Enviro Edible: Satisfying Hunger, Minimizing Waste

RAJATHI S
Assistant Professor,Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
rajathiit2590@gmail.com

ANUSHIYA Y
Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
anushiya123anu123@gmail.com

SOWMIYA M
Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
sowmiya27403@gmail.com

ABDUL RAHMAN S
Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
abdulrahmans.20cs@rathinam.in

FATHIMA SHEHANAS R
Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
fathimashehanasr.20cs@rathinam.in

DHANUSH KUMAR V
Dept of Computer Science and Engineering
Rathinam Technical Campus, Coimbatore,India
dhanushkumarv.20cs@rathinam.in

Abstract - **"Enviro Edible" is an innovative food waste management system designed to address the escalating global challenge of food waste. This comprehensive solution integrates technology, community engagement, and sustainable practices to minimize food wastage at various stages of the supply chain. The system employs a multi-faceted approach, encompassing smart inventory management, consumer awareness campaigns, and collaborative efforts with local businesses and charities. Key components include a user-friendly website that empowers consumers to make informed purchasing decisions, reducing the likelihood of excess food in households. Additionally, the system incorporates data analytics for businesses to preventing overstocking and expirations. Real-time analytics enable businesses to identify potential issues and make informed decisions to prevent food spoilage, reduce waste, and improve overall supply chain efficiency. "Enviro Edible" fosters partnerships with local charities and food banks, enabling seamless redirection of surplus food from businesses to those in need. Through real-time tracking and analytics, the system not only minimizes food waste but also creates a positive impact on communities by addressing hunger and promoting sustainable consumption. This food waste management system envisions a future where technology and collective efforts converge to create a more sustainable and responsible approach to food consumption, reducing environmental impact and enhancing social welfare.**

Index Terms – Food Waste Management, User-friendly website, Real-time, Supply chain efficiency, Minimize food waste.

I. INTRODUCTION

In a world grappling with the dual challenges of food scarcity and environmental sustainability, effective food waste management has become a paramount concern. The introduction of the " Enviro Edible " food waste management system marks a significant stride towards addressing this complex issue. This innovative system embraces a holistic approach, integrating technology, community engagement, and collaboration with businesses to curtail food waste across the supply chain. The prevailing global scenario demands a concerted effort to tackle the alarming amount of food discarded at various stages – from production and distribution to consumption. " Enviro Edible " is not merely a technological solution; it is a paradigm shift, fostering a culture of conscious consumption, reducing environmental impact, and channeling surplus food to those in need. Real-time analytics enable businesses to identify potential issues and make informed decisions to prevent food spoilage, reduce waste, and improve overall supply chain efficiency.

This introduction sets the stage for an exploration of the key features and benefits of the " Enviro Edible " food waste management system, highlighting its potential to revolutionize how we view and manage food resources, promoting a more sustainable and socially responsible approach to nourishment. The platform will provide a seamless and user-friendly experience, allowing users to connect with others from anywhere in the world.

II. RELATED WORK

Food Waste Quantification and Characterization:
Title: "A comprehensive review on food waste anaerobic digestion: Research updates and tendencies."
Authors: Zhang, C., Zhang, D., Zhang, G., & Chen, Y.

Technological Solutions for Food Waste Reduction:
Title: "Technological solutions for sustainable management of food waste: A review."
Authors: Kumar, V., Kumar, V., Christopher, J., & Vijay, V. K.

Behavioral Interventions and Public Awareness:
Title: "Reducing household food waste by integrating consumer behavior with systemic interventions: A review."
Authors: Russell, S. V., Young, K. S., & Unnikrishnan, A.

Case Studies and Implementation Strategies:
Title: "Implementation strategies for reducing food loss and waste globally."
Authors: Parfitt, J., Barthel, M., & Macnaughton, S.

Social and Cultural Perspectives:
Title: "Social and cultural aspects of food loss and waste: A systematic literature review."
Authors: Stancu, V., Haugaard, P., & Lähteenmäki, L.

Food Waste in Supply Chains:
Title: "Quantifying food losses and the potential for reduction in Switzerland."
Authors: Quested, T. E., Marsh, Stunell. D., & Parry, A. D.

Food Recovery and Redistribution Programs:
Title: "Food recovery and donation: An overview of current practice and regulations in the European Union."
Authors: Schneider, F., & Schmidt, T.

