

# RFID Based Smart Card Ration Distribution System

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**Abstract**— This document provides an automated system for distribution of commodities using smart cards to reduce corruption or increase transparency in the country. There are several documented problems in the current PDS system, including lack of transparency, lack of accountability, poor governance, weak services, and corruption at all levels. To solve this problem, this paper has addressed this problem using RFID and GSM. In this report, RFID cards are introduced. RFID cards substitute ration cards, this consists of all card holder details such as family member details, card type and validity and many more. Through this system, transparency will be increased because of the GSM technology and every consumer will have a unique RFID card. The customer database will be processed and stored within the Arduino microcontroller.

**Index Terms**— Transparency, Arduino, Microcontroller, GSM & RFID

## I. INTRODUCTION

### A. General

India's PDS is the world's most comprehensive and densest distribution network of commodities. It gives a ration card (nowadays) issued by the state and federal governments. Most individuals have a ration card that they use to buy goods from ration stores. There is a manual process by which you can get your allotted ration. Manual check by the allotment seller, after which the goods will be sent via the measurement instrument with the assist of an assistant. But this system has a weakness, first, the readings of the goods might be false due to person error, wrong intention, and second, the remaining goods will be sold to other private retailers if the government or customers do not purchase them at the end of the month.

Through this document, an automatic ration distribution system based on radio frequency identification is proposed to avoid the inconvenience of GSM and keypad. The Smart Ration Distribution System uses a unique RFID based smart card, like a metro card. Each card has a unique number, household information, a photo identification of the head of the household and a mobile phone number registered in a centralized system. After Scanning, the user has to enter a unique code, then the SG90 servo-motor system allows the precise distribution of the indicated amount. By following the steps below, the monthly quota available for each item is automatically updated in the database. To ensure transparency, recorded transaction details are sent via text message to the registered mobile number associated with the smart card. To ensure security, ration shop vendors cannot access the back-end database.

The main goal of this system is to distribute articles accurately according to the quantity specified by the user. The child's motor-based release eliminates the risk of accidentally using the wrong weight. The data is actually updated in the

backend database, helping to track the total amount of each item and prevent black marketing. Automated text messages sent to registered mobile numbers help consumers monitor their monthly allotment budgets and keep the system transparent.

### B. Literature Survey

Sharma, K. et. al. "Multi-Modality Biometric Assisted Smart Card Based Ration Distribution System" authors Said that it uses fingerprint scanning and facial identification. A database is required that will store records of the user's purchase history. They use a cloud system to maintain transparency and allow users to access data records in other retail stores [1].

S. Hanamat, M. Mukhedkar "Atomization of Rationing System" authors stated that he proposes to atomize the distribution system in that ration shop, keep the database in a central monitoring centre and update the data so that shop owners cannot cheat the public. Cards are used to authorize authorized users. GSM is used to update [2].

K. Wakade, et. al. "Smart Ration Distribution and Controlling" authors said that these people use the method of PDA devices and tax instead of current ration cards. In this case, the device authentication card provided by the government, e-card is used as a bank credit card/debit card to swipe and get particulars [3].

Valarmathy, R. Ramani, et al. "Automatic Ration Material Distribution Based on GSM and RFID Technology", authors said that distribution of ration materials is automated using RFID and GSM based system. To exploit the interest of the government consumer, he has to scan a card using a RFID Sensor to get the particulars of the items allotted to the user, then a microcontroller system verifies the details of the consumer and the amount allotted to the customer. Quantitative particulars are displayed after confirmation the customer can then select the required material using an

consumer interface. After getting the order, the controller sends the data to the authorities and customers via GSM technology [4].

