

# Smart Ration Card System Using IOT and Machine Learning

Sakshi Ingale, Siddhi Teli, Priyanka Jadhav, Shravani Halake, \*D.K.Kamble Sir

*Student, Computer Engineering Department, K.P.Patil Institute of Technology (Poly), Mudal*

*\*Guide, Lecturer, Computer Engineering Department, K.P.Patil Institute of Technology (Poly), Mudal*

**Abstract— This project aims to enhance the Public Ration Distribution System by making it fully automated, transparent, and corruption-free. It uses IoT devices to dispense rationed items accurately after verifying the user through an RFID Card. Every transaction is recorded online in real time. Machine Learning studies this data to predict future demand and detect any suspicious or fraudulent activity. A web app allows users and officials to track stock and transactions at any time. Overall, the system ensures fair distribution of government-subsidised goods, reduces fraud, and supports the Digital India mission.**

## I.INTRODUCTION

In India, the government offers essential food items such as rice, wheat, and sugar at subsidised prices through a ration card system, aiding those unable to afford market rates. However, this system faces issues including fake ration cards, corruption, inefficiencies, and poor record-keeping. The proposed Smart Ration Distribution System utilises technologies like Arduino Mega for hardware support, IoT for automated monitoring and dispensing of food grains, and machine learning for data analysis and fraud detection. This system enhances transparency, ensures fair distribution by verifying identities via Aadhaar, and enables users to track their rations through an app, all while storing data securely in the cloud. Registration involves users providing their information to an administrator, who verifies it and adds the details to a Google Spreadsheet, facilitating efficient management.

### ◇ How These Technologies Help :

This smart system makes ration distribution fair and automatic. Users verify their identity through Aadhaar or fingerprint, and the machine gives the exact ration amount, preventing cheating. All records are stored online, so everything is transparent. Machine Learning predicts how much stock is needed and finds fraud. People can check their ration details through an app, and officials can manage stock easily.

Overall, it saves time, reduces corruption, and ensures fair distribution.

## II.LITERATURE SURVEY

The paper by Balasubramani A and Sunil Kumar H U titled “Cashless Automatic Rationing System by Using GSM and RFID Technology” (IEEE ISMAC 2018) introduces an automation process for ration distribution utilising GSM and RFID technology. This system aims to minimise human interference in the distribution chain, which helps in reducing errors and corruption. Users can access their rations anytime through an RFID card, which, when scanned, allows a microcontroller to verify account balances and dispense the correct amount of rations.

In another article titled “Ration Distribution System in a Panchayat Level Using Automatic Dispenser” (IEEE MysuruCon 2022) by Naveen B, Ajay M R, and Akash H M, the authors present a panchayat-level ration abandonment project that implements an OTP verification system for users. This mechanism aids in preventing theft by shop workers and ensures that users receive the correct quantity and quality of materials, also sending an OTP to the registered mobile device before ration receipt.

Furthermore, Pranjali Pedwal and Ms Shubhangi Borkar outline in their work “Real Time Automatic Ration Material Distribution System” (IJCSMC 2016) a system that connects ration shops to government authorities via GSM technology. The system allows for real-time updating of stock data, ensuring retailers can automatically communicate inventory levels to the government and preventing the illegal sale of rationed materials.

### III. BLOCK DIAGRAM

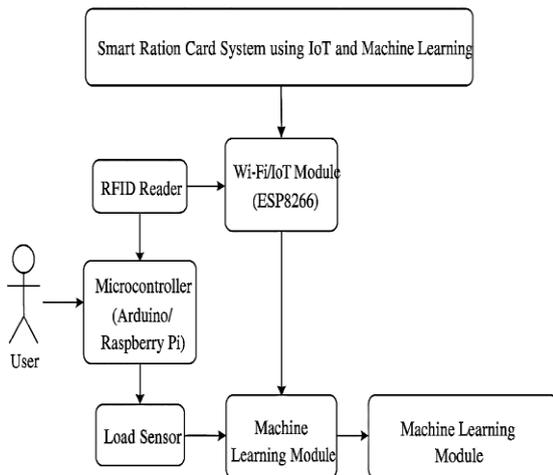


Fig 1..Block Diagram[2]

The block diagram of the Smart Ration Card System consists of the following major components:

- RFID Reader: Scans the smart ration card to identify the user.
- Microcontroller (Arduino/Raspberry Pi): Acts as the control unit, processing signals from sensors and sending data to the cloud.
- Load Sensor: Measures the quantity of ration being dispensed.
- Wi-Fi/IoT Module (ESP8266): Enables communication between the hardware system and the cloud database.
- Database Server: Stores user profiles, ration data, and transaction logs securely.
- Web Application/Dashboard: Allows administrators to monitor stock and generate analytical reports.
- Machine Learning Module: Analyses collected data for predictions, anomalies, and optimisation

### IV.METHODOLOGY

This Smart Ration Card System streamlines the process of distributing ration items, making it easier, faster, and more secure. When a new user wants to join the system, they provide basic details like name, address, and phone number to the administrator, who checks the information and adds it to a Google Spreadsheet database. The user then receives an RFID-based smart ration card.

