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Consumer Information System for Public Distribution System (PDS) In Warangal District, Telangana State

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Abstract: **A significant part of the challenges in a Public Distribution System (PDS) emanates from Bogus (ration cards belonging to fictitious families) and Shadow (genuine ration cards used by someone else) ration cards in the system. If the bogus cards can be substantially weeded out and a mechanism put in place to positively confirm and track the individual beneficiary off take on a monthly basis, then leakage would become more difficult to hide, the problems relating to PDS leakages, transparency and transportation would get resolved. A solution that improves the quality of the beneficiary database and that can track Individual Beneficiary off take coupled with a computerized MIS system can effectively improve the PDS system. By leveraging some of the large e-governance initiatives that are being rolled out, the solution can be implemented swiftly and cost effectively. In this paper it is proposed to have web based design of 'public portal' to achieve transparency regarding PDS. The design aims at the display of information related to Fair Price Shops (FPS) with respect to associated ration cards, entitlement of beneficiaries, stock positions at Mandal Level Stock points (godowns), movement of stocks, stock availability at each FPS etc. The portal is also designed to allow a card holder to login his/her complaints, and to get the contact details of F&CS officers in the vicinity. Under the portal some static information, which is permanent, can also be included for display.**

Keywords: **PDS, Smart Card, FPS, Ration Card.**

1. INTRODUCTION

Both State and Central Governments in India are implementing many welfare schemes for the benefit of poor people. One among the most popular schemes available is the 'Public Distribution System', through which the Government distributes food grains like rice at subsidized prices through fair price shops to the public. The Public Distribution System (PDS) in India is an important public system for enhancing food security also. The PDS provides subsidised food grains (and other essential commodities) through a network of 'fair price shops'. Corruption and high operational costs were among the reasons that were used to justify the move to the Revamped Public Distribution System (based on a principle of geographic targeting)in tribal, arid, hill and remote areas in 1992 and then to a Targeted Public Distribution System (TPDS) in 1997. Under the TPDS, households were classified as Above Poverty Line (APL) or Below Poverty Line (BPL), based on the economic status of households. BPL households continued to receive subsidised food grains through the TPDS whereas subsidies for APL households have been gradually phased out. There are many systemic challenges that plague the PDS system today and the key ones are described below:

- **PDS Ghost Card** –

A number of bogus ration cards which do not correspond to real families, exist in the BPL and AAY (Anna Anthyodaya yojana) categories. The quantity of food grains drawn on the basis of these bogus cards is a significant leakage from the system, as it does not reach the intended beneficiaries and unauthorised users take advantage. To enable proper distribution of food grains in a channelized manner, the Government/ local distribution planners allot ration cards on one

and only one authorized ration card for each family. Sometimes, some get ration cards on the name of nonexistent families and these are termed as bogus cards.

- **System Transparency and Accountability –**

The most serious flaw plaguing the system at present is the lack of transparency and accountability in its functioning. At present there are no checks on PDS regarding the possible identification of leakages in the form of supply to bogus card holders / shadow card holders. The system lacks transparency and accountability at all levels making monitoring of the system extremely difficult.

- **Grievance Redressal Mechanisms –**

There are numerous entities like Vigilance Committee, Anti-Hoarding Cells constituted to ensure smooth functioning of the PDS system. Their impact is virtually non-existent on the ground and as a result, malpractices abound to the great discomfiture of the common man. Apart from the challenges described, transportation of food grains and appointment of dealers of Fair Price Shops have also become difficult issues.

Hence it is important to build a system that can overcome the challenges faced by the PDS currently. This can be done by leveraging the help of Information Communication Technology to emulate the supply chain of PDS system at each district level.

1.1 Public Distribution System in Telangana State:

Telangana State Civil Supplies Corporation Ltd. is a State Agency appointed by the State Government for lifting of Rice and Wheat from FCI and Levy Sugar from factories under PDS. It is the responsibility of the corporation to undertake transportation, storage and delivery of the stocks under PDS at the door steps of the FPS dealers. The transportation of stocks from FCI/factories to Mandal Level Stock Points is called Stage-I transportation, which is being undertaken through the district-wise transport contractors appointed separately for food-grains and Levy Sugar. The transportation from MLS Point to the door step of the F.P. Shop Dealer is called Stage-II transportation, which is being undertaken through Contractors and Stage-II contractors are appointed by the District Collectors on approval of the rates by Head Office. Figure 1.1 shows the stages of the supply chain in Telangana.