III. PROBLEM STATEMENT

A. DESIGN A SYSTEM AND GOALS

In contemporary society, the escalating global challenge of food waste has emerged as a pressing environmental, economic, and humanitarian concern. Despite advancements in various sectors, the inefficiencies in the current food supply chain contribute significantly to the generation of substantial amounts of food waste. The intricate web of factors leading to this issue includes inadequate storage and transportation infrastructure, consumer behavior, lack of awareness, and suboptimal waste management practices. The inefficient handling of food from production to consumption results in not only the squandering of valuable resources such as water, energy, and land but also contributes to the emission of greenhouse gases in the decomposition process. Additionally, the moral imperative of addressing food waste is underscored by the simultaneous existence of widespread hunger and malnutrition in various parts of the world. Furthermore, existing waste management systems often fall short in effectively mitigating the adverse impacts of food waste. Traditional methods of disposal, such as landfilling, not only fail to harness the potential value of organic waste but also exacerbate environmental degradation.
Hence, there is an urgent need for an innovative and comprehensive food waste management system that addresses the entire lifecycle of food, from production and distribution to consumption and disposal. This system should integrate advanced technologies, behavioral interventions, and sustainable practices to minimize food waste generation, enhance resource efficiency, and promote a circular economy in the food sector.

B. OBJECTIVES

The primary objective of the proposed Food Waste Management System is to establish a comprehensive and sustainable solution that effectively reduces, manages, and optimizes the entire lifecycle of food, from production to consumption and disposal.
1. Minimize Food Waste Generation: Implement innovative technologies and best practices to minimize food waste at every stage of the supply chain, including production, distribution, and retail, thereby reducing the overall volume of food wasted.
2. Optimize Distribution and Storage Processes: Improve logistics and storage infrastructure to reduce spoilage, loss, and inefficiencies during transportation and storage, ensuring that food reaches consumers in optimal condition and minimizing unnecessary waste.
3. Implement Data-Driven Decision-Making: Utilize data analytics and technology to gather insights into food waste patterns, enabling stakeholders to make informed decisions, optimize inventory management, and identify areas for continuous improvement within the food supply chain.
4. Collaborate with Stakeholders: Foster collaboration among producers, retailers, consumers, and waste management entities to create a holistic and integrated approach to food waste reduction, acknowledging the shared responsibility and interconnectedness of all actors in the food system.
5. Comply with Regulatory Standards: Ensure adherence to local and international regulations pertaining to food waste management, waste disposal, and environmental sustainability, promoting legal compliance and responsible corporate citizenship.
6. Measure and Track Progress: Establish key performance indicators (KPIs) and monitoring mechanisms to regularly assess the effectiveness of the food waste management system, allowing for continuous improvement and adaptation to changing circumstances.
By addressing these objectives, the Food Waste Management System aims to create a more sustainable, efficient, and responsible food supply chain, thereby mitigating the adverse impacts of food waste on the environment, society, and the economy.

IV. LITERATURE REVIEW

The literature on food waste management system reflects a growing concern about the environmental, economic, and social impacts of food waste. Researchers and experts in various fields have investigated different aspects of food waste, including its causes, consequences, and potential solutions.
Extent and Causes of Food Waste: Studies often highlight the staggering scale of global food waste, identifying key contributors such as inefficient supply chains, consumer behaviors, and inadequate storage and processing facilities. Research aims to quantify the amount of food wasted and understand the root causes at various stages of the food supply chain.
Environmental Impacts: The environmental consequences of food waste, including greenhouse gas emissions, water usage, and land degradation, are well-documented. Literature emphasizes the urgency of mitigating these impacts through effective waste management strategies.
Economic Considerations: Scholars explore the economic implications of food waste for both businesses and societies. This includes the economic losses incurred by food producers, retailers, and consumers, as well as the potential economic benefits of implementing efficient waste reduction measures.
Technological Innovations: Research investigates technological solutions for food waste management, such as smart packaging, sensor technologies, and data analytics to optimize supply chain efficiency. These innovations aim to reduce waste by improving inventory management, distribution, and storage.

Policy and Regulatory Frameworks: Literature emphasizes the role of government policies and regulations in shaping food waste management practices. Studies discuss the effectiveness of existing policies, propose new regulatory approaches, and highlight the importance of international cooperation to address this global issue.

