# Blockchain enhanced automated ration distribution system : A smart approach to distribute ration

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*Abstract*—**In India Ration card is very essential for every homestead and needy people but there are a lot of problems in the existing distribution system which comes out with inaccurate distribution and even corruption in grain distribution. The "Automatic Ration System Using IoT" is a solution designed to automate the distribution of food grains, helps to minimize the corruption and inaccurate distribution and minimize the human effort by automating the distribution system of grains to people below the poverty line, based on the allocation provided through a ration card system. Utilizing the ESP8266, the system connects to the internet to manage data and automate the process. The user authenticates themselves using a fingerprint scanner, which is linked to a central database that verifies the user's identity and checks their allotted quota. After verification, the user selects the grain type they want to dispense from two available grain dispensers. Each grain is dispensed based on the user's entitlement, as measured by a load cell, ensuring accurate delivery. The data is displayed on an LCD screen for the user to review and is stored on a web-based system created using React for real-time monitoring and tracking. This platform helps in maintaining logs of distribution, managing user records, and ensuring accountability for both users and ration store managers. The system ensures transparency, reduces fraud, and improves the efficiency of ration distribution in public welfare programs.**

*Index Terms—Automated System, Real-time Monitoring, Fraud Prevention Digital Identity Verification Efficient Distribution*

## I. INTRODUCTION

The traditional ration distribution system in India faces several challenges, some of them includes

A. Corruption and Leakages
Diversion of food grains and other essential items provided for beneficiaries is common, that leads to significant losses in system.

B. Inefficiency in Targeting
Identifying and reaching the right people can be a problem. Many eligible households are often excluded, while the ineligible ones may receive the benefits.

C. Technological Gaps
Many states lack robust digital systems that tracks and manage ration, contributing to inefficiencies.

D. Awareness and Literacy Issues
Beneficiaries may not be aware about their rights or the processes involved.
Addressing these issues is crucial to improve food security and ensure that the benefits reach those who need them most.
Smart Ration Automated Distribution System is a technology solution aimed at improving the public distribution system (PDS) performance, cloud computing, transparency and accessibility )Biometric authentication, and real-time data analytics to be combined. In traditional ration distribution systems, manual processes can lead to inefficiencies and fraud. The Smart Ration System digitizes the process by integrating fingerprint-based user identification and precise grain dispensing. It ensures transparency and accuracy in ration allocation, reducing human error and improving overall efficiency.

E. Some Special Features:
1. Biometric authentication
Smart ration distribution systems often use biometric identification (fingerprint) to ensure that only eligible beneficiaries are entitled to benefits, reducing fraud and corruption.
2. Automated Dispensers
These automateddispensing devices or system allows beneficiaries tocollect their rations (such as rice, wheat, sugar) hands-free do not requires any human resources.

3. Reducing leakage and corruption
Monitoring and certification reduce opportunities for corruption, ensuring that benefits reach to those who need them most.

4. Efficiency
Automation reduces human resource, speeds up the process and reduce manual errors or delays in food delivery.

5. Convenience for beneficiaries
this automated ration distribution system provides time flexibility, that allows beneficiaries to receive their rations at their convenience.

6. Data Security
It manages sensitive personal data such as biometric information of people which requires robust security measures to prevent the data breaches.

7. Digital literacy
Especially in rural areas, beneficiaries may face challenges in interacting with the digital networks or understanding that how automated systems work.

In summary, the smart ration automated distribution system can transform the public distribution process by making them more safer, much more efficient and transparent, which ultimately improves service delivery to the people , especially in low-resource settings.

## II. LITERATURE SURVEY

A multi-mode biometric authentication distribution system that uses a smart card and a mark filtering process is designed to tackle invention and improve the efficiency of its users. It requires to store the collected data in a cloud computing system. Through a focus cloud computing, the system can maintain a simple and straightforward record of its users' activities. [1].

A GSM technology works by allowing a central server to communicate with an installed circuit, which enables real-time control and exchange of information. The use of an embedded circuit is considered essential when it comes to establishing a system. The system is also responsible for managing and controlling various services, such as storing and digital communication. A technique that involves the use of an Aadhar card instead of a traditional ration card will allow your customers to gain easy and convenient access to their data. [2].

