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A Smart Solution for Minimizing Urban Food Wastage and Alleviating Hunger

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Abstract: *By tackling the urgent problems of food waste and community food insecurity, A smart solution for minimizing urban food wastage and alleviating hunger project aims to transform local food systems. The effort seeks to create a complete system for effectively gathering, classifying, and dispersing excess edible food through strategic partnerships with companies, eateries, homes, and community organizations. The initiative aims to redistribute excess edible food from establishments,eateries, and homes to individuals in need by forming alliances with neighbourhood food banks, non-profits, and community organizations. The system's incorporation of Blockchain Technology is a crucial feature that guarantees security, traceability, and transparency during the food redistributionprocess. Here, create a rudimentary blockchain network to evaluate whether blockchain technology can be used to monitor and log food redistribution transactions. Hashing is used in the creation and validation of blockchain nodes. A reliable strategy for gathering, organizing, and maintaining extraedible food is offered by this application. This will automatically deliver the notification by predicting the user's position and matching it with the donor's location. By utilizing Blockchain's transparencyand traceability capabilities, the system allows users to submit requests for food aid with specific needs. After reviewing the requests, possible donors have the option to approve or disapprove thembased on the surplus that is available and how well they meet the needs of the user. Once accepted, the user's information is shared with the donors, who then grant their final approval based on the amount of food that is available and the amount that the user requires. Notifications are sent promptly to users whose requests are denied, maintaining openness and controlling expectations during the redistribution procedure.*

Keywords: Application design, Donor Enrolment, User Enrolment, Food Request, Update Food availability, Blockchain Creation, Location Prediction, Quantity measurement, Request Process, Delivery Confirmation

I. INTRODUCTION

Utilizing Blockchain Technology, the Food Waste Management and Food Redistribution project offers a complete and inventive answer to the urgent worldwide problems of food waste and food insecurity. The goal of this project is to solve the worrisome inefficiencies in the food supply chain,which result in the wastage of large amounts of edible food while millions of people go hungry and malnourished. This project aims to transform the management and redistribution of excess food by utilizing the decentralized and transparent properties of blockchain technology in conjunction with tactical alliances with nearby food banks, non-profits, and community organizations. Fundamentally,the goal of this project is to develop a just and sustainable system that simultaneously reduces community food insecurity and food waste at the source. Surplus edible food that would otherwise go to waste is found, tracked down, and distributed to those in need through cooperative efforts with businesses, eateries, and homes. Using blockchain technology, the Food Waste Management and Food Redistribution method seeks to create a comprehensive and long-lasting system for managing food waste while alleviating local food inequality.

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1.1 Blockchain Technology

P2P networks are expanded upon by blockchain, which offers a universal data set that all actors may rely on, notwithstanding the possibility that they do not know or trust one another. Every network node stores encrypted and unchangeable copies of data, forming a shared and reliable ledger of transactions. Native network tokens are used as financial incentives to strengthen the network's resilience against attacks and collusion.

For the Internet, blockchain and related technologies offer a universal and transparent layer of accounting and governance. Every network user has instantaneous access to the same data. All actorsmay see the details of transactions occurring over the network and can determine where they came from. Blockchain can alternatively be thought of as a public, transparent, international governance system or a distributed accounting system. A transaction is recorded permanently on the blockchainwhen it is approved by the network through majority consensus.

If not, the transaction is declined and doesn't proceed. The only transactions regarded aslegitimate and final are those that have been added to the blockchain.

By using machine consensus, a Blockchain system allows peer-to-peer (P2P) value transactions without the need for an intermediary. It functions over the Internet on a network of computers that are all running the protocol and have an identical copy of the transaction ledger. Theblockchain is a shared, public database of transactions that keeps track of every transaction made from the first block, known as the genesis block, to the present day.

Because the blockchain will be overseen by a national body in the nation, consortium blockchain technology is being used in this study. The main building block of the blockchain is a block. A block is made up of a header and a body, with the transactions being written to the system located in the block body. The block's header comprises details about the block, such as its prior hash, nonce value, difficulty, and time stamp for both the transactions and the block.