Consumer Behavior and Awareness: Understanding consumer attitudes and behaviors related to food waste is a recurring theme. Scholars explore ways to raise awareness, change consumption patterns, and promote more responsible food practices at the household level.

Social and Ethical Considerations: The social dimensions of food waste, including issues of food insecurity and ethical concerns, are explored in the literature. Researchers discuss how addressing food waste can contribute to more equitable food distribution and social justice.

Food Recovery and Redistribution: Initiatives focused on rescuing and redistributing surplus food to those in need are examined. Studies assess the effectiveness of food recovery programs, the role of food banks, and the impact on reducing both waste and hunger.

Cross-Sector Collaborations: Collaboration between various stakeholders, including government agencies, businesses, non-profits, and the research community, is emphasized as essential for developing and implementing effective food waste reduction strategies.

In conclusion, the literature on food waste management system underscores the complexity of the issue and the need for comprehensive, multi-faceted approaches. Solutions range from technological innovations to changes in consumer behavior, and from policy interventions to collaborative efforts across sectors. The holistic understanding provided by this body of literature is crucial for developing sustainable and effective strategies to address the challenges of food waste.

V. FUNCTIONAL REQUIREMENTS

User:

Step 1: First, the user has to sign up and register.
Step 2: Go to the homepage.
Step 3: If the user wants to donate food, they can donate by using donation page.

- If the user wants to donate food, they have to provide details about the food name, quantity of the food, and the location they are in (contact details).
- If they want to help people (orphans, roadside, etc.), they have to provide details and then collect the food to donate.
- Users can also donate waste food (to farms for animals), vegetable and fruit skins (for fertilizer).

Admin:

Step 1: First, register.
Step 2: Check/handle the details provided by the user.
Step 3: Be the mediator for the user. If they have any queries, clarify their doubts.

Delivery:

Step 1: If the user wants to receive food directly, they can do so.

VI. DATA PROCESSING

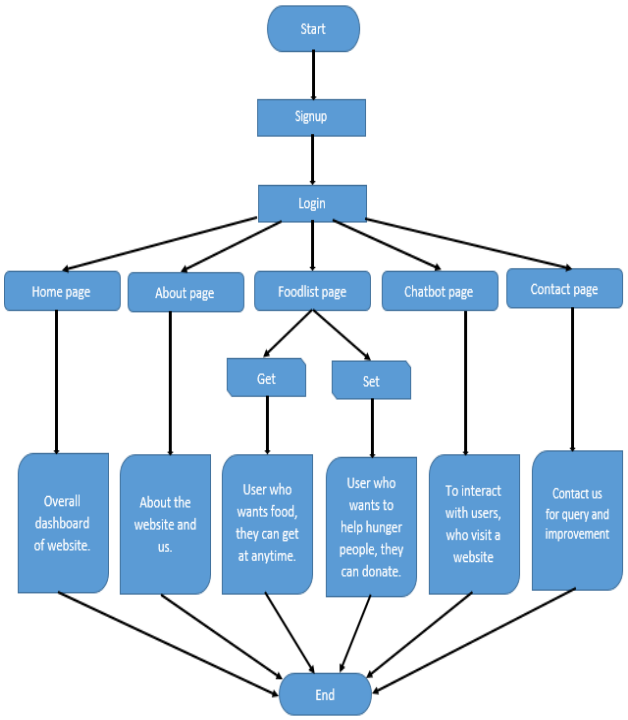

Fig.1: Flow chart for Food Waste Management System.

Data processing is integral to a food waste management system, involving the collection, integration, and analysis of data from various stages in the supply chain.

First, the user has to sign up and register. Next we login into our website. After login it will navigate to the homepage. If the user wants to donate food, they have to provide details about the food name, quantity of the food, contact details and the location by using set option. Users can also donate waste food to farms for animals, vegetable and fruit skins for fertilizer. If the user wants to receive food, then they can get food by get option. If users have any doubts, they can clarify their doubts by using profile card in about page to contact us. In the contact page users can send the queries or feedbacks for the improvement.

a) PHP

PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. PHP is a widely-used, free, and efficient alternative to competitors such as Microsoft's ASP. PHP is a programming language used to script websites that are dynamic and interactive. You'll find it in various types of web applications, from e-commerce websites to CRM systems like HubSpot and Salesforce. The term PHP stands for PHP Hypertext Preprocessor.