A hardware-based software system called HOG uses a combination of various sensors and software to identify the face and determine the appropriate ration for each

family member. It takes 128 measurements to detect the face and dispenses the correct amount according to the user's preference. One of the main disadvantages of this system is that other family members might not get the correct ration as the face would not match. [3]

The structure of a biometric device that uses smart cards in a public distributed system allows it to implement a smart card for every member of the family. A resident of a country or a city can use to get information on a particular point of interest or in general to know the overall stock available in a smartcard data. After every exchange, the stock gets decreased, and the resident gets an email and SMS from the government regarding the number and time of items that they bought with the item id. This information is then transferred to the principle database. The cards are additionally checked using the native's finger impression. Every member of the family has to have their unique finger impression taken to see if they are smartcard holders. The card is asked for and the designated things are taken. [4]

Through a GSM system, customers can easily access and update the status of their ration distribution quota and the available commodities. The central agency has the ability to regulate and alter the allocation of consumers and wireless data. [5]

A. Proposed Model
User Identification: The system uses a fingerprint sensor to identify the user. This eliminates the need for manual verification, ensuring only authorized users receive ration.

Data Processing: After the fingerprint is verified, the system checks the user's allocation details in the Firebase database.

Grain Dispensing: A load cell connected to an ESP8266 measures the weight of the grains. Based on the user's allocation, grains are automatically dispensed to the correct amount.

Real-time Data Update: The ESP8266 communicates with Firebase to log user data, ration amounts dispensed, and update the frontend in real-time.

User Interface: The frontend, built in React, shows the user's ration allocation and consumption history.

B. Database Detailed Structure
- User ID: Unique identifier based on the fingerprint.
- Name: User's name.

- Fingerprint Data: Encrypted fingerprint data.
- Allocated Ration: Quantity of ration allocated to the user.
- Remaining Ration: Remaining amount after each withdrawal.
- Dispense Data: how much grain dispensed
- Transaction ID: Unique transaction identifier.
- User ID: Linked to the user who received the ration.
- Grain Type: Type of grain dispensed.
- Weight: Amount dispensed.
- Date Time: Timestamp of the transaction.

C. Future Innovation and Direction

Enhanced Security: Future systems could use facial recognition in addition to fingerprints to improve security further.

AI-based Ration Prediction: Implement AI models to predict ration needs based on consumption patterns, allowing better planning and allocation.

Blockchain Integration: For transparency, blockchain can be integrated for transaction security, ensuring tamper-proof records.

Expanded Sensor Integration: Integrating additional sensors for temperature and humidity monitoring could ensure grain quality is maintained throughout the process.

## III. ANALYSIS OF LITERATURE SURVEY

A. Challenges and Limitations

The literature review reveals that while the individual components of a smart ration automated distribution system have been extensively researched, the main challenge is to develop a user-friendly mobile applicationthat is efficient and informative collected in the. In addition to providing personalized services based on user preferences or usage patterns, privacy and security of user data is important, as sensitive information such as personal data will be collected information and use cases mouth.

Developing sophisticated smart rationingsystems that integrate advanced sensors, wireless technology and static mobile applications will be a major barrier to entry due to high technical and infrastructure costsA careful balance of costs is required its material preferences and operational limitations may limit the capabilities of somesystems.

Successful implementation of smart rationautomated systems will depend on building aresearch foundation, addressing technology integration gaps, and ensuring system reliability and public acceptance.



Fig1. Smart Ration Automated System.

## IV. RESEARCH METHODOLOGY

A. Power Supply

A microcontroller and its associated components receive power from an AC adapter. But, this type of device does not have any internal components that can supply the required voltage, and the main switch's excessive supply is unsuitable for use with electronic gadgets.

B. DC Motor

DC motor are electrical machine that convert mechanical energy into electrical energy. They work on a principle. that "Current carrying conductor placed in a magnetic field which gives forces and this force can be used to rotate the motor." Hence it is called the principle of electromagnetic induction or electromagnetic force

C. Load Cell

A load cell is a crucial component in weighing and measurement systems, as it converts the applied force or weight into an electrical signal that can be processed and measured. The application of the use of HX711 is efficient and effective since it is an integrated circuit designed for use in load cell applications to convert an analog signal to a digital value with high levels of accuracy.