At the ration shop, the user just scans their RFID card. The system checks their details in the cloud database and sends an OTP to their registered mobile number

for security. After the OTP is verified, the machine automatically dispenses the correct amount of ration and updates the data online. This reduces manual work and prevents fraud.

The system also uses Machine Learning to study transaction patterns. It can detect suspicious activities like using the same card many times or excessive ration claiming. ML also predicts future stock requirements based on past data and seasonal needs

#### A. Implementation:

1. Each beneficiary receives a smart ration card embedded with an RFID tag.
2. At the ration shop, the user scans their card at the IoT device.
3. The device verifies the user's details via the cloud database.
4. Once verified, the IoT controller dispenses the allocated ration using automated valves and updates the database in real-time.
5. The machine learning model later analyses transaction data to identify unusual usage or potential fraud and to forecast future demand

#### B. Machine Learning Use Case

##### • Fraud Detection Model:

The ML algorithm monitors data patterns such as multiple uses of a single ID, usage from different locations or excessive ration claims. If abnormal behaviour is detected, the system flags it for review.

##### • Demand Prediction Model:

The ML system forecasts the amount of stock required in upcoming months based on historical data, seasonal patterns, and population size.

#### C. Results and Outcomes

After implementation (pilot testing in a sample region or simulation), the system achieved:

- Elimination of fake card usage through RFID verification.
- Automated data entry, reducing manual errors.
- Real-time monitoring of ration transactions.
- Data-driven decision-making using ML analysis.
- Increased transparency between the government, dealers, and beneficiaries.

### V. MODULE DESCRIPTION

1. Biometric

A biometric scanner reads your unique body features, like fingerprints, to confirm your identity. Instead of using a password, your body itself becomes the key to access a system.



Fig2. Biometric[2]

2. RFID

RFID uses small tags and readers that communicate wirelessly. The reader sends radio waves to the tag, which responds with stored information like an ID. Tags can be battery-powered (active) or powered by the reader's signal (passive).



Fig.3 RFID [1]

3. ArduinoMega

The Arduino Mega is a popular microcontroller board used to control electronics. It has many input/output pins to connect sensors, displays, or other devices and runs programs to operate the system. It can be powered by USB or batteries.



Fig.4 Aurdino MEGA[2]

4. LCD

An LCD is a screen that uses liquid crystals to show

information visually. You see these displays in devices like phones, TVs, and monitors.



Fig.5 LCD[3]

5. Load Cell

A load cell measures weight or force by turning pressure into an electrical signal. The harder you press, the stronger the signal, which helps measure things like the exact weight of items



Fig. 6 Load Cell [4]

6. Keypad

A keypad is a set of buttons arranged in rows and columns that lets users enter numbers or commands. It's commonly used in devices where you need to input information manually.



Fig .7 Keypad[3]

VI.MERITES

- Increased security through biometric verification: Aadhaar-based system ensures secure and accurate customer identification, minimising fraud.
- Accurate ration distribution: Automated dispensing system provides precise ration amounts based on eligibility, eliminating human error.

- Real-time tracking and transparency of data: IoT enhances data transparency and accountability, preventing manipulation and discrepancies in stock.
- Decreased corruption and unauthorised manipulation: Automation reduces human intervention, lowering the chances of corruption and unauthorised data modifications.
- More efficient stock management: Real-time monitoring and automated updates optimise inventory management, minimising waste.
- Improved user experience with OTP-based security: OTP authentication enhances system security and offers a convenient method for users to access allocated rations.

#### VII.ABBRIVATION

- ✧ RFID Radio-Frequency Identification
- ✧ GSM – Global System for Mobile Communication
- ✧ IOT – Internet of Things
- ✧ MCU – Microcontroller
- ✧ OTP – One Time Password

#### VIII. CONCLUSION

The Indian government has introduced the Smart Ration Card System to modernise its public distribution system by replacing outdated manual processes with automated system. The Smart Ration Card System, using IoT and Machine Learning it is the public distribution system's automated process. It ensures fair distribution of government resources, improves efficiency, and reduces corruption. The integration of biometric authentication, IoT devices, and ML prediction models makes the system reliable, secure, and intelligent. By providing real-time monitoring and data-driven insights, this project helps government departments make better decisions, reduce wastage, and ensure that benefits reach the right people. This system is a practical example of Technology for Social Good and supports the Digital India initiative. The new Smart Ration Card System will efficiently and effectively provide essential commodities to all beneficiaries, increase operational accuracy and restore public confidence in the ration distribution system.

#### REFERENCES

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