Food Waste Optimization in Supermarkets

Introduction

Food waste is a global issue impacting sustainability, food security, and business efficiency. This project focuses on understanding and optimizing food waste at the **retail level**, using global data on food waste by country and region. We analyze household, retail, and food service waste to identify patterns, outliers, and actionable strategies for reduction.

Problem Framing & Hypothesis

- **Objective**: Identify regions and countries with high retail food waste and understand the factors behind it.

- **KPI**: Retail food waste per capita (kg/year).

- **Hypotheses**:

  1. Retail food waste is higher in regions with weak supply chains and poor infrastructure.

  2. Retail food waste does not strongly correlate with household or food service waste.

  3. Confidence in food waste estimates is lower in regions with underdeveloped reporting systems.

Descriptive Analysis

- Calculated the **average food waste per capita** across all countries.

- On average, **household food waste** is the largest contributor, followed by **food service** and **retail**.

- Used cross-tabulations and summary statistics to explore patterns by region.

Diagnostic Analysis

- Countries were segmented into high vs low retail waste groups using the global average as a threshold.

- A cross-tab showed:

    - Sub-Saharan Africa, Central Asia, and Southern Asia had the most countries with above-average retail waste.

    - Western and Northern Europe had mostly below-average retail waste.

- Regions with many high-waste countries also had lower confidence levels in their waste estimates — pointing to both real issues and data gaps.

Inferential & Predictive Analysis

- **Correlation analysis**:

    - Household vs Retail: **0.15** → weak positive.

    - Household vs Food Service: **0.02** → almost no correlation.

- Built a **regression model** to predict **total food waste**:

    - R^2 score = **1.0**, confirming total is a sum of its parts: household + retail + food service.

Recommendations

- Improve **cold chain logistics**, especially in developing regions.

- Deploy **AI-based inventory & expiry tracking systems**.

- Use **smart promotions** and **dynamic pricing** for near-expiry products.

Conclusion

Retail food waste varies dramatically by region, driven by factors like infrastructure, logistics, and policy enforcement. While household waste is the largest contributor globally, **targeting retail waste in high-burden regions** can yield impactful results. **Data confidence** must also be improved to ensure accurate targeting and policy design. A mix of **technology, operations, and awareness** is key to optimizing food systems and reducing waste.

By Shibaa Naik