

Food Wastage Management App (Streamlit)

Live Dashboard Link : <https://food-wastage-manage.streamlit.app/>

Problem Statement

Food wastage is one of the most pressing issues globally, and its impact is deeply felt in local communities. On one hand, restaurants, grocery stores, and households often discard surplus food due to oversupply, nearing expiry dates, or lack of efficient distribution systems. On the other hand, millions of people face daily challenges of food insecurity, struggling to access even basic meals. This mismatch between food surplus and food scarcity highlights the urgent need for a structured mechanism that bridges the gap.

Another major challenge is tracking and analyzing trends in food donations and claims. Without data-driven insights, it is difficult to identify high-contributing providers, frequently claimed meal types, or areas where demand outstrips supply. As a result, the potential for optimizing food redistribution remains largely untapped.

Therefore, the problem lies in the absence of a digitally enabled, data-driven, and user-friendly platform that connects food providers with receivers, ensures efficient tracking of surplus food, and supports data analysis for improving operations. By leveraging technology, particularly SQL for data management and Streamlit for visualization, a local solution can be developed to minimize wastage, improve distribution, and address hunger more effectively.

Project Summary

The Local Food Wastage Management System is designed as a community-focused digital platform to connect surplus food providers with receivers in real-time. The project integrates Python, SQL, and Streamlit to create a seamless ecosystem where providers, such as restaurants, supermarkets, and households, can list surplus food while NGOs, community centers, and individuals in need can claim it.

A Streamlit-based dashboard acts as the user interface, providing an interactive, intuitive, and visually appealing experience. Users can filter data by city, provider type, meal type, or time range, and explore outputs from 15 analytical SQL queries. The dashboard features KPIs such as total providers, receivers, listings, and available food quantities, alongside detailed visualizations like bar charts, pie charts, and metrics.

Insights generated from the platform include trends in provider contributions, commonly donated food types, claim distributions, and high-demand meal categories. These insights not only support day-to-day operations but also inform long-term strategies for reducing wastage and strengthening food networks.

In essence, this project delivers a functional, scalable, and socially impactful solution that combines data analysis with real-world application. It empowers local communities to reduce food wastage, enhance efficiency in food redistribution, and ensure surplus food benefits those who need it most.

Business Objective

The primary business goal of the Food Wastage Management System is to establish a sustainable, efficient, and data-driven platform that reduces food wastage while addressing local food insecurity. By creating a structured channel between food donors and receivers, the system ensures that surplus food is redistributed effectively rather than discarded.

From an operational perspective, the platform improves transparency and coordination by providing real-time visibility into surplus food availability, categorized by city, food type, and meal type. This allows NGOs, shelters, and individuals to claim food faster, reducing spoilage and ensuring that donations reach those in need. For providers, the system builds trust by simplifying the donation process, offering direct communication with receivers, and recognizing high-contributing organizations through data insights.

Another business goal is to leverage analytics for strategic decision-making. Insights such as the most claimed meal types, cities with demand-supply gaps, or providers with consistent donations can guide policies, outreach campaigns, and logistical planning. These insights not only optimize redistribution but also support future partnerships with stakeholders such as municipal bodies, NGOs, and CSR initiatives from businesses.

The system also aims to scale beyond local implementation, serving as a replicable model for other regions. By integrating user-friendly features through Streamlit and ensuring database accuracy via SQL, the project demonstrates a low-cost, high-impact solution that can be expanded geographically.

Q1. How many food providers and receivers are there in each city?

```
SELECT city,
        COUNT(DISTINCT Provider_ID) AS total_providers,
        COUNT(DISTINCT Receiver_ID) AS total_receivers
FROM (
    SELECT City, Provider_ID, NULL AS Receiver_ID FROM providers
    UNION ALL
    SELECT City, NULL AS Provider_ID, Receiver_ID FROM receivers
) AS combined
GROUP BY city;
```

Insight:

This query highlights the distribution of food providers and receivers across different cities. A higher concentration of providers in a city indicates strong donation potential, while a higher number of receivers reflects higher demand. For example, if City A has many providers but fewer receivers, it shows surplus availability but limited distribution networks. Conversely, City B may have more receivers than providers, signaling unmet demand. Identifying these patterns helps NGOs and policymakers design targeted interventions. Cities with balanced ratios demonstrate effective redistribution ecosystems, ensuring that donations meet local needs. On the other hand, mismatches can highlight logistical gaps, such as the need for food transportation from surplus cities to deficit ones. Overall, this analysis provides a geographic lens into food redistribution efficiency and helps organizations align resources where they are needed most.

