AMERICAN JOURNAL OF MANAGEMENT AND IOT MEDICAL COMPUTING
Peer Reviewed, Referred & Indexed Journal
E-ISSN: 3069-0110
Vol.5, No.2(1) (2026)
www.ajmimc.com

FOOD WASTE MANAGEMENT SYSTEM

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ABSTRACT

The Food Waste Management System is a web-based solution designed to address the critical issue of food wastage while simultaneously tackling hunger and environmental concerns. In modern society, large quantities of surplus food generated by restaurants, hotels, households, and events are often discarded due to the lack of proper coordination and distribution mechanisms. This system provides a centralized digital platform that connects food donors with NGOs and volunteers in real time, enabling efficient collection and redistribution of excess food to needy individuals. The application allows donors to upload details such as food type, quantity, location, and expiry time, ensuring transparency and accessibility. Volunteers and NGOs can view available donations, request pickups, and track delivery status, ensuring timely utilization before spoilage. Additionally, the system incorporates features such as secure user authentication, role-based access, real-time notifications, and an administrative dashboard for monitoring activities and generating reports. It also addresses non-edible waste by promoting eco-friendly disposal methods such as composting and biogas production. By integrating modern web technologies and automation, the system minimizes manual effort, enhances coordination, and improves resource utilization. Overall, the Food Waste Management System contributes to social welfare by reducing hunger, promotes sustainability by minimizing waste, and supports environmental protection by reducing landfill impact and greenhouse gas emissions.

Keywords: Food Waste, Web Application, NGOs, Sustainability, Food Distribution, Real-Time System

I. INTRODUCTION

Food wastage has become a major global issue affecting environmental sustainability, economic stability, and social well-being [1]. Every day, large amounts of edible food are discarded from restaurants, hotels, households, and events while millions of people suffer from hunger and malnutrition [2]. This imbalance highlights inefficiency in food distribution systems and the lack of coordination between food providers and recipients [3]. Traditional food management systems rely heavily on manual communication such as phone calls and personal networks, which are time-consuming and unreliable [4]. Due to the absence of a centralized platform, surplus food often remains unutilized and gets spoiled before reaching those in need [5]. Poor logistics and lack of real-time updates further contribute to inefficiencies [6]. Food waste also leads to environmental problems such as greenhouse gas emissions and resource depletion [7]. Therefore, there is a need for an automated and scalable system to improve food distribution [8]. Modern technologies such as web applications provide effective solutions for this issue [9]. Real-time tracking systems enhance coordination between

users [10]. Data-driven platforms improve decision-making and resource allocation [11]. Digital systems reduce dependency on manual processes [12]. Automation helps minimize delays and human errors [13]. Integration of communication tools improves response time [14]. Overall, technology plays a vital role in addressing food wastage challenges [15].

The Food Waste Management System is proposed as a comprehensive solution to bridge the gap between donors and receivers [16]. It provides a centralized platform where donors can upload details of surplus food [17]. NGOs and volunteers can view available food and respond quickly [18]. Real-time notifications ensure timely communication between users [19]. The system reduces delays and prevents food spoilage [20]. Tracking features help monitor food from donation to delivery [21]. This improves transparency and accountability [22]. Automation reduces manual effort and increases efficiency [23]. The system can handle peak demand using scalable technologies [24]. It supports environmental sustainability by promoting proper waste disposal methods [25]. Composting and biogas generation reduce environmental impact [26]. The system encourages social responsibility by enabling food donation [27]. It supports underprivileged communities by reducing hunger [28]. Secure authentication ensures data safety and user privacy [29]. Admin monitoring improves system reliability and performance [30].

II. LITERATURE SURVEY

Food waste management has been extensively studied due to its environmental and social impact [1]. Research shows that food waste occurs at different stages such as production, transportation, and consumption [2]. Households and food service industries are major contributors to food wastage [3]. Various techniques such as source reduction and redistribution have been proposed [4]. Redistribution of surplus food is considered one of the most effective solutions [5]. Recycling methods like composting help reduce environmental impact [6]. Circular economy approaches promote reuse of food waste into useful resources [7]. Technologies such as IoT systems are used to monitor food waste [8]. Artificial intelligence helps predict and reduce wastage [9]. Data analytics improves supply chain efficiency [10]. Smart systems help track food availability in real time [11]. Digital platforms enhance coordination among stakeholders [12]. Behavioral studies show that lack of awareness contributes to food waste [13]. Poor planning and consumer habits also increase wastage [14]. Awareness programs can help change user behavior [15].

