IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 3, March 2026

DOI: 10.17148/IARJSET.2026.13357

WASTE REDUCTION TRACKER

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Abstract: The increasing volume of waste generated in local markets has become a major environmental and management challenge. Improper waste monitoring leads to food spoilage, financial loss, and negative environmental impact. Manual record-keeping methods are inefficient and lack proper tracking and analysis capabilities. This project proposes a web-based Waste Reduction Tracker for Market that enables systematic recording, monitoring, and analysis of waste generated in market environments. The system allows users to log waste details such as item name, quantity, and date. It provides real-time reports and graphical visualization using bar and pie charts to analyze waste patterns. By maintaining digital records and generating automated reports, the system helps market administrators identify high-waste items and take preventive measures. The proposed solution is simple, scalable, and efficient, contributing to improved waste management and environmental sustainability.

Keywords: Waste Management, Waste Tracking, Market Monitoring, Web Application, Data Visualization, Sustainability.

I. INTRODUCTION

Markets generate significant quantities of waste daily, especially from perishable goods such as vegetables, fruits, and food products. Inefficient waste management not only leads to financial loss but also contributes to environmental pollution. Traditional waste monitoring systems rely on manual recording, which is time-consuming and prone to errors. With advancements in web technologies, digital systems can be implemented to improve tracking, reporting, and analysis of waste data. A Waste Reduction Tracker provides a centralized platform where waste entries can be recorded, monitored, and analyzed efficiently. The system ensures proper documentation, transparency, and data-driven decision-making. This project focuses on designing and implementing a web-based waste tracking system that allows users to add waste entries, view reports, and analyze waste data through graphical representations. By digitizing waste records, the system enhances accuracy, reduces manual workload, and promotes sustainable waste management practices in markets.

II. LITERATURE REVIEW

Several digital waste management systems have been developed to address waste monitoring challenges in urban and commercial environments. Existing solutions focus on:

- Smart waste bins using IoT sensors for real-time monitoring.
- Municipal waste tracking systems for large-scale city management.
- Inventory-based waste tracking in supermarkets and warehouses.

However, many existing systems are complex, costly, or designed for large-scale industrial applications. There is limited focus on simple, web-based waste tracking systems specifically designed for small and medium-sized markets. The proposed Waste Reduction Tracker addresses this gap by providing a user-friendly, cost-effective, and scalable solution tailored for market-level waste monitoring.

Research Gap:
Most existing waste management systems are either hardware-dependent (IoT-based) or designed for large municipalities. There is a need for a simple, software-based, web application that allows market administrators to monitor and analyze waste efficiently.

III. PROBLEM STATEMENT

Markets generate various types of waste daily, but many lack a proper digital tracking system. Manual methods:

- Do not provide accurate analysis.
- Make it difficult to identify high-waste items.
- Do not support graphical reporting.
- Increase the chances of data loss and human error.

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Therefore, there is a need for a digital, web-based system that can:

- Record waste details efficiently.
- Store data securely in a database.
- Generate reports and visual insights.
- Help reduce waste through proper monitoring.

IV. METHODOLOGY

The proposed system follows a structured methodology consisting of the following stages:

1. System Design Methodology

The project follows a web-based system design methodology where the application is developed using a client-server architecture. The frontend is created using HTML and CSS to provide a user-friendly interface, while the backend is implemented using Flask (Python) to handle application logic and data processing. The system is connected to a MySQL database for storing and retrieving waste records. This structured design ensures smooth interaction between the user interface, application logic, and database, making the system efficient and scalable.

2. Authentication-Based Access Control

The system implements an authentication-based access control mechanism to ensure security and restricted usage. Only authorized users, such as the Market Admin, can log into the system using valid credentials. This methodology prevents unauthorized access to sensitive waste data and ensures that only verified users can add, modify, or view records. It enhances data security and maintains accountability within the system.

3. Data Collection Method

The project uses a structured data collection method where waste information is manually entered into the system. The user records details such as item name, quantity of waste, and date. This organized approach ensures that waste data is consistently recorded in a standardized format. Proper data collection is essential for maintaining accurate records and enabling effective analysis of waste generation patterns.

4. Database Management Methodology

The system uses a relational database management methodology through MySQL to store and manage waste data. All records are saved in structured tables, ensuring data integrity and efficient storage. The database allows easy retrieval of historical records for reporting and analysis. This methodology ensures organized data handling, reduces redundancy, and improves reliability of stored information.

5. Data Retrieval and Reporting Method

The application follows a dynamic data retrieval methodology to generate reports. Stored waste data is fetched from the database and displayed in tabular format for easy viewing. This structured reporting method allows users to review past entries, verify information, and monitor waste trends. It enhances transparency and simplifies record management within the system.

6. Data Visualization Methodology

To improve analysis and understanding, the system uses a data visualization methodology by generating bar charts and pie charts. These graphical representations provide a clear comparison of waste quantities and show proportional distribution among items. Visualization simplifies complex data and helps users quickly identify patterns and high-waste items.