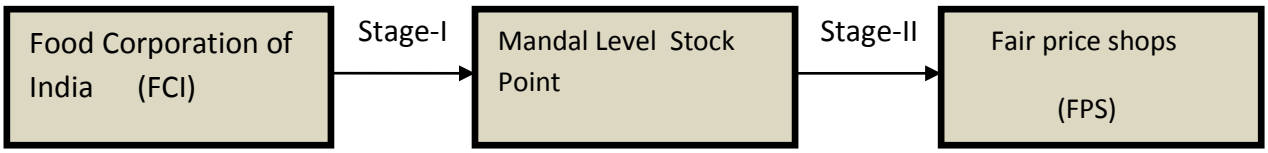

Figure 1.1: Supply Chain of PDS

1.2 Food Corporation of India (FCI):

The Food Corporation of India undertakes the procurement of food grains on behalf of the Government of India and State Governments in the States, where it has been entrusted with this responsibility either as a sole agency or jointly with other public procurement agencies. It also undertakes massive price support operations for food grains and cereals on behalf of the Central and State Governments to protect the interests of the growers. It prevents distress sales by ensuring to the farmers, predetermined procurement/support prices. It also handles huge stocks of food grains procured by other agencies for the central pool, and utilizes the services of co-operative societies to the maximum extent possible. Another major function of the Corporation is the distribution of procured/ imported food grains through nearly 5 lakh fair price shops all over India. Food grains are issued on the basis of the allocations made by the Central Government. The Food Corporation of India makes food grains available to the vast majority of population at reasonable prices. The quantity of food grains distributed through public distribution and open sales has varied in between 17.4 to 25.8 million tonnes during the last 5 years.

1.3 Mandal level Stock Points:

These are the intermediate inventory storage points run by the T.S. Civil Supply Corporation. The grains are stored and according to the prescribed procedure sent to the different fair price shops under their jurisdiction.

The Corporation is having 18 Mandal Level Stock Points in the District for storage cum distribution of stocks. As and when the extra storage space is required, Corporation is hiring additional godowns of State Warehousing Corporation in district.

1.4 Fair Price Shop:

Essential commodities like Rice, Wheat, Sugar, Iodized Salt and Kerosene are being distributed to the targeted cardholders as per the eligibility and rates fixed by the Government through the Fair Price Shops. In crisis essential commodities like pulses, onions, edible oils and vegetables (tomato and potato) are also being supplied through the fair price shops under Market.

- **Objectives of FPS:**

To ensure proper supply of essential commodities through the fair price shops to the targeted cardholders at the quantum and rates fixed by the Government. As a result, the consumers are relieved from the clutches of the traders' rampant exploitation.

- **Functions of FPS**

The fair price shop dealers are required to lift the allotted essential commodities by paying the cost and make available adequate stocks at any given time. They shall distribute the essential commodities to the cardholders as per their eligibility and rates fixed.

A strategy that has been recently designed for tracking and maintaining the information regarding the distribution system of fair price shop (FPS) through web is called 'Cloud Computing' and we proceed to explain this idea in the following.

1.5 Cloud computing:

Cloud computing refers to the delivery of computing resources over the internet. Instead of keeping data on the own hard drive or updating applications for our needs, we use a service over the Internet, at another location, to store the information or use its applications. Once a cloud is established, how the cloud computing services are deployed in terms of business models can differ from case to case depending on requirements. The primary service models being deployed are commonly known as:

• ***Software as a Service*** **(SaaS) —** Consumers purchase the ability to access and use an application or service that is hosted in the cloud. A benchmark example of this is salesforce.com, here necessary information for the interaction between the consumer and the service is hosted as part of the service in the cloud. Office Web Apps are available to office volume licensing customers and Office Web App subscriptions through its cloud-based Online Services.

• ***Platform as a Service*** **(PaaS)** — Consumers purchase access to the platforms, enabling them to deploy their own software and applications in the cloud. The operating systems and network access are not managed by the consumer, and there might be constraints as to which applications can be deployed.

• ***Infrastructure as a Service*** **(IaaS) —** Consumers control and manage the systems in terms of the operating systems, applications, storage, and network connectivity, but do not themselves control the cloud infrastructure.