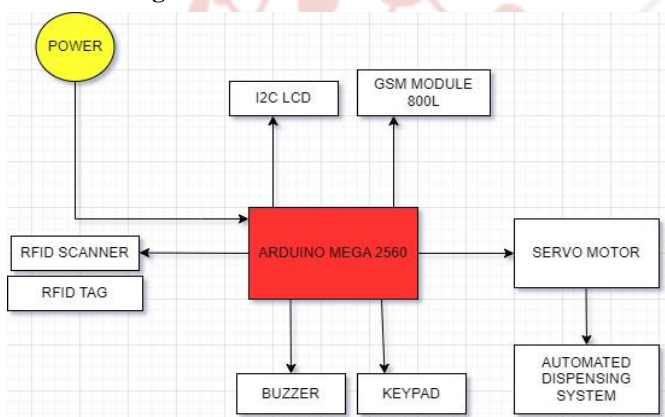
Dr. M. P. Rajesekaran, et.al proposed an “Automated Smart Ration Distribution System for Prevention of Civil Supplies Hoarding in India”. In this case, the system uses smart electronic measuring devices. Data related to transactions will be digitized using an Arduino microcontroller that accurately calculate the product and continues to update the inventory and database [5].

S. B. Parsewar, P. P. Polawar, et al. in the “Automatic Rationing System” authors said that corruption and forgery has been going on for a long time and if the government does not know how to efficiently fight it, corruption will remain damaging in near future. The purpose of this paper is to organize and summarize existing work on corruption, forgery and identifying opportunities for further research. The PDS can be modernized with the help of computerization. This paper discusses various types of strategies adapted to use ICT to maintain leakages and in delivery mechanisms. 0.78million farmers immediately received computer generated cheques as a result of this project. The PDS ratio of ordinary people increased in surveillance [6].

M. Agarwal, M. Sharma, et.al has proposed “Smart Ration Card Using RFID and GSM’s”. In this paper, they used RFID tags that contain the details of family members and the customer needs to show this tag or card to the RFID reader. The on-board micro-controller verifies user authentication. If the user is found to be genuine, they will give the grain materials to the customer based on the number of families [7].

**II. METHODOLOGY**

**A. Block Diagram**



**Fig. 1.** Block diagram

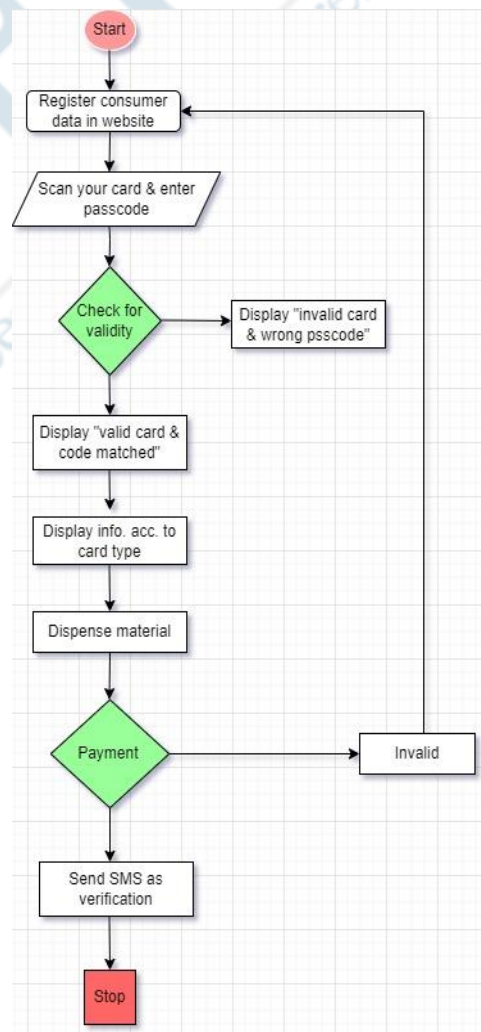
**B. Advantages**

- Contribution to Digital India platform
- Remove Malpractice
- Accurate Measurement
- User friendly
- Provide transparency between government & customer.

