



# ‘FOOD WASTE AS A RESOURCE: A SYSTEM FOR TRANSFORMING FOOD WASTE INTO ORGANIC FERTILIZERS AND BIOGAS USING CUTTING-EDGE TECHNOLOGIES’

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**Abstract:** FoodRescue is a mobile app addressing food waste and insecurity through efficient surplus food management. Donors submit excess food details, triggering immediate notifications to Admins. Admins oversee pending donations and forward notifications to verified Mediators, who play a key role in directing food to those in need or biogas production. Additional features include recipient feedback, a rating system, and analytics. The technology stack ensures scalability, while legal compliance includes robust food inspection protocols. Outreach involves partnerships, and a marketing plan aims to raise awareness. FoodRescue aims to foster collaboration, reduce waste, and alleviate hunger sustainably.

**Key words – Food Management (FM), Admins, Mediators, biogas production, scalability, robust food inspection protocols**

## I.INTRODUCTION

In a world where food waste coexists with the harsh reality of global hunger, the FoodRescue app emerges as a pioneering solution, seeking to bridge the gap between surplus food and those in need while addressing the responsible management of inedible food waste. This innovative application is designed with a dual-purpose framework, unifying surplus food donation and waste disposal functionalities within a single, intuitive platform.

FoodRescue represents a collective effort to combat the escalating challenges of food waste and hunger by offering a seamless, user-centric experience. By consolidating surplus food donation and waste management into a unified system, this app aims to optimize resource utilization, enhance user engagement, and provide valuable insights through integrated analytics.

This introduction sets the stage for a transformative initiative, where technology meets sustainability, creating a holistic solution that not only redistributes surplus food to those who need it most but also responsibly manages inedible food and vegetable waste through cutting-edge functionalities. As we delve into the features and advantages of the FoodRescue app, we explore its potential to redefine the landscape of food waste management and contribute meaningfully to building a more sustainable and compassionate world.

## II.OBJECTIVES

- **Minimize Food Waste:**  
Develop a user-friendly interface for donors to easily input details about surplus food, encouraging increased donations. Implement a real-time notification system to ensure prompt communication between donors and admins, reducing the likelihood of food spoilage.
- **Enhance Food Distribution Efficiency:**  
Create an admin dashboard for efficient oversight of pending donations, notifications, and analytics, streamlining the distribution process. Enable Mediators to receive and act on donation notifications swiftly, optimizing the routing of surplus food to either those in need or biogas production.
- **Promote Sustainable Practices:**  
Integrate a feedback loop and rating system to encourage accountability among donors and Mediators, fostering sustainable and

responsible food handling practices. Implement analytics to track and display key metrics, promoting transparency and accountability in the app's impact on reducing food waste.

- **Ensure User-Friendly Experience:**  
Design an intuitive and user-friendly interface for donors, admins, and Mediators, facilitating seamless interactions within the app. Prioritize accessibility features to ensure inclusivity, allowing a diverse range of users to participate in food donation and distribution efforts.
- **Establish Legal Compliance:**  
Develop and implement stringent food inspection protocols to ensure compliance with health and safety regulations, safeguarding the health of recipients. Regularly update the app to align with any changes in local regulations related to food donation and distribution.
- **Build and Strengthen Partnerships:**  
Establish partnerships with local restaurants, event organizers, and non-profits to expand the network of potential food donors and recipients. Facilitate communication and collaboration among all stakeholders to create a supportive ecosystem for sustainable food redistribution.
- **Raise Awareness and Community Engagement:**  
Design and execute a comprehensive marketing strategy to raise awareness about the FoodRescue app through social media, local news, and community events. Organize outreach programs to educate the community about the environmental and social impact of reducing food waste and addressing food insecurity.
- **Ensure Scalability and Reliability:**  
Implement a robust and scalable technology stack to accommodate increasing user numbers and data volumes. Conduct regular maintenance and updates to address any technical issues, ensuring the app's reliability and continuous functionality.