II. RELATED WORK

De Boni, et.al,…[1] Give a summary of the social, economic, and environmental problems associated with food waste (FLW) in order to help policymakers prevent, reduce, and value food wastes throughout the food supply chain. In reality, identifying the hotspots and important points enables the development of customized policy measures that may enhance the food supply chain's sustainability and efficiency. This is done by taking into account the various production settings andusing an integrated strategy that involves all of the major players. FLW use up a lot of natural resources, including energy, nutrients, water, and land, which has an adverse effect on the environment. In actuality, they not only raise the price of producing food but also harm the environment by reducing biodiversity and depleting nutrients. For these reasons, calculating the financial and environmental costs associated with food loss and waste (FLW) seems to be a crucial step in developing sustainable alternatives and policies for food production and consumption [5]. Although a decrease in FLW is known to have a good impact on the environment, the extent of averted loss and waste, the point in the supply chain where the savings are generated, and the amount of money saved all have a significant role in these outcomes.

The primary method for evaluating the environmental impact of FLW is life cycle analysis (LCA), which can be applied bottom-up utilizing databases from specialized, in-depth inquiries or top-down using data from input-output tables. The effects of cultivation, such as soil degradation, loss of landscape features, loss of biodiversity, etc., are linked to the impact of agricultural land use.

Harvey, et.al,…[2] Through a data-driven examination of OLIO, a UK-based startups that runs a P2P, location-based food sharing website with over four million registered members globally(https://olioex.com/), the suggested solution seeks to close these information gaps. By connecting users who have edible but undesired food with other users who are interested in gathering and consuming it, the network helps reduce food waste. Despite being a for-profit business, users of OLIOare welcome to share all food, including food donations from nearby stores, delis, and bakeries. OLIOfunctions as a free online marketplace for "second hand" food, to put it another way. In order to evaluate the rebound effects of zero cost digital sharing economy platforms, we use the platform as an illustrative case study, focusing on the UK—the largest and most developed food-sharing network. We use data-science techniques, econometrics, and environmentally extended input–output analysis(EEIO) to estimate the extent to which rebound effects could potentially outweigh the predicted environmental advantages associated with sharing. Since we lack precise information on users' re- spending habits, we model rebound fewer than seven distinct re-spending scenarios. In particular, we quantify rebound related to

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re-spending, namely the environmental impacts incurred as collecting users re-spend the money they saved by sourcing free food through the platform. The introduction's next parts provide a succinct summary of pertinent research on rebound effects and food waste.

Furthermore, in order to facilitate this kind of assessment, a food waste prevention calculator grounded in life cycle thinking has been created. It identifies potential trade-offs early in the design process and consistently evaluates the economic and environmental advantages of such initiatives.

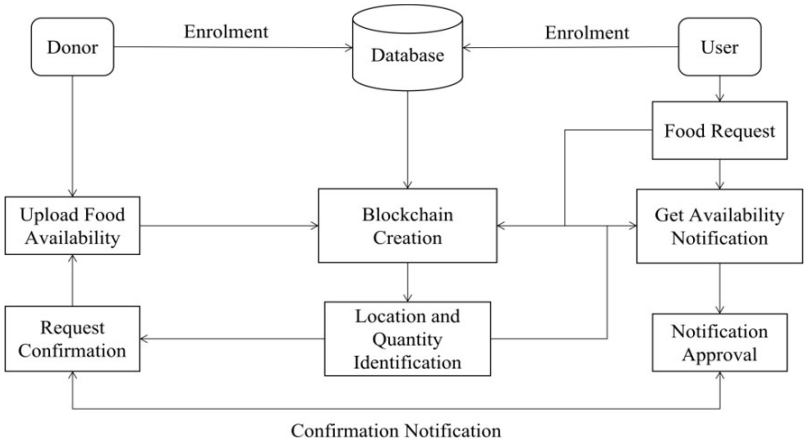
III. BACKGROUND OF THE WORK

In order to address food insecurity in their communities, a network of cooperative local businesses, individuals, and non-profit groups works together to redistribute discarded food to hungry people. It starts with companies and individuals proactively identifying food that is surplus but still edible because they understand the potential benefits of donating it to those in need. Instead of goingto waste, this extra food is put to good use in the battle against hunger.