Q2. Which type of food provider (restaurant, grocery store, etc.) contributes the most food?

```
SELECT Provider_Type,
       SUM(Quantity) AS total_quantity
FROM food_listings
GROUP BY Provider_Type
ORDER BY total_quantity DESC;
```

Insight:

This query examines the role of different provider types in food donation. By analyzing the total quantity donated, it becomes clear which sector contributes the most surplus food—restaurants, supermarkets, grocery stores, or households. For example, restaurants may dominate due to leftover prepared meals, while supermarkets often contribute items nearing expiry. If households contribute significantly, it highlights strong community engagement. This information helps organizations prioritize collaborations; NGOs may focus efforts on restaurants if they are the largest contributors, or on grocery stores if packaged goods are more prevalent. Additionally, understanding donation patterns by provider type helps tailor outreach strategies—restaurants may need logistical support for timely pickup, while households may require user-friendly donation channels. Ultimately, this insight enables a more strategic approach to maximizing donations by recognizing and strengthening partnerships with high-contributing provider categories.

Q3. What is the contact information of food providers in a specific city?

```
SELECT Name, Contact
FROM providers
WHERE City = 'New David';
```

Insight:

This query retrieves provider contact details city-wise, serving as a practical tool for NGOs and food seekers. Having direct access to provider names and contacts ensures smooth communication for coordination, pickups, and verification. For example, NGOs operating in a city with multiple providers can quickly reach out to schedule food collection, reducing delays and minimizing wastage. Additionally, city-specific contact listings create an organized directory that fosters trust and collaboration. This information becomes critical in emergency scenarios, such as natural disasters, where rapid mobilization of surplus food is necessary. Moreover, it helps identify gaps—cities with fewer available contacts may indicate weak provider networks that need strengthening through outreach campaigns. Overall, the ability to filter and access provider contact details empowers receivers, NGOs, and logistics teams to enhance efficiency, ensuring that surplus food is redistributed effectively to those who need it most.

Q4. Which receivers have claimed the most food?

```
SELECT r.Name AS Receiver_Name,
       SUM(c.Claim_ID IS NOT NULL) AS total_claims,
       COUNT(*) AS claim_records
FROM claims_data c
JOIN receivers r ON c.Receiver_ID = r.Receiver_ID
GROUP BY r.Name
```

```
ORDER BY total_claims DESC;
```

Insight:

This query ranks receivers based on the number of food claims made. High-claim receivers are often organizations such as orphanages, shelters, or community kitchens that serve large groups of people daily. Identifying these receivers is important because it highlights where food demand is most concentrated. If a small number of receivers account for most claims, it may suggest over-dependence on surplus donations, which can help prioritize them during periods of limited supply. Conversely, receivers with very few claims may face barriers such as lack of transportation or awareness. Insights from this analysis can guide NGOs to balance distribution, ensuring equitable access across different organizations. Additionally, consistently high-claim receivers can be considered for long-term partnerships or support in logistics infrastructure. Ultimately, this helps improve fairness, avoid monopolization of resources, and ensure food is reaching diverse groups in need.

Q5. What is the total quantity of food available from all providers?

```
SELECT SUM(Quantity) AS total_available_food
FROM food_listings;
```

Insight:

This query calculates the overall availability of surplus food in the system. It provides a real-time snapshot of donation capacity across all providers. High total availability indicates strong engagement by providers and greater redistribution potential. However, excess availability may also pose challenges, such as the need for rapid transportation to prevent spoilage. On the other hand, low availability may signal fewer active providers, seasonal fluctuations, or reduced donations, which can lead to shortages for receivers. Monitoring this figure over time allows NGOs to plan logistics better—high supply periods require efficient distribution channels, while low supply requires prioritization of critical receivers. Additionally, total availability serves as a key performance indicator (KPI) for tracking the system's overall health and efficiency. By regularly analyzing this metric, organizations can make proactive decisions to balance food supply and demand while minimizing waste.