Cloud manufacturing is a computing and service oriented manufacturing model developed from existing advanced manufacturing models (e.g. ASP, MGrid) and enterprise information technologies under the support of cloud computing, Internet of things, virtualization and service-oriented technologies, and advanced computing technologies. It aims to realize the full sharing and circulation, high utilization, and on-demand use of various manufacturing resources and capabilities by providing safe and reliable, high quality, cheap and on-demand used manufacturing services for the whole life cycle of manufacturing. The abstract running principle for CMfg is shown in Figure. 1.2. In a CMfg system, various manufacturing resources and abilities can be intelligently sensed and connected into the wider internet, and automatically managed and controlled using IoT technologies (e.g. radio frequency identification (RFID), wired and wireless sensor network, embedded system). Then the manufacturing resources and abilities are virtualized and encapsulated into different manufacturing cloud services (MCSs) that can be accessed, invoked, deployed, and on-demand used based on knowledge by using virtualization technologies, service-oriented technologies, and cloud computing technologies. The MCSs are classified and aggregated according to specific rules and algorithms, and different kinds of manufacturing clouds are constructed. Different users can search and invoke the qualified MCSs from a related manufacturing cloud according to their needs, and assemble them to be a virtual manufacturing environment or solution to complete their

manufacturing task involved in the whole life cycle of manufacturing processes under the support of cloud computing, service-oriented technologies, and advanced computing technologies.

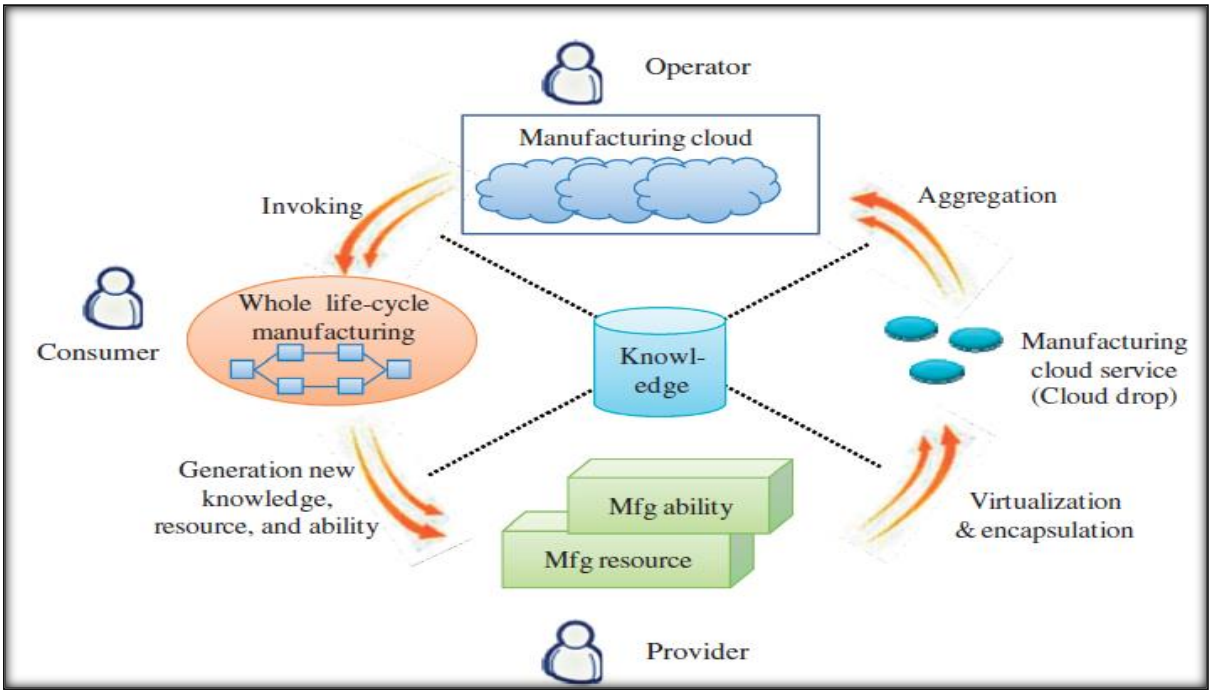

Figure 1.2: Cloud Manufacturing Structure

In October 2007, cloud computing was first introduced to the public through a cooperation between two computing companies, I.B.M and Google. Cloud computing as a model that allows the sharing of many computing resources as services to various clients. In this model, clients can easily change or adjust their service requirements at a very low cost. The Clouds in cloud computing includes both software and hardware in datacenter that are usable and accessible virtualized resources. The components of cloud computing include data, information, application semantics, metadata, schema, data dictionary, data catalog, and information model. **Li Bo hu** systematically explained the cloud manufacturing in [5]. Clouds manufacturing mixes network-based manufacturing and service technology with cloud computing, cloud security, high performance computing, IOT and other advanced technology to achieve all kinds of manufacturing resources (manufacturing hardware devices, computing systems, software, modes, data, knowledge, etc.) centralized management, intelligent business, provides readily available, demand-oriented, safe, reliable, high-quality, low-cost services to various manufacturing activities for manufacturing life cycle process in context of manufacturing operations.