These objectives collectively aim to make FoodRescue a powerful tool in the fight against food waste and hunger, fostering a sustainable and collaborative approach to surplus food management.

### III.BACKGROUND

In response to the pressing issues of food wastage and hunger, our team has embarked on a mission to create a comprehensive mobile application aimed at bridging the gap between excess food sources and those in need. The key components of our project include a login page, admin page, and donor page, each serving a specific purpose within the system.

- **Objective:**
  - Mitigate food wastage by collecting excess food from events, restaurants, and various sources.
  - Distribute collected food to individuals facing food insecurity.
  - Redirect unsuitable food for consumption to biogas production industries.
- **User Roles:**
  - **Donors:**
    - Log in to the app and submit details about excess food.
    - Specify the quality of the donated food (edible or suitable for biogas production).
    - Receive notifications confirming successful submission.
  - **Admins:**
    - Manage and review incoming notifications from donors.
    - Coordinate with nearby mediators for efficient food distribution.
    - Monitor overall system functionality and performance.
  - **Mediators:**
    - Receive notifications from admins about available food resources.
    - Organize the distribution of edible food to those in need.
    - Facilitate the transportation of unsuitable food to biogas production industries.
- **Communication Workflow:**
  - Donors trigger notifications upon submitting excess food details.
  - Admins promptly review and forward notifications to mediators.
  - Mediators coordinate logistics for the transportation of food.
  - Feedback loops are established for donors to specify the quality of provided food.

- App Features:
  - User-friendly interface for seamless navigation.
  - Real-time notifications to ensure timely responses.
  - Detailed feedback column for donors to communicate the quality of the donated food.
  - Robust security measures on the login page to protect user data.
- Environmental Impact:
  - Contributing to the reduction of food wastage.
  - Supporting the production of biogas from organic waste.
- Future Considerations:
  - Explore potential partnerships with events, restaurants, and food-related industries.
  - Continuously optimize the app for improved efficiency and user experience.

By leveraging technology to facilitate the redistribution of surplus food, our app aspires to make a meaningful impact on both reducing food waste and addressing the critical issue of hunger in our communities.

#### IV.LITERATURE SURVEY

- Padmaja Vootla , Samuel Andemariam Bariaghabr, Fadhel Al Remeithi, Faraj Al Mansoori published a paper Food Waste - A Global Challenge to Sustainability in the year 2018. This paper explores how reducing food waste can help achieve sustainability goals and address global food inequality. [1]
- Garcia\_Herrero,D.Hoehn,M. Margallo, J. Laso published a On the estimation of potential food waste reduction to support sustainable production and consumption policies in the year 2018. This paper is about a biogas plant that uses mixed kitchen waste from a college dining room in Bhutan to produce gas for cooking. [2]
- Hajjdiab Hassan, Anzer Ayesha, Tabaza Hadeel A, Ahmed Wedad published a A Food Wastage Reduction Mobile Application in the year 2018. This paper is about a an android mobile application that helps restaurants to donate and share their excess food with people who need it. [3]
- Renata Soares Pinto, Renata Machado dos Santos Pinto, Felipe Fochat Silva Melo, Suzana Santos Campos published A simple awareness campaign to promote food waste reduction in a University canteen Optimization of Biogas Production from Kitchen Waste installed at College of Science and Technology in the year 2018. This paper is about an initiative to reduce food waste at the School of Agriculture canteen (University of Lisbon, Portugal) by using an education campaign and a waste separation system. [4]
- Tenzin Tshewang, Wangdi Sangay, Dorji Gom, Nepal Prem Kumar. published a Optimization of Biogas Production from Kitchen Waste installed at College of Science and Technology in the year 2018. This paper is about a biogas plant that uses mixed kitchen waste from a college dining room in Bhutan to produce gas for cooking. [5]
- Santosh Kumar Panda, Andre Blome, Lukasz Wisniewsk, Alexander Meyer published a IoT Retrofitting Approach for the Food Industry in the year 2019. This paper is about about a method to improve the quality and efficiency of industrial food production. [6]
- M.D.C.J Gunawardane, H.A.N Pushpakumara, E.N.M.R.L Navarathne, Shashika Lokuliyana. published a Zero Food Waste: Food wastage sustaining mobile application in the year 2019. This paper is about a project that aims to reduce food waste by using a mobile app that can identify and weigh food items and suggest recipes based on the leftovers. [7]
- Hsiu-Hua Chang. published a Sustainable Development: Drivers of Consumer Food Wasting in the year 2019. This paper is about a study that examines the ethical issue of food waste from the consumer perspective. [8]
- Coimbra Portugal, Carvalho J, Gertal Agência, Norte Maia Portugal. published a Waste Control in Catering Company: decision tools in the year 2019. This paper aims to measure the food waste of a unit where a company that provides collective meals operates. [9]
- Fredi Jakob, James J. Dukarm. published a Production of Bio-Gas and Organic Fertilizer Using Canteen and Kitchen Waste in the year 2019. This paper proposes a simpler method for assessing the fault severity of transformers using DGA. [10]
- Batista Isaac Danilo Santos, Sardina Idalmis Milian, Dantas Rummenigge Rudson .published a Monitoring Restaurants in Real-Time in the year 2019. This paper describes a project to develop a smart software that can monitor the amount and temperature of food in a self-