D. Demand Forecasting

- $D_t = D_{t-1} + \alpha(S_t - D_{t-1})$

o  Dt = Demand at time t
o  Dt−1 = Demand at the previous time period StS tSt
   = Supply or available resources at time
o  α\alphaα = Smoothing factor (0 < α\alphaα < 1)

E. Inventory Management
Optimize inventory levels to minimize waste and ensure availability.
It=It−1+St−Dt
It = Inventory at time t
It−1 = Inventory at the previous time period
St = Supply received at time t
Dt = Demand at time t
Supply chain have two gain options for channel A: 64 or 128., The input voltage of the system is 40mV or 20mV.
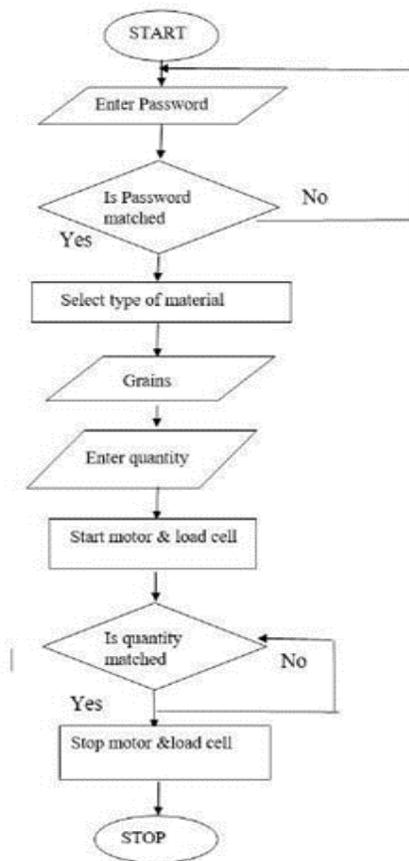


Fig 2. The Smart Ration Flowchart.

F. Fingerprint Scanner
Fingerprint Sensor R305, the fingerprint scan of the user. This allows it to wrap up the enrollment process and allow the user to get ration. When the user has registered their fingerprint, they will be prompted to put their finger on the scanner. If the scan is successful and the stored fingerprint matches, a new user is register through a fingerprint scanner.

G. Microcontroller
Microcontroller used the system of Arduino Mega2560, which is known as the heart of the system. It is based ATmega2560 controller and board are physically superior. It is responsible for handling all the activities related to the environment. depending of input data from the sensor.

H. GSM
Automated Ration Distribution System abbreviated as ARDS focuses on creating an efficient, secured and fair means of distributing ration to the beneficiaries using GSM communication & real time feedback. We set the GSM module to be able to connect with the GSM network link. It also features modules that could encrypt and that could decrypt the data thus secure communication.GSM module also handles the encryption and decryption of data
The theme of this project is to automatically ration distribution by the user with real time feedback. The two components of this methodology are the design structure and the experiments. The first one involves gathering together the various components of a hardware system and their specifications. The experiments are then conducted to develop a system that will give a fair and equitable distribution of ration to the needy to the beneficiaries.

V. FUTURE SCOPE

This improvement can be used in various areas of the application apart from the traditional ones. For instance, it can be utilized in supermarkets and malls to process orders more efficiently. This system can also help organizations save money by allowing them to select a large number of products from a single controller. Some government or organization may decide to install this system due to its potential profitability.

VI. CONCLUSION

The ration blockchain-enhanced automated distribution system applies the smart characteristics that enhance transparency and efficiency with accountability in the management of resources. Smart contracts automate processes that are faster, more

secure, and cost-effective to ensure equitable access to resources. This system will allow the consumers to receive real-time updates about the status of their ration and provide them with the necessary details to get their entitlements. It is very beneficial for the government as it can prevent corruption and improve the market sector. The main advantage of this system is that it will allow the customers to get their entitlements in a more timely manner.

## REFERENCES:

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