We propose to adopt this approach in this paper in context of Public Distribution System (PDS).

Following the paradigm of cloud computing, we can distinguish three types of clouds agile manufacturing: public, private and hybrid. Public clouds are handled by third parties, and the work of many different clients may be mixed in the factories (virtual), servers, storage systems and other infrastructure in the cloud. End users do not know what other clients works may be carried out in the same factories, even on the same machines. In this type of cloud, the end user basically deals only edit their processes and track them. Private clouds are a good choice for companies that need high data protection and editing at lower levels (the process) of the services offered by cloud: definition of its own services, computational resources and production, machine or, even, factories. Private clouds are in demand for infrastructure managed by a single customer who controls what and where he or she runs a process. They are owners of the factory, of IT and can decide which users are allowed to use the infrastructure. Hybrid clouds combine the models of public and private clouds. Every customer is a part owner and shares another, albeit in a controlled manner. Hybrid clouds may be the key to achieving an external supply in scale form and under demand, but these clouds add the complexity of determining how to allocate tasks and processes across these different environments. Companies may feel some attraction to the promise of a hybrid cloud, but this option, at least initially, will probably be reserved for simple applications without conditions, which do not require any synchronization or not require highly specialized or expensive equipment.

Now we shall proceed to describe the advantages of cloud computing as follows:

- Achieve economies of scale – increase volume output or productivity with fewer people. The cost per unit, project or product plummets.
- Reduce spending on technology infrastructure. Maintain easy access to the information with minimal upfront spending. Pay as (weekly, quarterly or yearly), based on demand.
- Globalize our workforce on the chip. People worldwide can access the cloud, provided they have an Internet connection.
- Streamline processes. Get more work done in less time with less people.
- Reduce capital costs. There's no need to spend big money on hardware, software or licensing fees.
- Improve accessibility. One can have access anytime, anywhere, making life so much easier!
- Monitor projects more effectively. Stay within budget and ahead of completion cycle times.
- Less personnel training is needed. It takes fewer people to do more work on a cloud, with a minimal leaning curve on hardware and software issues.

2. LITERATURE REVIEW

The Public Distribution System (PDS) in India represents a direct intervention by the government of food market. It involves subsidized distribution of limited quantities of essential food such as cereals, sugar, edible oil etc. Among them, distribution of cereals assumes crucial importance it is supposed to provide food security to the poor. Of late, however, PDS has come under severe criticism for its urban bias, its ineffectiveness in reaching the poor and its inefficiency with reference to cost of distribution in the food grain market, these ideas are well explained by **Mooij (1994)** [1]. **Indrakanth (1997)** in [2] has described about the leakages occurring in PDS. He points out that, the leakages in PDS operations take place at every stage of the supply chain and take place in various forms. The leakages may take place right at the warehouse level and food grain may not reach to the targeted FPS, or FPS dealer may divert a part of allotted quota to open market. FPS owner may collude with district supply authorities in this operation or the leakage may also take place at household level where beneficiary may purchase the ration but sell it in open market at higher prices. **Vyas (2005**) in [3] describes the responsibility of the Central Government as procurement, storage, and transportation of grains from purchase points to central warehouses, The responsibility of state governments and the union territory administrations is to transport these commodities from the central warehouses and distribute them to consumers through the network of FPS. It is pointed out that the subsidy provided in the PDS depends on the level of procurement and off take under PDS and other schemes. **GyanPrakash (2011)** in a thought provoking paper [4] explains the difficulties faced by Public Distribution System (PDS) in distribution of scheduled commodities to the targeted citizens through a network of institutions comprising Food Corporation of India (FCI) warehouses and fair price shops (FPS). Understanding these will be of help in proposing, redesigning of PDS processes, introducing IT based interventions, thereby, making flow of food items and other commodities visible and making some policy recommendation. This is a recent article in which framework for revamped supply chain of PDS was proposed.