b) MySQL

MySQL is a relational database management system based on SQL – Structured Query Language. The application is used for a wide range of purposes, including data warehousing, e-commerce, and logging applications. The most common use for MySQL however, is for the purpose of a web database. MySQL is used to store data in tables that map to objects. Each table has a schema defining what columns each row of the table will have. Developers can reliably store and retrieve many data types, including text, numbers, dates, times, and even JSON.

c) HTML

HTML stands for Hyper Text Markup Language. It is the standard markup language for creating Web pages.HTML describes the structure of a Web page, it consists of a series of elements.HTML elements tell the browser how to display the content.HTML elements label pieces of content such as "this is a heading", "this is a paragraph", "this is a link", etc.

d) CSS

CSS stands for Cascading Style Sheets, and it's used to add style to a web page by dictating how a site is displayed on a browser. CSS is unique in that it doesn't create any new elements, like HTML or JavaScript. Instead, it's a language used to style HTML elements.

e) JavaScript

JavaScript is a scripting language used to develop web pages. Developed in Netscape, JS allows developers to create a dynamic and interactive web page to interact with visitors and execute complex actions. It also enables users to load content into a document without reloading the entire page.

VII. SYSTEM OVERVIEW

Fig.2: Index page

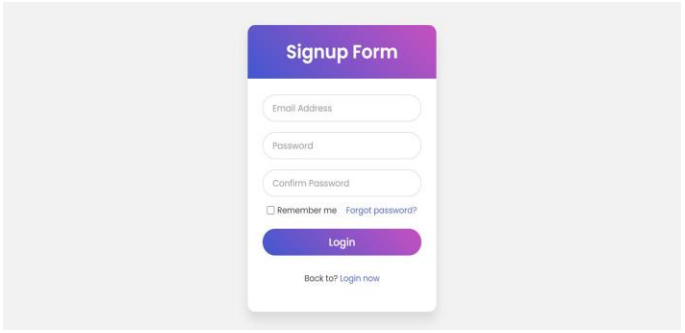

Fig.3: Signup page for admin

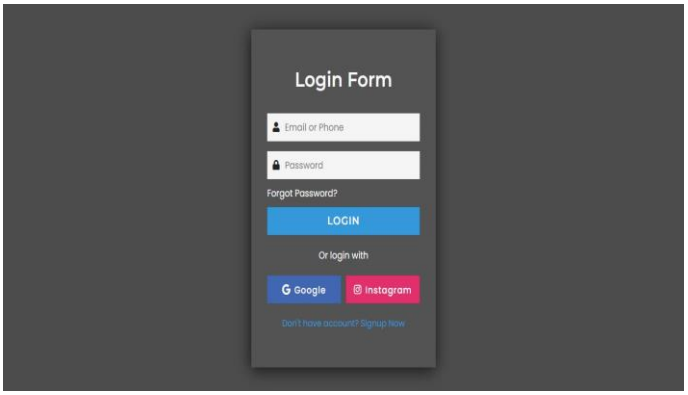

Fig.4: Login page for user

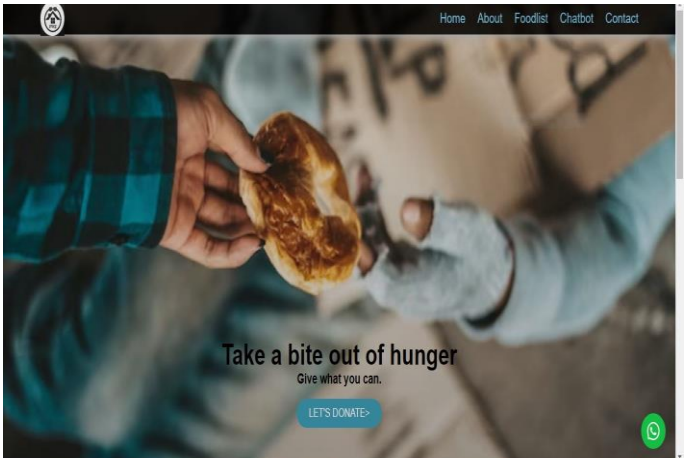

Fig.5: Home page

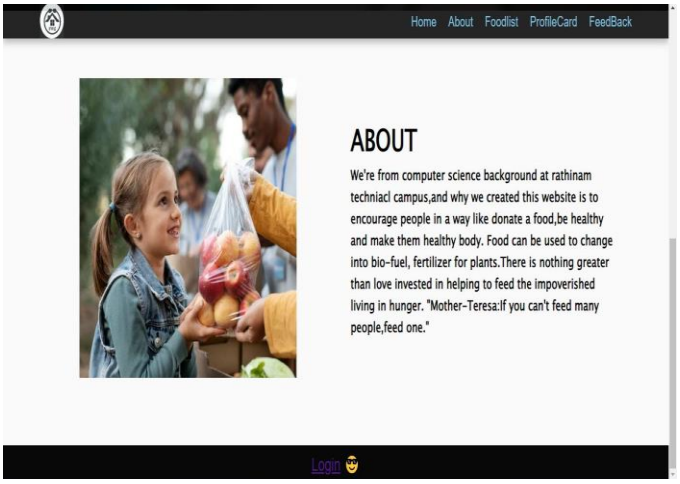

Fig.6: About page

Fig.7: Food list page

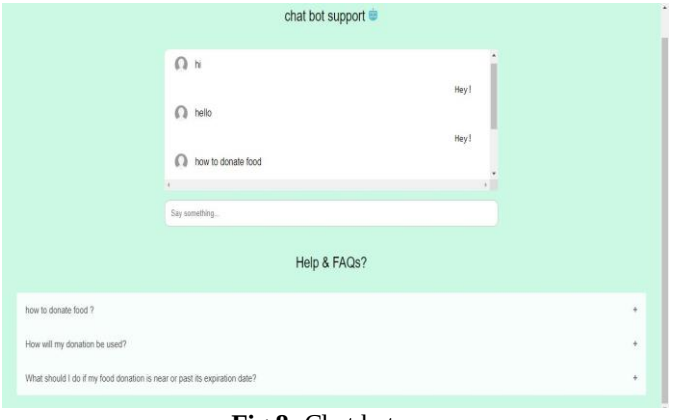

Fig.8: Chat bot

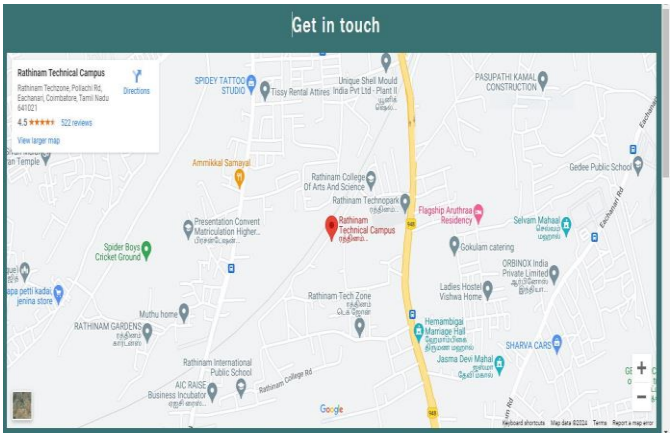

Fig.9: Contact page1

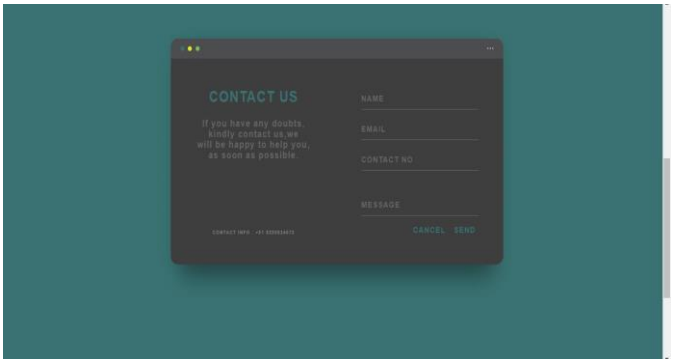

Fig.10: Contact page2

VIII. CONCLUSION

Implementing an effective food waste management system is imperative for addressing the environmental, social, and economic challenges associated with food waste. By adopting sustainable practices at various stages of the food supply chain, from production and distribution to consumption and disposal, we can significantly reduce the negative impacts on the environment, conserve resources, and alleviate societal issues related to hunger and inequality. In summary, an approach to food waste management is essential for building a more sustainable and resilient food system. Through collective efforts, we can mitigate the environmental impact of food waste, address social issues, and contribute to a more equitable and sustainable future for all.

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