7. Decision Support Approach

The project incorporates a simple decision support approach by enabling users to analyze waste trends and take corrective actions. Based on reports and graphical insights, the Market Admin can identify frequently wasted items and implement strategies to reduce waste. This methodology supports informed decision-making and promotes sustainable waste management practices.

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Fig:1.1: System Flow Diagram

V. PERFORMANCE AND EVALUATION

The performance of the Waste Reduction Tracker for Market is evaluated based on system accuracy, data reliability, response time, usability, and effectiveness of visualization. The evaluation ensures that the system functions correctly, stores data securely, retrieves information efficiently, and presents accurate reports for analysis. The following parameters are used to assess system performance.

1. Data Accuracy

The system ensures accurate recording and storage of waste details entered by the user. Each waste entry, including item name, quantity, and date, is stored correctly in the database without data loss. The retrieved data in reports matches the entered records, confirming that the system maintains high data consistency and reliability.

2. System Efficiency

System efficiency is evaluated based on response time during data entry and report generation. The application quickly processes user inputs and retrieves stored data from the MySQL database without noticeable delay. Efficient backend processing using Flask ensures smooth performance even when multiple records are stored.

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3. Data Retrieval Performance

The reporting module successfully fetches stored waste data and displays it in tabular format. The retrieval process is optimized to ensure fast access to historical records. This allows users to review and monitor waste entries without performance issues.

4. Graphical Visualization Performance

The system generates bar charts and pie charts accurately based on stored data. The visual representation correctly reflects waste quantities and distribution. Chart rendering is fast and dynamically updates according to database records, ensuring real-time visualization of waste trends.

5. Usability and User Interface Evaluation

The application is designed with a simple and user-friendly interface. The navigation between login, dashboard, waste entry, and reports is smooth and intuitive. The layout and structured presentation improve ease of use, making the system accessible even for users with basic technical knowledge.

6. Reliability and Security

The login authentication system enhances security by allowing only authorized users to access the application. The database ensures secure storage of waste records. The system performs consistently without crashes or data corruption, demonstrating reliability.

VI. RESULT AND DISCUSSION

The Waste Reduction Tracker for Market was successfully developed and implemented as a web-based application to monitor and analyze waste generated in market environments. The system effectively records waste details such as item name, quantity, and date, and stores them securely in the MySQL database without data loss. The retrieved records are accurately displayed in tabular format, confirming the reliability and consistency of stored data. The graphical visualization module generates bar charts and pie charts that clearly represent waste distribution and quantity comparison among items. These visual outputs help in easily identifying high-waste products and understanding waste trends over time. During system testing, the application demonstrated fast response time in data entry, report generation, and chart rendering. The login authentication mechanism ensured secure access and prevented unauthorized usage. The user interface was found to be simple, intuitive, and easy to navigate, allowing smooth interaction between different modules such as dashboard, waste entry, and reports. The overall results indicate that the digital system is more efficient and accurate compared to traditional manual record-keeping methods. By providing structured data analysis and clear visual insights, the system supports informed decision-making and contributes to improved waste management and sustainable practices within market environments.