Surplus food providers make sure that their gifts get to the people who need them most by maintaining open lines of communication with local non-profits, food banks, or community centers that specialize in food redistribution. This hands-on involvement promotes effective coordination andprompt food redistribution, reducing waste and optimizing its effects. Before donated food is given to those experiencing food insecurity, volunteers are essential in manually sorting and temporarily keeping it at distribution centers or local hubs. Although manual systems are less sophisticated than automated ones, their hands-on approach guarantees that every donation is given based on individual needs and handled with care. Additionally, by addressing a critical societal issue, the person-to- person impact of this strategy strengthens the social fabric by fostering a sense of communal supportand solidarity.

IV. PROPOSED SYSTEM MODEL

Using blockchain technology, this project offers a creative and sustainable way to address theurgent problems related to food waste. Through the use of blockchain technology, an open and safe system is created to track excess edible food coming from establishments such as restaurants, stores, and homes, guaranteeing effective use and distribution. The foundation of this program is partnerships with neighbourhood food banks, nonprofits, and civic associations, which enable the efficient distribution of excess food to low-income individuals and families. Businesses, eateries, andhomes register their excess food supply on the blockchain network to start the process. Access to thisdata is granted to pertinent parties, such as neighbourhood food banks and community organizations,and it is securely stored. After that, anyone in need of help can peruse the postings for excess food that are available and make requests based on what they need. The blockchain system automaticallysends the user's information to the appropriate donors upon receiving a request. Donors can examine the request to ascertain the amount of food that is accessible and the amount that the user requires. By ensuring a transparent exchange, excess food is dispersed fairly and effectively, reducing food insecurity in the community to the greatest extent possible.



This approach improves accountability, transparency, and confidence throughout the food redistribution process by utilizing blockchain technology. Moreover, it encourages improved coordination and collaboration amongst stakeholders,

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which eventually helps to create a food system that is more robust and sustainable. This project offersa potential strategy for tackling the pressing problems of food waste and poverty through the smooth integration of technology and community involvement.

APPLICATION DESIGN

The program's general design, including its user interface (UI) and application processing, is coveredby this module..
Its main goal is to provide an interface that is simple to use and intuitive for both users who are asking food aid and contributors.
Creating interfaces for notifications, food request submission, surplus food details display, and donor enrolment are important components.

DONOR ENROLLMENT

Donor enrolment in the system is managed by this module.
It has features including profile creation, donor credential verification, and registration.
Information from donors includes their location, the kinds of extra food they can give, and theiravailability.

RECIPIENT MODULE

This module contains functions to input and update data on surplus food products, such as type, quantity, expiration date, and quality
It is in charge of managing and displaying details about surplus food available for donation.
This module allows donors to list excess food products they have and make them available fordistribution.

BLOCKCHAIN IMPLEMENTATION

To give food redistribution transactions transparency and traceability, this module incorporates blockchain technology into the system.
It has features for generating, preserving, and searching blockchain entries about food requests, donations, and transactions.
Because blockchain maintains records' immutability, it increases systemic confidence andaccountability.

COMMUNICATION

This module manages the system of automated notifications that links users in need with surplusfood.
By predicting user locations and matching them with donors in the area, it notifies donors aboutpossible receivers.
The application itself allows for the sending of notifications via SMS to guarantee promptcommunication.
It has features for submitting, reviewing, and processing user requests according to information onsurplus food and donor availability.

Blockchain Technology

Blockchain is an open, trusted, shared ledger of transactions that is not controlled by any one personbut is accessible to all.. There exist three distinct varieties of blockchain technology: public, private, and consortium. Public blockchains like as Bitcoin and Ethereum, allow anybody, anywhere, to joinand receive relief whenever they choose. These intricate mathematical functions serve as evidence for this. The company's internal public ledger is called the private blockchain, and access to it is only authorized by the blockchain's owner. Because there are fewer nodes in the private blockchain thanin the public one, block creation and mining speed are significantly faster.
In a Blockchain, each block consists of following headers.

Previous Hash:

This hash address locates the previous block.

Transaction Details:

Information about every transaction that must take place.

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Nonce:

An arbitrary integer used in cryptography to distinguish the hash address of a block.

Hash Address of the Block:

A hashing algorithm is used to send the previously mentioned data, including the nonce, transaction details, and previous hash. This generates an output with a length of 64 characters (256 bits), whichis referred to as the unique "hash address".