**C. Algorithm**

1. Start & register the consumer data in database at our back-end office.
2. Now, at the ration shop, scan your RFID card.
3. If it is valid, then enter the passcode. Otherwise, it will show invalid.
4. If code is not matched It will display not matched. Now repeat step 2 again.
5. If it is matched. Now you have the option to change the passcode by press # (If you want to change otherwise continue with previous passcode).
6. After right scanning & correct passcode. It will display consumer details that had stored in database.
7. Now dispense material according to consumers card type.
8. Now receive payment in cash.
9. In the last, a SMS is sent on consumer registered mobile number.
10. Stop

**D. Flow chart**



**Fig. 2.** Flow Chart

**III. COMPONENT DESCRIPTION**

• **Arduino Mega 2560**

Arduino Mega is a type of micro-controller with model number ATmega2560 and having 54 digital Input/Output pins (15 of them are used as PWM outputs), 16 analog outputs, 4 UARTs , a USB connection port, a power connector, and a tiny reset button. It includes everything you have to support the microcontroller, just connect it to a computer or laptop via USB A to B cable, or run it with an AC-to-DC adapter or battery to get started. In this proposed system that contains ground, 2 analog pins, 5V and 3.3V, 18 digital pins.

• **I2C LCD Module**

The I2C module is equipped with an integrated PCF8574 I2C chip, which converts I2C serial data to parallel data for the LCD display.

• **16\*2 LCD Display**

It has 16 columns and 2 rows (16\*2). This display is mainly based on multi-segment light emitting diodes. These LCD modules are inexpensive and programmable. That's why it's used in a variety of DIY circuits, hardware, and embedded projects.

• **Servo Motor - Sg90**

Servo Motor SG90 is an electric device used to push and rotate an object with high accuracy. The position of the servo motor is determined by the electric pulse and the circuit is built on it. The automatic dispensing system is controlled by servomotors for precise rotation and positioning of product delivery dispensers.

• **RFID Card**

RFID cards receive, store and transmit data using radio waves using an RFID reader. RFID cards have different physical characteristics and are used for specific applications. It has a reading distance of 3 cm.

• **GSM (Global Sim Modulator): 800L**

The GSM SIM 800L module is a GSM modem. You can use this module to do anything that a normal dialer can do; Send a text message, make a phone call or more.

**IV. SIMULATION**

**A. Software**

• **Arduino IDE Software**

Arduino IDE is a simple open-source software program used to write and upload code to the Arduino board. The Arduino IDE is deals with various OS including Windows, Mac OSX and Linux. It supports C and C++ programming languages.

• **Proteus Software**

Proteus is a pictorial, virtual network model and circuit simulation software. Proteus comprises of SPICE circuit simulation, virtual components, and micro-processor models to simultaneously simulate a complete microcontroller-based design. Proteus can also interact between software running on

a microcontroller and related analog or digital electronic devices.