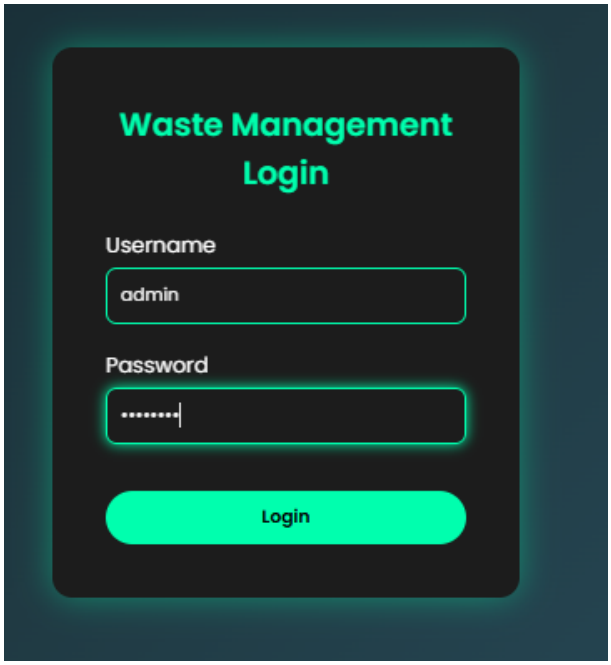

Fig 1.3: Home Page

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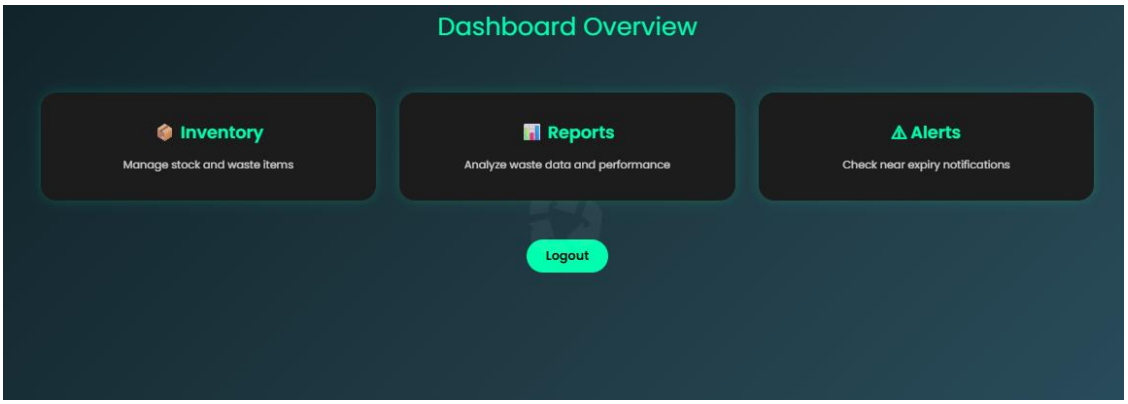


Fig 1.4: Prediction page

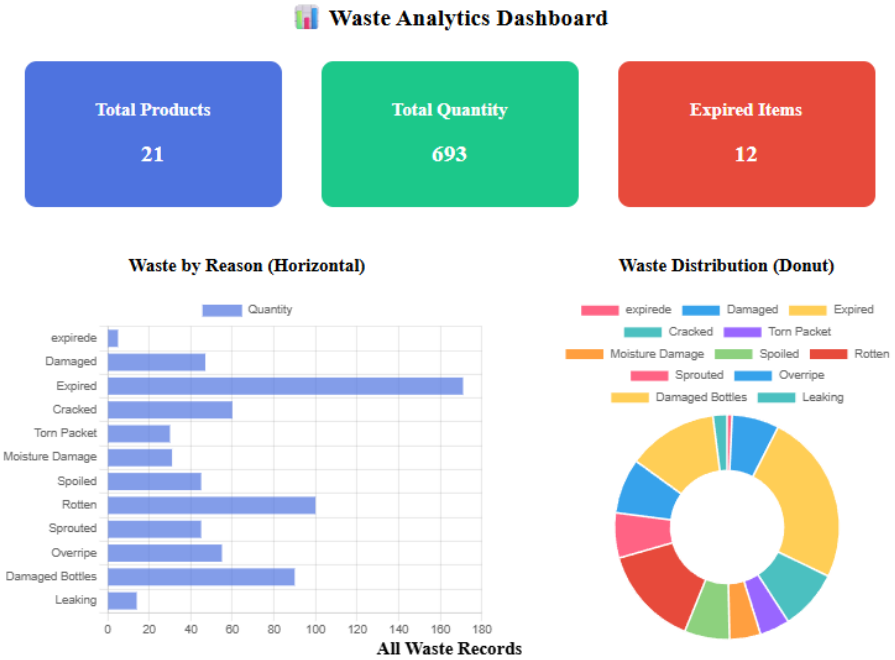
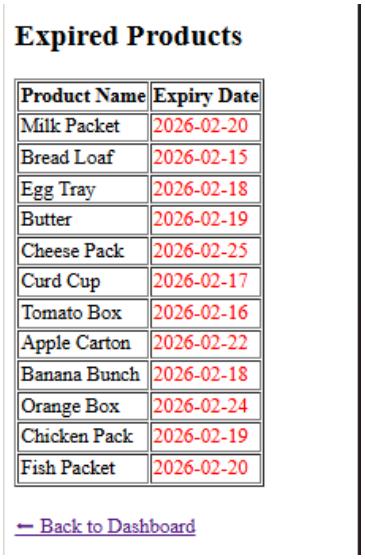


Fig 1.5: Report Page



Expired Products

Product Name	Expiry Date
Milk Packet	2026-02-20
Bread Loaf	2026-02-15
Egg Tray	2026-02-18
Butter	2026-02-19
Cheese Pack	2026-02-25
Curd Cup	2026-02-17
Tomato Box	2026-02-16
Apple Carton	2026-02-22
Banana Bunch	2026-02-18
Orange Box	2026-02-24
Chicken Pack	2026-02-19
Fish Packet	2026-02-20

← Back to Dashboard

Fig 1.6 : Alert Page

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VII. FUTURE WORK AND CONCLUSION

The Waste Reduction Tracker for Market can be further enhanced by integrating advanced features to improve functionality and scalability. In the future, the system can be upgraded to support multiple user roles such as market vendors, supervisors, and administrators with role-based access control. A mobile application version can also be developed to enable real-time waste entry and monitoring through smartphones. Additionally, automated waste prediction techniques using machine learning algorithms can be incorporated to forecast future waste trends based on historical data. The system can also be integrated with IoT-based smart waste bins to automatically collect waste data without manual entry. Cloud-based deployment can be implemented to improve accessibility, data backup, and scalability. Furthermore, advanced analytics dashboards with detailed reports and export options (PDF/Excel) can be added for better decision-making support. These enhancements will improve system efficiency, automation, and adaptability, making the Waste Reduction Tracker more intelligent and suitable for large-scale market environments.

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