Q6. Which city has the highest number of food listings?

```
SELECT p.City,
       COUNT(f.Food_ID) AS total_listings
FROM food_listings f
JOIN providers p ON f.Provider_ID = p.Provider_ID
GROUP BY p.City
ORDER BY total_listings DESC
LIMIT 1;
```

Insight:

This query identifies cities with the most active food listings, offering insights into geographical distribution patterns. A high number of listings in a city indicates strong participation by providers, robust donation culture, or effective awareness campaigns.

Conversely, cities with fewer listings may highlight weak provider networks, logistical challenges, or lack of visibility for the donation system. Understanding city-wise differences enables NGOs and policymakers to allocate resources more effectively. For example, high-listing cities may need better storage and transport infrastructure, while low-listing cities may require targeted outreach campaigns to encourage donations. This analysis also uncovers potential demand-supply mismatches. If a city with high food insecurity shows few listings, intervention strategies must be designed to strengthen local provider engagement. Overall, the query provides valuable regional insights to guide decision-making in food redistribution networks.

Q7. What are the most commonly available food types?

```
SELECT Food_Type,  
       COUNT(*) AS total_items  
FROM food_listings  
GROUP BY Food_Type  
ORDER BY total_items DESC;
```

Insight:

This query analyzes which food categories—vegetarian, non-vegetarian, vegan, or others—are most frequently donated. Understanding the composition of donated food helps in managing storage, distribution, and nutritional balance. For example, if vegetarian meals dominate, NGOs may need to diversify sources to meet non-vegetarian or vegan demand. Similarly, a high proportion of perishable foods like cooked meals indicates the need for faster logistics, while durable items like rice or packaged goods require less urgency. Insights from this analysis also reveal donation trends by community type; households may contribute more cooked meals, while supermarkets may donate more packaged items. Additionally, recognizing underrepresented food categories ensures that nutritional diversity is maintained for receivers. By aligning distribution strategies with available food types, NGOs can maximize utility, reduce spoilage, and ensure beneficiaries receive balanced and culturally appropriate meals.

Q8. How many food claims have been made for each food item?

```
SELECT f.Food_Name,  
       COUNT(c.Claim_ID) AS total_claims  
FROM claims_data c  
JOIN food_listings f ON c.Food_ID = f.Food_ID  
GROUP BY f.Food_Name  
ORDER BY total_claims DESC;
```

Insight:

This query measures the popularity of specific food items by analyzing the number of claims each has received. High-claim items are usually staple foods like rice, bread, or prepared meals, reflecting essential demand. Conversely, items with fewer claims may be less culturally relevant, harder to store, or less preferred. Identifying frequently claimed items helps providers understand real demand patterns, ensuring that their donations align with what receivers need most. For example, if cooked meals are consistently claimed quickly,

logistics should be optimized to prioritize their redistribution before spoilage. Low-claim foods, on the other hand, may require awareness campaigns or rethinking donation strategies. Ultimately, this analysis enhances demand forecasting and ensures that food redistribution efforts are tailored to meet receiver needs, minimizing waste while maximizing consumption.

Q9. Which provider has had the highest number of successful food claims?

```
SELECT p.Name AS Provider_Name,  
       COUNT(c.Claim_ID) AS successful_claims  
FROM claims_data c  
JOIN food_listings f ON c.Food_ID = f.Food_ID  
JOIN providers p ON f.Provider_ID = p.Provider_ID  
WHERE c.Status = 'Completed'  
GROUP BY p.Name  
ORDER BY successful_claims DESC  
LIMIT 1;
```

Insight:

This query highlights the most reliable providers—those whose donations result in the highest number of completed claims. Such providers play a crucial role in sustaining the ecosystem, as their contributions are consistently useful, timely, and in demand. Successful claims usually reflect proximity to receivers, contribution of essential food types, or efficient donation practices. Recognizing these top providers encourages their continued participation, builds trust, and sets benchmarks for others. Conversely, providers with fewer successful claims may face challenges such as location constraints or less relevant donations. Insights from this analysis help NGOs design incentive programs to reward high-impact providers and support low-impact ones with training or logistical assistance. By focusing on successful claim patterns, this query ensures that the system remains efficient, rewarding reliability while improving weaker links.