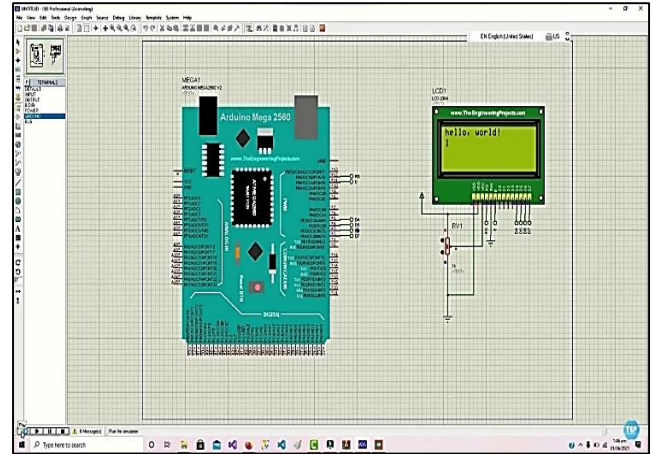


Fig. 3. Arduino & LCD interface

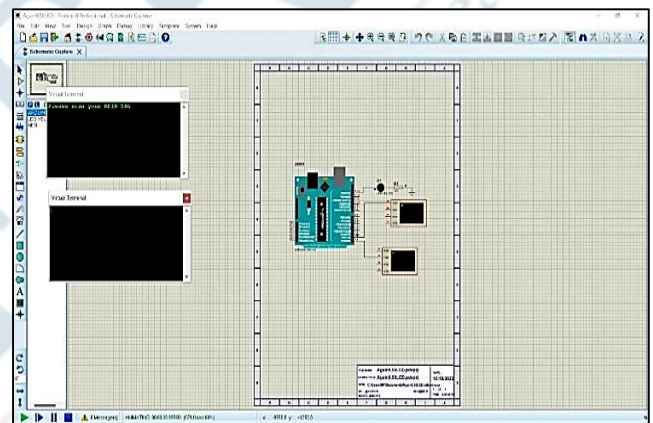


Fig. 4 Scan your RFID Card

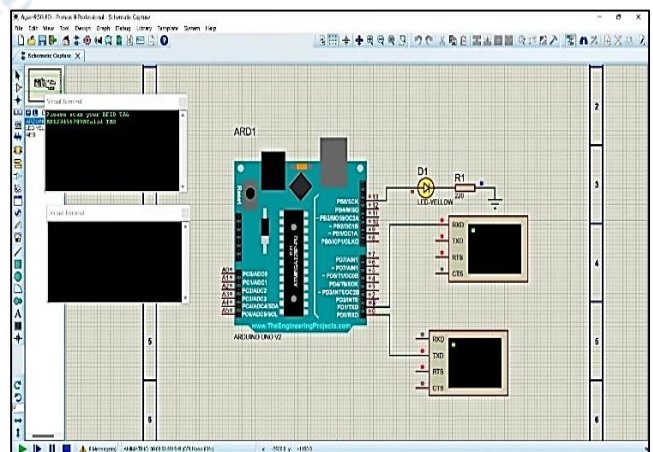


Fig. 4.1 RFID Card verification



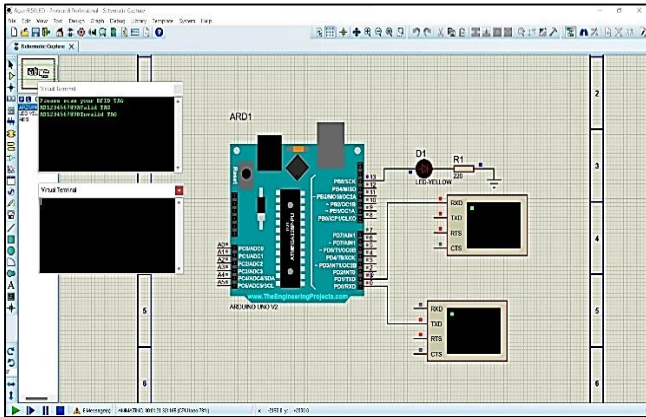


Fig. 4.2. Arduino & RFID interface

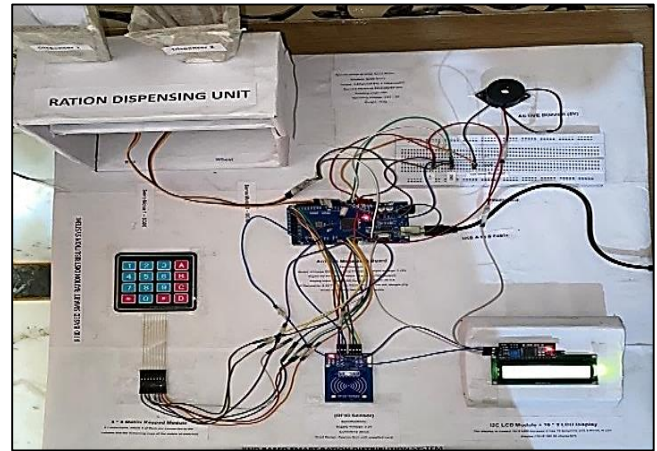


Fig. 7. Hardware Set-up

Operations: - Screen1: - RFID based smart ration distribution system.