Several applications have been developed to manage food waste efficiently [16]. These systems provide platforms for food donation and distribution [17]. Location-based services improve matching between donors and receivers [18]. Cloud computing enables scalability and better data handling [19]. Machine learning techniques help predict food demand [20]. However, many existing systems lack real-time updates [21]. Some platforms face issues with user engagement [22]. Limited scalability is another challenge in current systems [23]. Many systems focus only on donation without addressing disposal [24]. There is a need for integrated solutions covering all aspects of food waste management [25]. A centralized system improves coordination among users [26]. Automation enhances efficiency and reduces manual work [27]. Real-time tracking ensures better monitoring of food distribution [28]. User-friendly interfaces increase accessibility [29]. The proposed system addresses these gaps effectively [30].

III. PROPOSED SYSTEM

The proposed Food Waste Management System is a web-based platform designed to efficiently connect food donors with NGOs and volunteers in real time. It provides a centralized database where donors can upload surplus food details such as type, quantity, location, and expiry time. Once the information is submitted, the system notifies nearby NGOs and volunteers, enabling quick response and collection. This real-time communication reduces delays and ensures that food is distributed before spoilage. The system also includes user authentication and role-based access, allowing different users such as donors, volunteers, and administrators to interact securely within the platform.



Fig.1 Architecture

The system incorporates features such as request handling, food tracking, and admin monitoring to improve transparency and accountability. Volunteers can view available donations, accept requests, and update delivery status, while administrators can monitor activities and generate reports. Additionally, the system is designed to handle peak demand efficiently using scalable technologies. It also addresses non-edible food waste by directing it toward eco-friendly disposal methods such as composting and biogas production. Overall, the proposed system improves coordination, reduces food wastage, supports social welfare, and promotes environmental sustainability.

IV. SYSTEM DESIGN

The system design of the Food Waste Management System follows a multi-tier architecture consisting of presentation, application, and database layers. The presentation layer provides the user interface through which donors, NGOs, volunteers, and administrators interact with the system. It includes web pages for registration, login, food donation entry, and tracking. The application layer handles the core logic of the system, including user authentication, request processing, notification management, and coordination between different users. The database layer stores all relevant data such as user information, food details, request status, and transaction records, ensuring data consistency and quick retrieval. This layered architecture improves scalability, maintainability, and system performance.