service restaurant buffet. [11]

- Christian Reynolds, Liam Goucher, Tom Qusted, Sarah Bromley. published a Consumption-stage food waste reduction interventions in the year 2019. This paper summarizes the need for a review of the effectiveness of interventions to prevent food waste at the consumption stages of the food system. [12]
- Elena-Diana Ungureanu-Comanita ErsiliaLazar Cosbuc Petronela. published a Human Health Risks Concerning Food Waste Management in the year 2020. This paper summarizes a study that aims to address the problem of food waste and its effects on the environment and human health. [13]
- Anbarasu V, Karthikeyan P, Anandaraj S.P. published Turning Human and Food Waste into Reusable Energy in a Multilevel Apartment Using IoT a in the year 2020. This paper is about a proposed system of human and food waste management in multi-apartment buildings that can produce biogas for electricity and cooking purposes. [14]
- Nikish Kumar S, Balasubramaniam Saiharsha, S. Sanjay Tharagesh R, Kumar Priyanka. published a An Autonomous Food Wastage Control Warehouse: Distributed Ledger and Machine Learning based Approach in the year 2020. This paper is about a proposed system of autonomous warehouse management that can reduce food wastage by using Machine Learning and Blockchain technology. [15]
- Rshinta Oktaviana, Diana Ambarwati Febriani, Intan Yoshana, L.R.Payanta. published a FoodX, a System to Reduce Food Waste in the year 2020. This paper is about a proposed system that can connect the community with donors who want to share excess food in Indonesia. [16]
- Christina Varghese;Drashti Pathak;Aparna S. Varde. published a SeVa: A Food Donation App for Smart Living in the year 2020. This paper is about a proposed mobile app called SeVa that can help users find and access available food resources in their local area, and reduce food waste and hunger. [17]
- Gayathri N, Divagaran A R, Akhilesh C D, Aswiin V M. published a IOT Based Smart Waste Management System in the year 2020. This paper is about a proposed system that can measure and reward the users for reducing food waste in colleges, hostels, and workplaces. [18]
- Saman Attiq,Muhammad Danish Habib, Puneet Kaur, Muhammad Junaid Shahid Hasni. published a Drivers of food waste reduction behaviour in the household context in the year 2021. This paper abstract is about a research study that investigates the factors that influence household consumers' behaviour towards reducing food waste. [19]
- Caterina Trevisan, Marco Formentini. published a Digital Technologies for Food Loss and Waste Prevention and Reduction in Agri-Food Supply Chains in the year 2023. This paper is about a research study that examines the use of Industry 4.0 technologies in the agri-food sector to prevent and reduce food loss and waste (FLW). [20]