Block and Hash Generation

1. A block with details on the transactions that are happening right now.
2. Every data set produces a hash.
3. A hash is a string of numbers and letters.
4. Transactions are entered in the order in which they occurred.
5. The hash is dependent on both the current transaction and the hash of the prior transaction.
6. A transaction's slightest modification generates an entirely new hash.
7. The nodes examine the hash to ensure that a transaction has not been altered.
8. If a transaction is approved by a majority of the nodes then it is written into a block.
9. The Blockchain is made up of all the blocks that are referenced by one another.
10. Because a blockchain is distributed among numerous computers, each of which has a copy ofthe blockchain, it is effective

V. EXPERIMENTAL RESULTS

The proposed waste food redistribution project was implemented in mobile application. This will help both donors and users to make communication in transparent and secure way. The results of theproposed project implementation was given below,

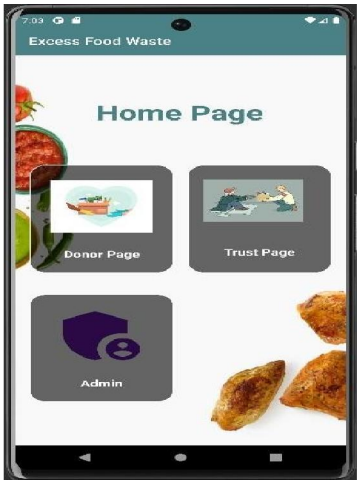

Fig.3 Home Page

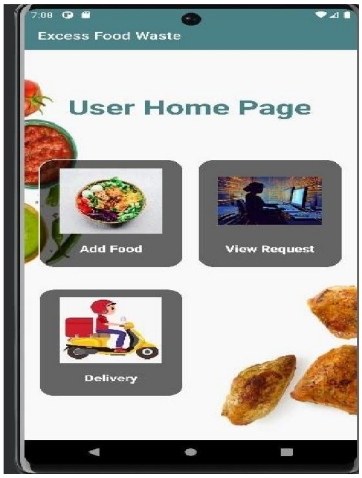

Fig .4 Donor Home Page

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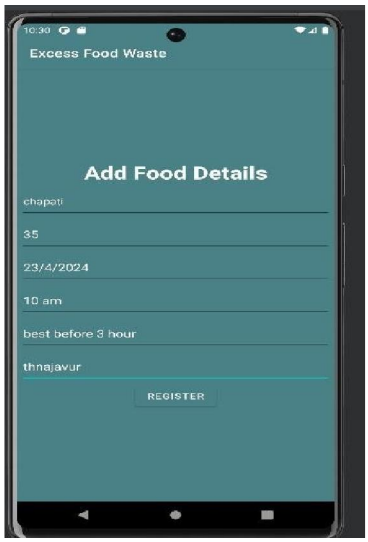

Fig .5 Add food details

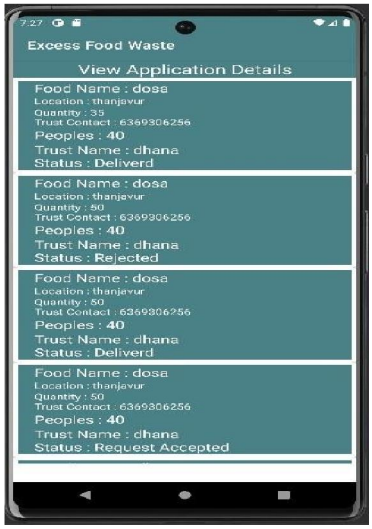

Fig .6 View Request Confirmation

VI. CONCLUSION

To sum up, the application of blockchain technology to food redistribution presents a revolutionary way to address the problems of hunger and food waste. This project guarantees effective usage and redistribution to those in need by offering a transparent and safe platform to track excess edible food from companies, eateries, and homes. Collaborating with nearby food banks, charitable organizations, and community groups amplifies the efficacy of this endeavor by cultivating a network of assistance and togetherness among the community. Automated communication between users and donors facilitates the fair distribution of excess food, optimizing its impact on reducing food insecurity. This project is a prime example of how cutting-edge technologies may spur constructive social change and create a more resilient and sustainable food system that serves everyone.

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