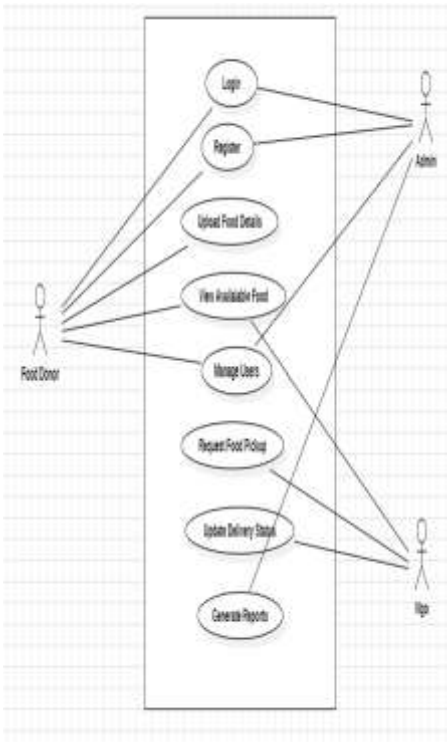


Fig.2 Use case diagram

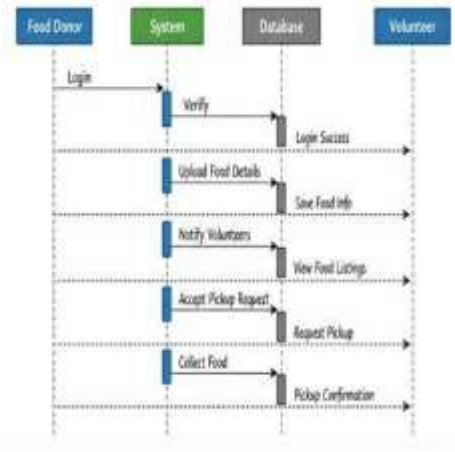


Fig.3 Sequence Diagram

The system is further structured into modules such as user management, food donation, volunteer coordination, notification, tracking, and admin control. According to the UML diagrams, the system workflow begins with user login, followed by uploading food details, notifying volunteers, accepting requests, and completing delivery. The sequence diagram illustrates real-time interaction between users and the system, while the activity diagram shows the step-by-step workflow from donation to distribution. The class diagram defines relationships between entities such as User, Food Donor, Volunteer, Food Donation, and Request. This modular and structured design ensures efficient communication, reduces system complexity, and enhances reliability.

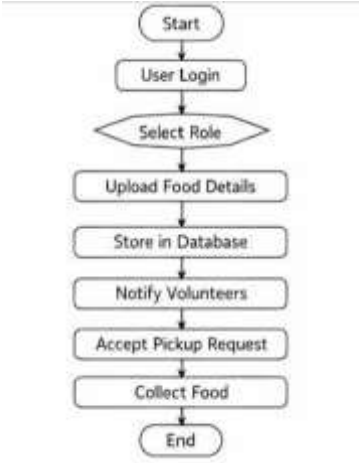


Fig.4 Activity Diagram

V. RESULTS & ANALYSIS

Test Analysis is an important step where we study the system requirements and identify what needs to be tested. In the Food Waste Management System, we analyze features like user login, food donation, request handling, and delivery tracking. We create test scenarios, define test conditions, and prepare test data. We also identify risks such as delivery delays and system failures. This ensures that the system works efficiently and all functionalities are properly tested

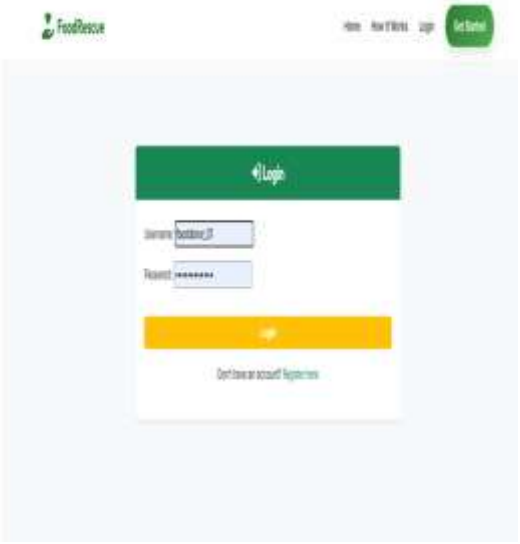
Received: 25-03-2026 | Accepted: 26-04-2026 | Published: 06-05-2026 | www.ajmimc.com

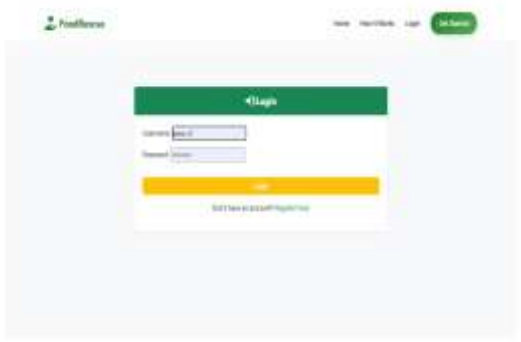
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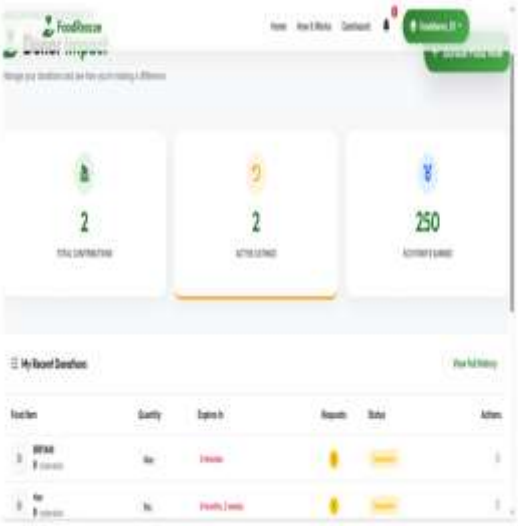