Li Bo hu (2010) in [5] systematically explained the cloud manufacturing in an article titled by cloud manufacturing--the newly service-oriented network-based manufacturing mode. Clouds manufacturing mixes network-based manufacturing and service technology with cloud computing, cloud security, high performance computing, IOT and other advanced technology to achieve all kinds of manufacturing resources (manufacturing hardware devices, computing systems, software, modes, data, knowledge, etc.) centralized management, intelligent business, provides readily available, demand-oriented, safe, reliable, high-quality, low-cost services to various manufacturing activities for manufacturing life cycle process. At present, the research on cloud computing research is still in the experimental stage at home and aboard, Cheng puts forward the basic functions and system designing of the cloud manufacturing services management and control platform, and gives the specific application, which has certain reference value. **Cheng et al. (2010)** [6] studied a utility model and utility equilibrium of resource service transaction in cloud manufacturing. Here in decision-making methods have been developed to maximize the utility of a resource demander and resource provider. Yet it is difficult to represent the manufacturing resources without a standardized schema, not to mention that original user requests would be difficult to be fulfilled.

Hence taking the inspiration from literature cited we are trying to use cloud computing in the supply chain of public distribution system.

3. PROBLEM STATEMENT

In this paper the authors propose to develop a cloud based supply chain for Public Distribution System for Warangal district in Telangana so that better transparency can be achieved and less leakage and diversion of commodities is achieved and feasibility of web based supply chain for variety of input data can be checked.

3.1Project Objectives:

The main objective of the project is to create transparency in operations so that every citizen can very easily know what is happening and what is supposed to happen. Transparency is the basic requirement to check corruption. Without providing adequate transparency no controls or inspections can reduce corruption. Transparency will be created by computerizing all operations and providing all information on the web.

4. METHODOLOGY

4.1: Different modules of cloud based supply chain:

The step by step processes of making cloud based PDS can be seen in the flowchart given in Figure 4.1.Steps are as follows:

- Preparation of master data of District
- Creation of a Beneficiary Database
- Public District Portal
- Ration card digitisation
- Smart ration card
- Fair price shop automation
- Integration of POS device with district zonal office.
- Allocation details of food grains
- Security and privacy issues of the portal
- Grievance redressal mechanism

The explanation of the each step is given in detail after the flowchart given below. These details will help in making the public distribution system in Warangal corruption free to some extent.