Q10. What percentage of food claims are completed vs. pending vs. cancelled?

```
SELECT Status,  
       COUNT(*) * 100.0 / (SELECT COUNT(*) FROM claims_data) AS  
percentage  
FROM claims_data  
GROUP BY Status;
```

Insight:

This query examines the overall efficiency of the redistribution system by analyzing claim status distribution. A high percentage of completed claims indicates that food is reaching receivers successfully, reflecting a well-functioning network. On the other hand, a large share of pending or cancelled claims signals operational inefficiencies. Pending claims may result from delays in transportation or communication gaps, while cancellations often indicate food spoilage or mismatched demand. Understanding these percentages allows NGOs to address bottlenecks. For example, if cancellations are high for perishable items, faster logistics must be introduced. Similarly, reducing pending claims may require better coordination between

providers and receivers. Ultimately, this analysis helps improve system reliability, minimize wastage, and build confidence among both donors and receivers, making food redistribution more effective and sustainable.

Q11. What is the average quantity of food claimed per receiver?

```
SELECT r.Name AS Receiver_Name,  
       AVG(f.Quantity) AS avg_claimed  
FROM claims_data c  
JOIN receivers r ON c.Receiver_ID = r.Receiver_ID  
JOIN food_listings f ON c.Food_ID = f.Food_ID  
GROUP BY r.Name;
```

Insight:

This query measures the average volume of food each receiver typically claims. High average quantities often correspond to institutions like schools, shelters, or community kitchens that serve large populations. In contrast, smaller averages may represent households or individuals claiming food for personal use. This insight is critical for equitable distribution—larger receivers may require bulk deliveries, while smaller ones may benefit from more frequent, smaller allocations. If a few receivers consistently claim disproportionately high volumes, it may suggest over-reliance, raising fairness concerns. Analyzing these averages also helps forecast future demand and plan inventory accordingly. By understanding claim patterns, NGOs and providers can balance supply more effectively, ensuring that both large and small receivers are supported without creating inequalities.

Q12. Which meal type (breakfast, lunch, dinner, snacks) is claimed the most?

```
SELECT f.Meal_Type,  
       COUNT(c.Claim_ID) AS total_claims  
FROM claims_data c  
JOIN food_listings f ON c.Food_ID = f.Food_ID  
GROUP BY f.Meal_Type  
ORDER BY total_claims DESC;
```

Insight:

This query identifies meal preferences among receivers by tracking claim frequencies for breakfast, lunch, dinner, and snacks. The results provide cultural and operational insights. For example, if lunch and dinner are most claimed, it suggests that shelters and community kitchens rely heavily on donations during peak mealtimes. Breakfast claims may be more common in schools or day centers, while snacks may indicate flexible or supplementary needs. Understanding these preferences helps providers tailor donations to meet real demand, ensuring food is consumed rather than wasted. Additionally, knowing which meal types are most in demand helps optimize delivery schedules—breakfast donations require early morning logistics, while dinner may need late-day distribution. This insight ensures alignment between supply and demand, improving overall redistribution efficiency.

Q13. What is the total quantity of food donated by each provider?

```
SELECT p.Name AS Provider_Name,  
       SUM(f.Quantity) AS total_donated  
FROM food_listings f  
JOIN providers p ON f.Provider_ID = p.Provider_ID  
GROUP BY p.Name  
ORDER BY total_donated DESC;
```

Insight:

This query ranks providers by total donation volume, recognizing the most significant contributors in the network. High-volume providers are critical to sustaining redistribution efforts and should be acknowledged, encouraged, and supported to continue. Smaller contributors, while important, may benefit from awareness or logistical support to increase their impact. By identifying top donors, NGOs can prioritize partnerships and resource allocation, ensuring a steady supply of surplus food. This analysis also provides transparency, encouraging accountability and motivating providers through recognition. Additionally, understanding donation volumes helps design policies—for example, large providers may be offered tax incentives or logistical support, while smaller ones may require simplified donation processes. Ultimately, this query highlights the backbone of the food redistribution ecosystem and ensures efforts are concentrated where they yield the maximum benefit.