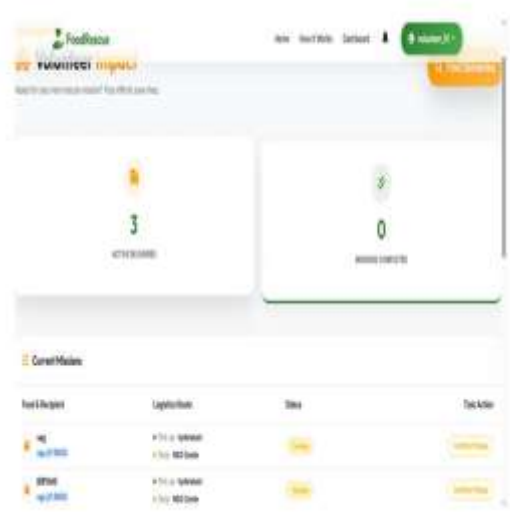


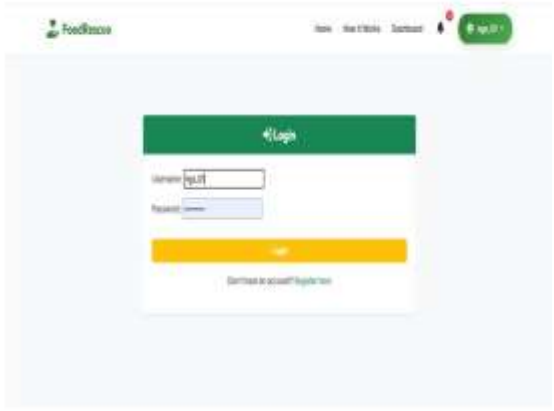


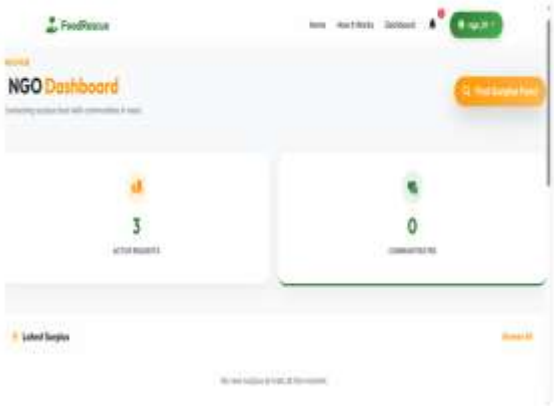












VI. CONCLUSION

The Food Waste Management System provides an effective and innovative solution to address the growing problem of food wastage while supporting social and environmental sustainability. By creating a centralized platform that connects food donors, NGOs, and volunteers, the system ensures efficient collection and distribution of surplus food to those in need. It simplifies the donation process through user-friendly interfaces and enhances coordination through real-time notifications and tracking features. The system significantly reduces food wastage by minimizing delays and ensuring timely delivery, thereby preventing spoilage. Additionally, it promotes environmental sustainability by encouraging proper disposal methods such as composting and biogas generation, which help reduce pollution and greenhouse gas emissions. The integration of modern web technologies improves system efficiency, transparency, and reliability, making it suitable for large-scale implementation. Furthermore, the system encourages social responsibility by motivating individuals and organizations to contribute to hunger reduction. The involvement of administrators ensures proper monitoring and management, maintaining the overall effectiveness of the platform. Future enhancements such as mobile applications, AI-based demand prediction, and GPS tracking can further improve system performance and scalability. Overall, the Food Waste Management System is a practical and impactful solution that not only reduces food wastage but also contributes to a more sustainable and equitable society.

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Received: 25-03-2026 | Accepted: 26-04-2026 | Published: 06-05-2026 | www.ajmimc.com