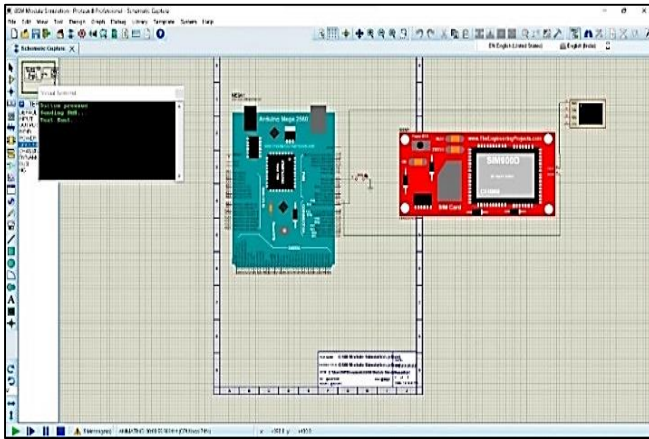


Fig. 5. Arduino & GSM

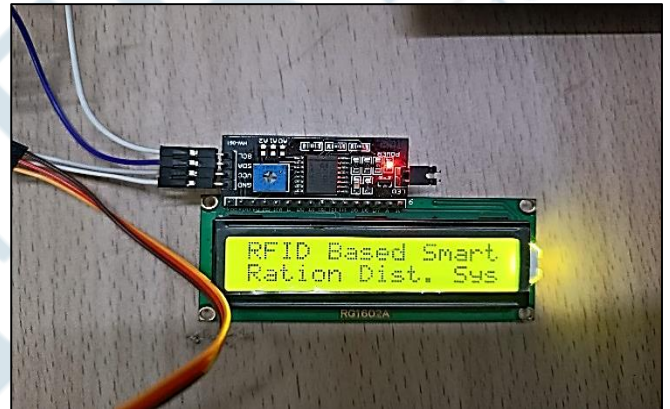


Fig. 8. Starting Interface

Screen 2: - The screen displays the inputs to be entered.