## V. RESEARCH METHODOLOGY

### System analysis

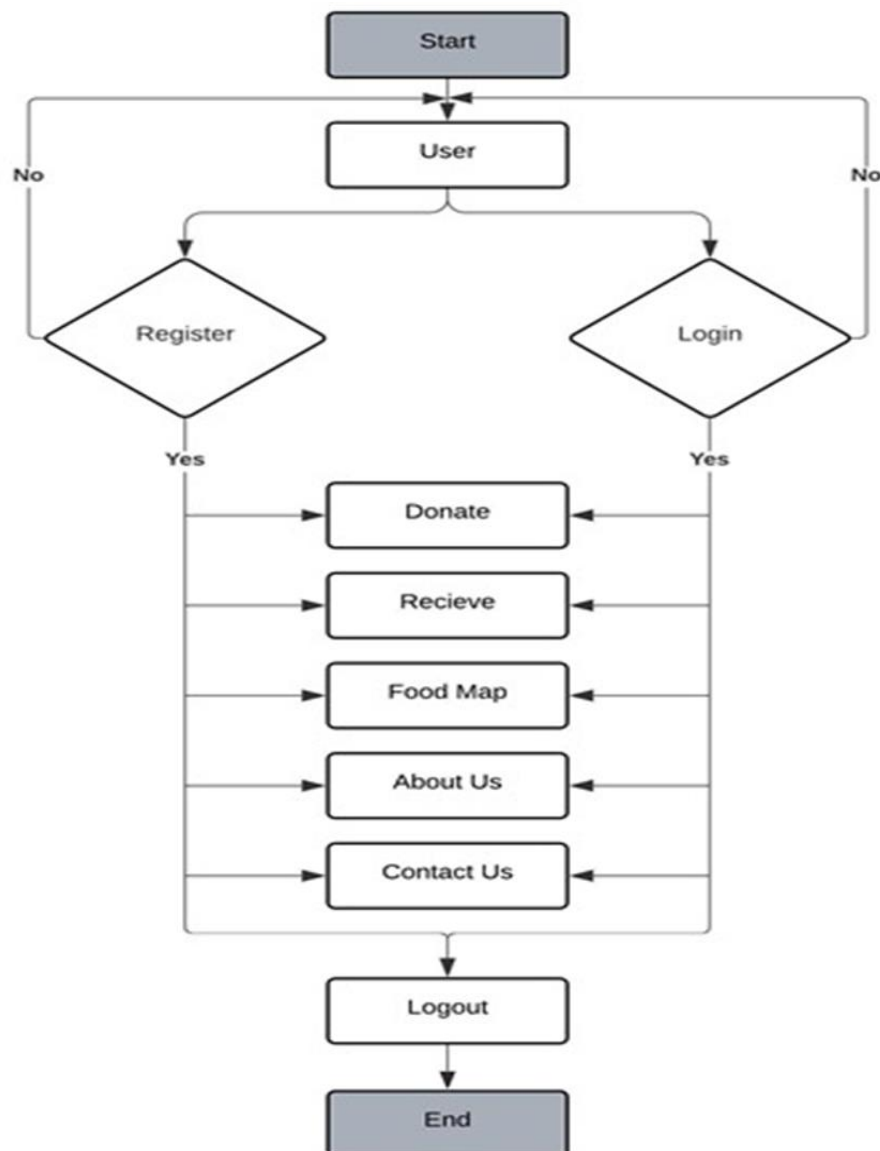
#### HARDWARE REQUIREMENTS

- Processor : Intel Pentium
- Ram : 2 GB or above
- System type : 64/32-bit Operating system.
- Hard disk : Hdd 20gb storage

#### SOFTWARE REQUIREMENTS

- Operating System : Windows 7,8/10/11
- Programming language : Django python
- Frontend : Html ,CSS, Bootstrap

## Proposed Framework



5.1 proposed framework

## VI. RESULT AND DISCUSSION

**Food Donation:** The practice of food donation has shown significant results in reducing food waste and addressing food insecurity. It has been successful in redistributing surplus food to those who need it most, thereby reducing hunger and malnutrition. However, there are challenges such as logistical issues in food collection and distribution, maintaining the quality and safety of donated food, and ensuring the dignity of recipients. There is a need for more research and policy support to address these challenges and make food donation more effective.

