and-advancing-sustainable-food-systems/394455)

## Related Content

---

### Exploring the Potential of Quantum Computing in AI, Medical Advancements, and Cyber Security

Srinivas Kumar Palvadi (2024). *Quantum Innovations at the Nexus of Biomedical Intelligence* (pp. 58-77).

[www.irma-international.org/chapter/exploring-the-potential-of-quantum-computing-in-ai-medical-advancements-and-cyber-security/336145](http://www.irma-international.org/chapter/exploring-the-potential-of-quantum-computing-in-ai-medical-advancements-and-cyber-security/336145)

### Enabling Smart Power Grids Through Quantum Computing and Artificial Intelligence

M. Sunil Kumar, R. V. V. Krishna, V. Satyanarayana and A. Purna Chandra Rao (2024). *Real-World Challenges in Quantum Electronics and Machine Computing* (pp. 58-78).

[www.irma-international.org/chapter/enabling-smart-power-grids-through-quantum-computing-and-artificial-intelligence/353098](http://www.irma-international.org/chapter/enabling-smart-power-grids-through-quantum-computing-and-artificial-intelligence/353098)

### Quantum Computing in the Era of Intelligent Battery Design

J. Suresh, R. V. V. Krishna, V. Satyanarayana and R. Sumathy (2024). *Real-World Challenges in Quantum Electronics and Machine Computing* (pp. 246-262).

[www.irma-international.org/chapter/quantum-computing-in-the-era-of-intelligent-battery-design/353110](http://www.irma-international.org/chapter/quantum-computing-in-the-era-of-intelligent-battery-design/353110)

### Hidden Treasures of Semiconducting Materials for Quantum Computing: An Upcoming Fortune for Supercomputing

Dillip Kumar Pattanayak, Arun Kumar Padhy, Lokesh Kumar Prusty, Ranjan Kumar Bhuyna and Samita Pattanayak (2022). *Technology Road Mapping for Quantum Computing and Engineering* (pp. 132-153).

[www.irma-international.org/chapter/hidden-treasures-of-semiconducting-materials-for-quantum-computing/300521](http://www.irma-international.org/chapter/hidden-treasures-of-semiconducting-materials-for-quantum-computing/300521)

## Thyroid Gland Classification With Diagnosis System Using TL Algorithms and Quantum Computing

B. Lakshmi prabhaaaand A. Murugan (2025). *Real-World Applications of Quantum Computers and Machine Intelligence* (pp. 371-384).

[www.irma-international.org/chapter/thyroid-gland-classification-with-diagnosis-system-using-tl-algorithms-and-quantum-computing/367066](http://www.irma-international.org/chapter/thyroid-gland-classification-with-diagnosis-system-using-tl-algorithms-and-quantum-computing/367066)