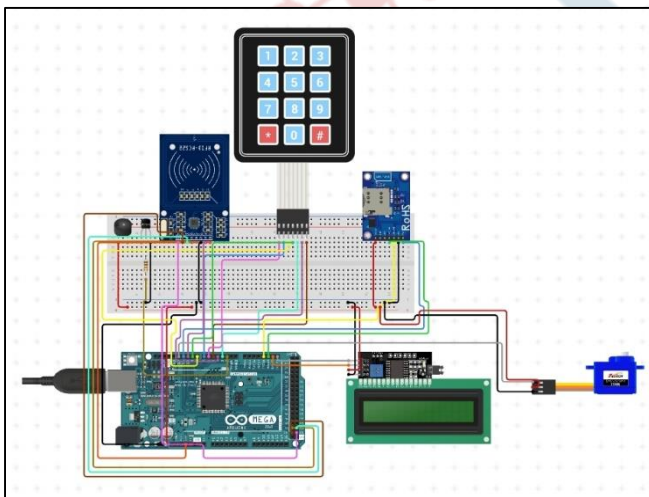


Fig. 6. Complete circuit.io Set-Up

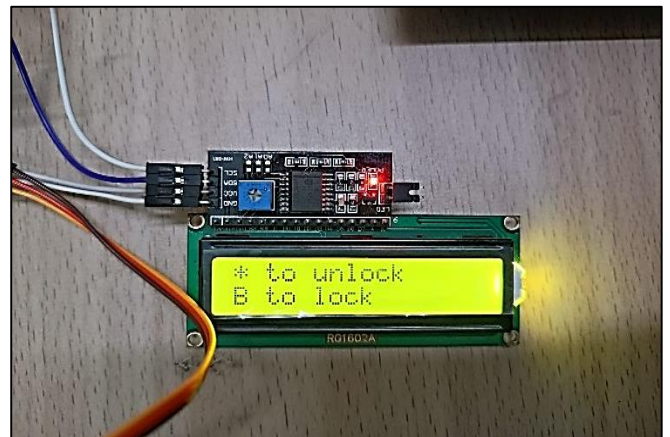


Fig. 9.1. \* To unlock & B to lock the screen



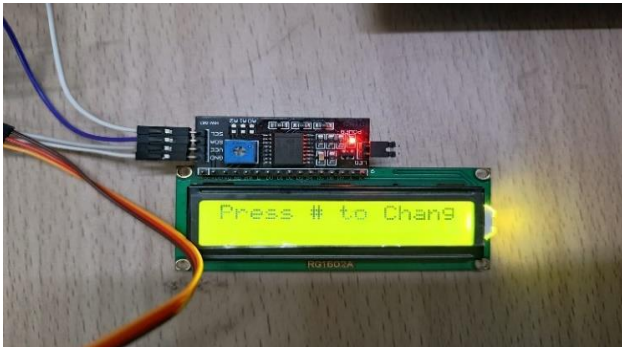


Fig. 9.2. # to change the password

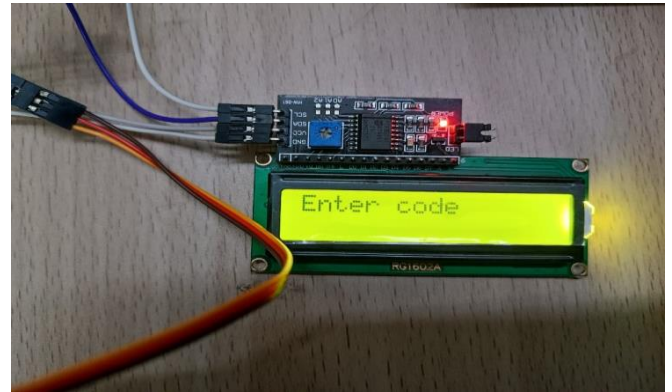


Fig. 11.1 Enter code.

Screen 3: - Scan card & enter code.



Fig. 10. Scan tag & enter code

Screen 5: - Displays 'Dispensing'

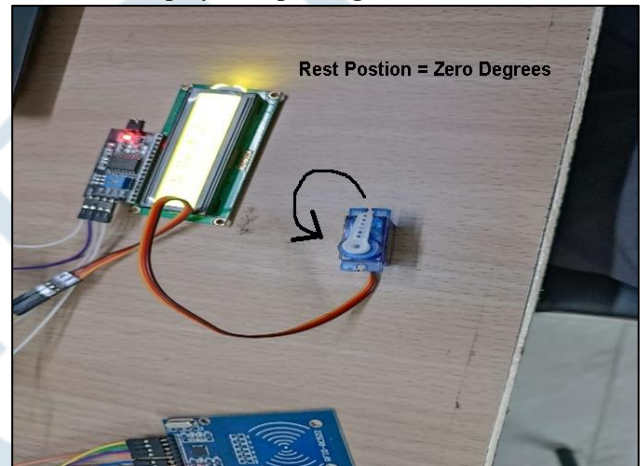


Fig. 12. 0 degrees

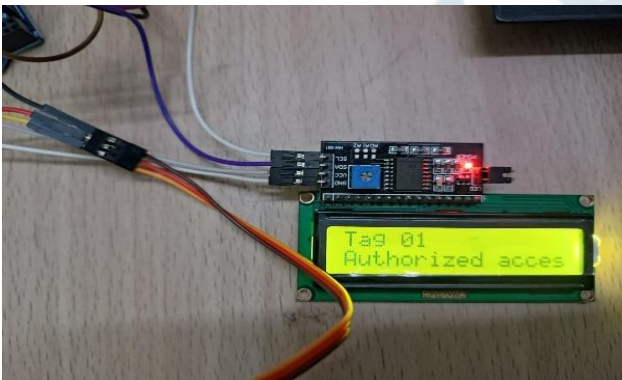


Fig. 10.1. Authorized access

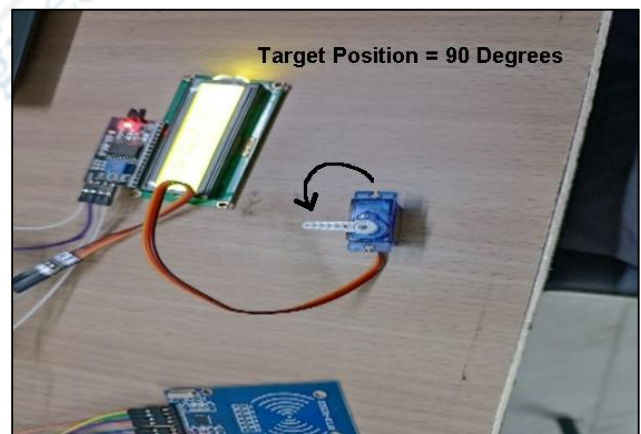


Fig. 12.1. 90 degrees

Screen 4: - Please enter the code (by default 1234)