**Converting Waste Food into Biogas:** The conversion of food waste into biogas has proven to be a viable solution for managing organic waste and producing renewable energy. It has the potential to significantly reduce greenhouse gas emissions and reliance on fossil fuels. However, the process requires specific conditions and infrastructure, which can be costly. There are also challenges related to the collection and pre-treatment of food waste, as well as the storage and utilization of biogas. Further research and development are needed to overcome these challenges and make this technology more accessible and efficient.

Both food donation and the conversion of food waste into biogas offer promising solutions to the problems of food waste and energy production. However, they also present unique challenges that need to be addressed through continued research, innovation, and policy

support. These initiatives not only contribute to environmental sustainability but also have the potential to address social issues such as food insecurity. Therefore, they warrant further exploration and investment.

## VII. FUTURE SCOPE

- **Dual Application Architecture:** The FoodRescue app is designed with a dual application structure, featuring distinct interfaces for surplus food donation and waste disposal functionalities.
- **Specialized User Paths:** Users are presented with specialized pathways upon launching the app, allowing them to choose between contributing surplus edible food or managing the disposal of inedible food and vegetables.
- **Targeted User Profiles:** Different user profiles are established based on their primary engagement with the app, distinguishing between those primarily interested in food donation and those focused on waste disposal.
- **Separate User Registration:** Users register and create accounts based on their specific intent—either as a food donor or a waste manager—ensuring that each user's journey aligns with their purpose.
- **Distinct Features for Food Donors:** The surplus food donation app provides features such as a donation form, location services for event-based donations, and a notification system to alert administrators and nearby mediators.
- **Features for Waste Managers:** The waste disposal app includes functionalities for categorizing and managing inedible food and vegetables, incorporating a routing system for directing waste to biogas production facilities.
- **Efficient Admin Dashboard:** The administrative dashboard is equipped to manage both food donation and waste disposal aspects, allowing administrators to oversee and coordinate activities seamlessly.
- **Mediator Interface:** Mediators receive notifications from both apps, allowing them to efficiently route surplus food to those in need and guide inedible items to the appropriate waste management channels.
- **Cross-App Analytics:** Integrated analytics provide a comprehensive overview of user engagement, allowing administrators to assess the impact of both food donation and waste disposal efforts collectively.
- **Unified Feedback System:** A consolidated feedback system enables users, mediators, and administrators to provide input on both food donation and waste disposal processes, fostering continuous improvement.
- **Educational Resources:** In-app resources educate users on the dual functionality, emphasizing the importance of responsible practices in both surplus food donation and waste management.
- **Cross-Platform Integration:** While there are two separate applications, efforts are made to facilitate seamless integration, ensuring that users can transition between the surplus food donation and waste disposal functionalities effortlessly.
- **Enhanced User Experience:** Design considerations prioritize a cohesive and user-friendly experience, acknowledging the dual nature of the app and making navigation intuitive for users engaging in both activities.

## VIII. CONCLUSION

- **Food Waste Conversion:** Innovative conversion technologies have emerged to effectively transform food waste into valuable resources. These technologies include anaerobic digestion, insect-based conversion, and microbial fermentation.
- **Environmental Benefits:** The conversion of food waste into resources can lead to significant environmental benefits, including waste reduction, greenhouse gas emission reduction, and resource conservation.
- **Energy Production:** Converting biowaste into biogas via anaerobic digestion technology is a strategy that could contribute to multiple U.N. Sustainable Development Goals and the Paris climate agreement.
- **Sustainability:** The findings emphasize the importance of adopting and further developing these conversion technologies as a means to mitigate environmental impacts, promote circular economy principles, and enhance the overall sustainability of the food and agriculture sector.

- **Challenges:** Current limiting factors to the sector's growth include technical and adaptive challenges, lack of awareness in many regions, and unsupportive policy instruments that can discourage biogas adoption.

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