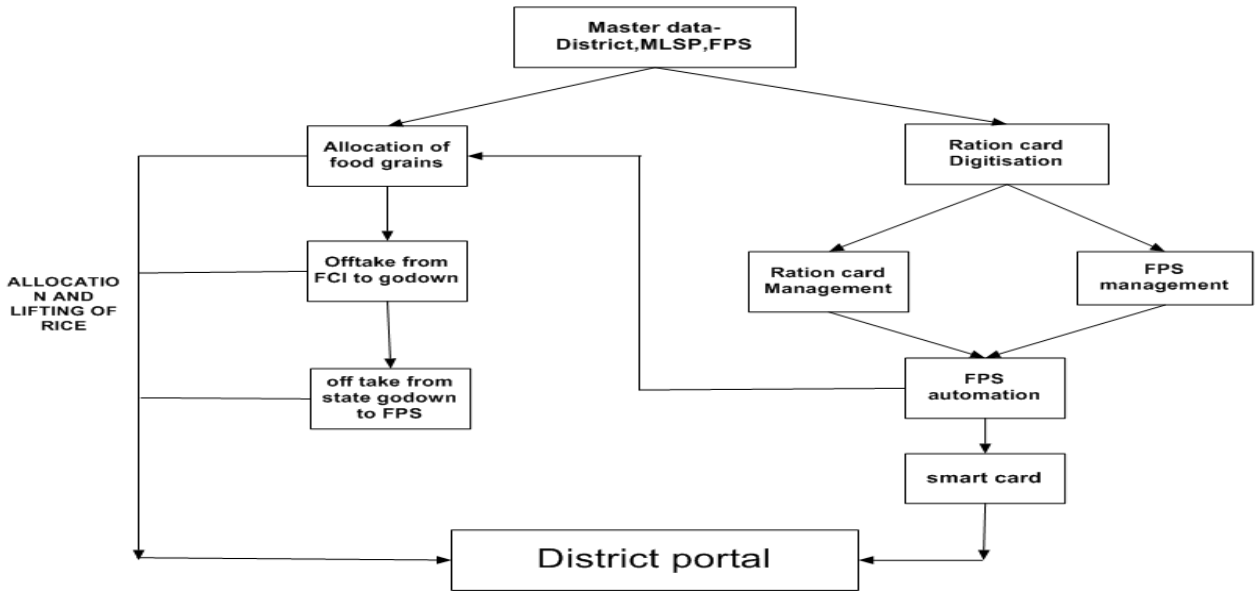

Figure 4.1 : Different modules of cloud based supply chain

4.2 Preparation of master data of District:

First of all the data regarding the stake holders, Mandal level service points, Ration card, Wholesalers, FPS dealer is collected. Several master file are created. This will help in having all the data in structured manner and can be accessed (privately and publicly) anytime. Further it will help the district to maintain central repository of all PDS stakeholders which can further be used by other applications.

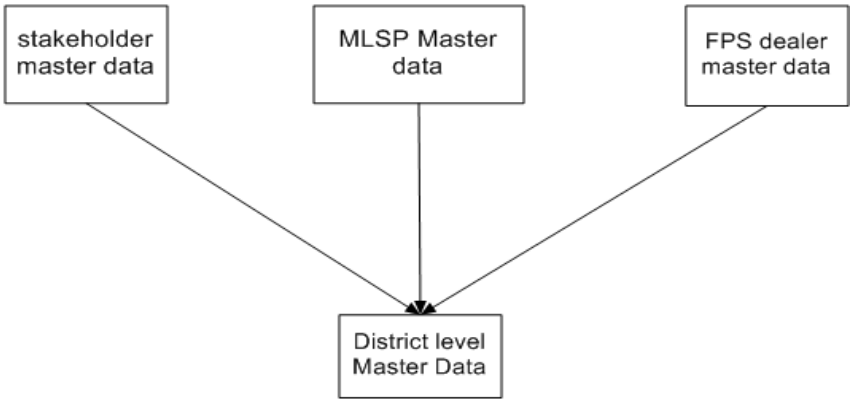

Figure 4.2: Integration of various data into single master data

Table 4.1 : Sample data file

Sl.No.	**Name of the Mandal**	White	AAY	A.P	Sugar	Wheat	P.Oil (Ltrs)	Redgram dal (Kgs)	Kerosen Oil (Ltrs)	Total FPShops
1	2	3	4	5	6	7	8	9	10	
Warangal Division										
1	Warangal	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0	128
2	Hanumakonda	6.17	0.00	0.00	0.00	0.00	0.00	0.00	280	119
3	Geesugonda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	39
4	Atmakur	1.15	0.00	0.00	0.00	0.00	0.00	0.00	146	34
5	Sangem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	36
6	Ghanpur (Stn)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140	53
7	Zaffarghad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	27
8	Wardhannapet	5.50	0.00	0.00	0.00	0.00	0.00	0.00		48
9	Parvathagiri	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0	35
10	Rayaparthi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	130	37
11	Dharmasagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	47
12	Hasanparthy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	46
	Total	**38.28**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**696**	**649**

Similarly there are various data like beneficiary, godown data etc. These all are clubbed into one master file with proper sequencing and keys so that it can be accessed with ease by the administrator. The schematic diagram is shown in Figure 4.2.

4.3 Creation of a Beneficiary Database:

The beneficiary database is digitized and any offline data on register or manual file is fed into excel file which further is fed into central district ration card database. As of now, the beneficiary database is manually stored and ration records are kept manually. So, the digitisation of database helps in eliminating the bogus ration cards. So the MS excel file of the ration card if available is fed into the Structured Query Language database.

Table 4.2: Ration card details of Fair price shop in Atmakur Mandal, Warangal district

S.No.	Card No.	Name of the Cardholder	FamilySize	Card Status	LPG
1	WAP213700100003	Dameruppala Jayamma	5	-	No
2	WAP213700100004	Thati Konda Batukamma	1	-	No
3	WAP213700100006	Devaruppula Veeraswamy	6	-	No
4	WAP213700100010	Nekkonda Mallamma	5	-	No
5	WAP213700100013	Boda Kiran	2	-	No
6	WAP213700100014	Sadiram Ravinder	2	-	No
7	WAP213700100018	Burra Uppalaiah	2	-	No
8	WAP213700100020	Salanki Sanjeeva Rao	3	-	No
9	WAP213700100025	Madarapu Chandraya	1	-	No
10	WAP213700100026	Durishetti Bathukamma	6	-	No
11	WAP213700100027	Areti Aruna	3	-	No
12	WAP213700100028	Kavati Saraiha	3	-	No
13	WAP213700100029	Durisetti Sarvaiah	3	-	No

Such data is displayed on public portal where user can verify the details about him by searching his or her name or card number if he knows it. The data can be seen in the Table 4.2.