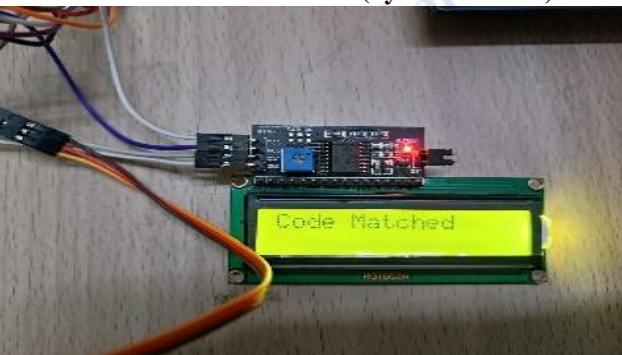


Fig. 11. Code matched.

## V. EXPERIMENTAL RESULT

THE EXPERIMENTAL ANALYSIS BELOW WILL SHOW HOW OUR DEVELOPED PDS BEHAVIORS EFFICIENTLY AND TRANSPARENTLY.

For demonstration purposes, wheat is used as a solid material and water as a liquid material to test the entire configuration.

Table 1 below lists wheat as a distribution medium for 250 g.

**Table 1**

Trail s	Expect ed Weight (Gm)	Actual Weigh tl (Gm)	Using Weighi ng m/c (Gm)	% of Accura cy	% of Accurac y using Weighi ng m/c
1.	250	246.4	246.80	98.56	98.712
2.	250	242.6	243	98	97.2
3.	250	241.4	242	96.96	97.04
4.	250	248.6	249	99.44	99.592
5.	250	250	250.04	99.69	100.016
6.	250	247.4	248	98.96	99
7.	250	247.8	247.68	99.2	99.072
8.	250	245.4	246.6	97.16	98.64
9.	250	239.6	240.2	95.4	96.008
10.	250	239.4	239.02	95.76	96



**Fig. 13**

Below is Table 2 with wheat dispensing material for 500g.

**Table 2**

Trail s	Expecte d Weight (Gm)	Actua l Weigh t (Gm)	Using Weighi ng M/c	% of Accura cy	% of Accurac y using weighin g m/c
1.	500	499	498.8	99.48	99.76
2.	500	485.6	492.4	98.64	98.48
3.	500	497.4	499.01	99.8	99.802
4.	500	496.7	480	95.96	96.00
5.	500	485.6	485.72	97.12	97.144
6.	500	479.8	498.2	99.34	99.64
7.	500	492.6	499.02	99.78	99.804
8.	500	487.7	487.28	97.54	97.456
9.	500	498.4	498.47	99.68	99.694
10.	500	492.6	495.08	98.52	99.016



**Fig. 14**

**VI. RESULTS**

- Table 1 shows the maximum accuracy of 99.6% compared to weight.
- In same way, Table 2 shows the highest accuracy of 99.96% compared to weight.
- Table 3 has a maximum accuracy of 99.78%.
- The proposed system is therefore fast, accurate and reliable.
- The time required from logging into the system, authentication to distribution of goods is approximately 2 minutes.

**VII. CONCLUSION**

The proposed system is capable of combating corruption in sophisticated public distribution systems. This system shows that the ration distribution system is managed effectively. System administrators can check account availability for beneficiaries on one side and customers can view transactions on the other side. As a result, the system achieves transparency between the upper layers, namely customers.

**VIII. ACKNOWLEDGMENT**

We would like to take this opportunity to sincerely thank our department and the University where we can share our ideas and put our learning into practice. I am also grateful to Dr. Prem Prakash Yadav for his hard work in guiding us, encouraging words and helpful suggestions.

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