4.4 Public District Portal:

There is a need for a single unified information system i.e. District TPDS portal for achieving total transparency in Targeted Public Distribution System (TPDS) by ensuring all information pertaining to the TPDS is made available in the public domain. The portal shall be used to display information related to FPS wise digitized database of ration cards, entitlement of beneficiaries, stock position at godowns, lifting of foodgrains, stock availability at FPS, movement and date of stock/ quantity supplied to FPS every month for all the shops, etc. The portal also enables a beneficiary or citizen to log his/her complaints, contact details of F&CS officers in the vicinity, etc. Under the portal certain information will be static in nature (circulars, document, etc.) that are displayed as Static pages.

Figure 4.3: District Public Portal

List of the information which is provided in this portal are as follows:

- Hierarchy of departments/offices, Officer's name, designation, contact number and their roles & responsibility
- List of beneficiaries, FPS, godowns, etc.
- Details of monthly allocation, lifting and distribution under TPDS schemes.
- Gazette notifications, circulars and proceedings Information regarding Public Awareness including ration card application forms, etc.
- Acts & Rules (Consumer Protection Act, Essential Commodities Act, etc.)
- SMS alerts Registration facility for beneficiaries, individuals, etc.
- Details of Officer in-charge of Grievance Cell along with contact and email details.
- Ration Card related information.
- Details of State schemes & Allocation Policy.
- Rate and eligible quantity of commodity distributed under various schemes.
- Information related to FPS allotment, inspection, cancellation, suspension, revocation, tc. etc.
- Retailing dates and rules of essential commodity at FPS.
- Dates of Allocation, Lifting and Distribution.
- MIS reports.
- Details of District Food Supply Officer (DFSO).
- Summary Report of Godowns/Warehouses.
- Summary Report of Fair Price Shop.
- Ration Card Report.
- District-wise Ration Card Count– BPL, AAY & APL.
- Mandal wise Ration Card Count – BPL, AAY & APL.
- FPS-wise Ration Card Count – BPL, AAY & APL.
- Details of Ration Card – BPL, AAY & APL.
- Allocation Details.
- Capacity and stock position of Godowns.
- From FCI Godowns to State Godowns – quantity, release order, etc.
- District-wise issuance of foodgrains (BPL, AAY & APL) – monthly
- Monthly report Issuance of foodgrains (BPL, AAY & APL) – monthly
- Statistical Reports.

We will see all the details individually in detail and also tries to understand how it will help in streamlining the supply chain of PDS in Warangal district. The snapshot of public portal can be seen in Figure 4.3.

4.5 Ration card digitisation:

Ration card data is fed into the central district database. Such data is made available Mandal wise so that user can search the details if required. For this user has to go to ration card icon and choose its Mandal and particular fair price shop. For example if user is from Atmakur Mandal his information will be available in that Mandal. Such data can only edited by the administrator having valid access given by collectorate office. Steps are shown in Figure 4.4.

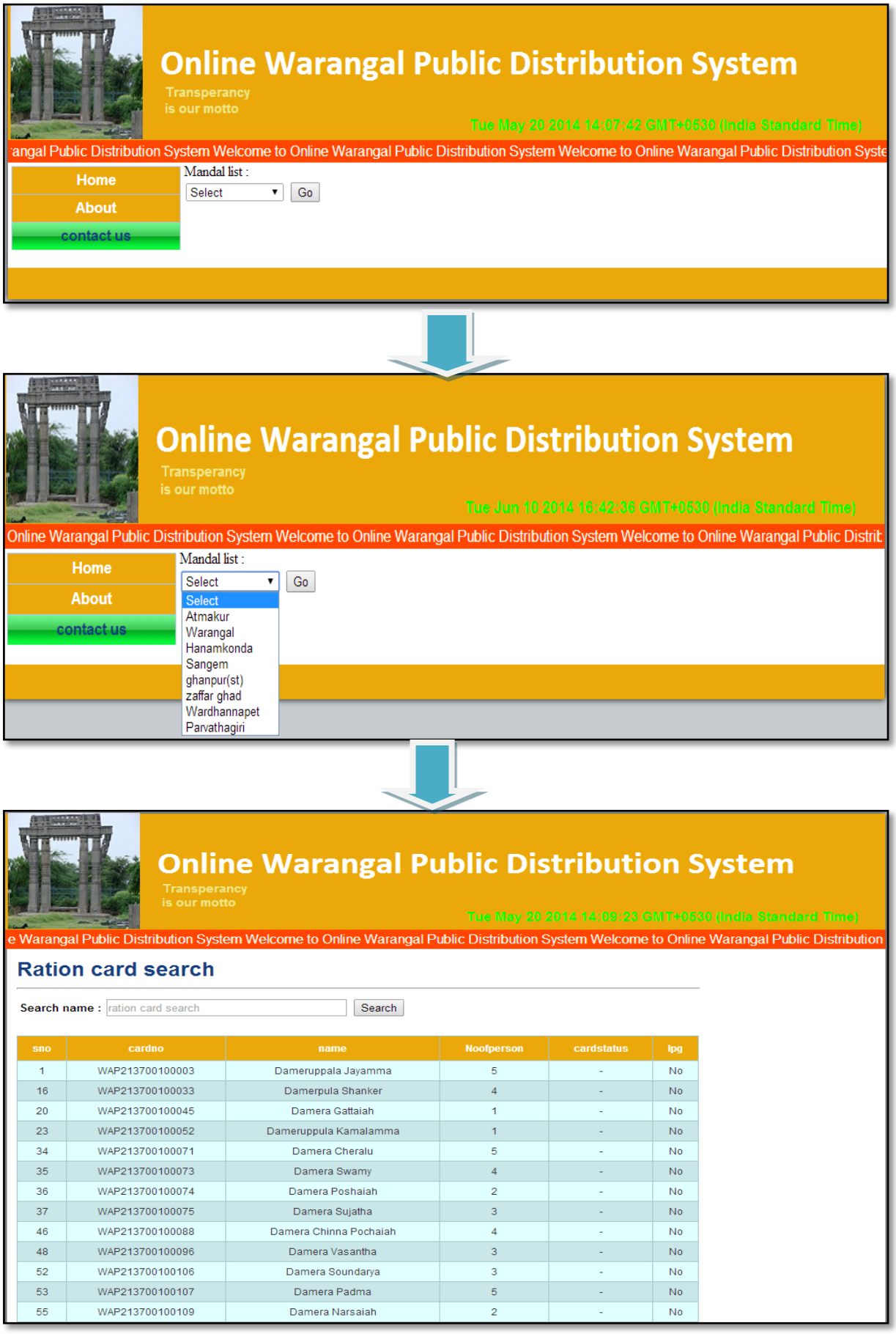

Figure 4.4: Steps for Ration card search

4.6 Smart Ration Card:

Smart Cards are secure electronic devices which are used for storing date pertaining to the beneficiary, in a secure form. It is pertinent to note the only authorized persons can view the date stored on the card and/or write information thereon.

The smart cards are compliant with the unique ID (UID) project called Aadhaar. When a smart card is used In PDS, the following data can be stored on the card:

1. The name of the Beneficiary, family members.

2. The address of the beneficiary.

3. Bio metrics of the beneficiary and family members.

4. The category in which the beneficiary falls (i.e. APL, BPL, Antodaya) and the monthly entitlement.

A smart card resembles a debit card in size and shape. Integrated circuits/microprocessor are embedded in these cards to enable them to process data. These cards can receive inputs, which are processed — by way of the Integrated Circuit Card applications — and deliver an output. The card can be embedded with a hologram to avoid counterfeiting. The microchip will store all information and help government track utilization. Card-holder can buy from an approved private grocer. Biometric feature would act as safeguard against misuse. Moreover, it will eliminate intermediaries, lower pilferage, thus help reduce food subsidy. At all Fair Price Shops , a smart transaction terminal (STT) will be used to match the fingerprint records on the smart card with that of the consumer's and authenticate the transaction .As smart ration card is already being issued by the government. So it is being assumed that old paper ration card will cease to exist. Every beneficiary will have smart- Aadhaar enabled ration card as shown in Figure 4.5.

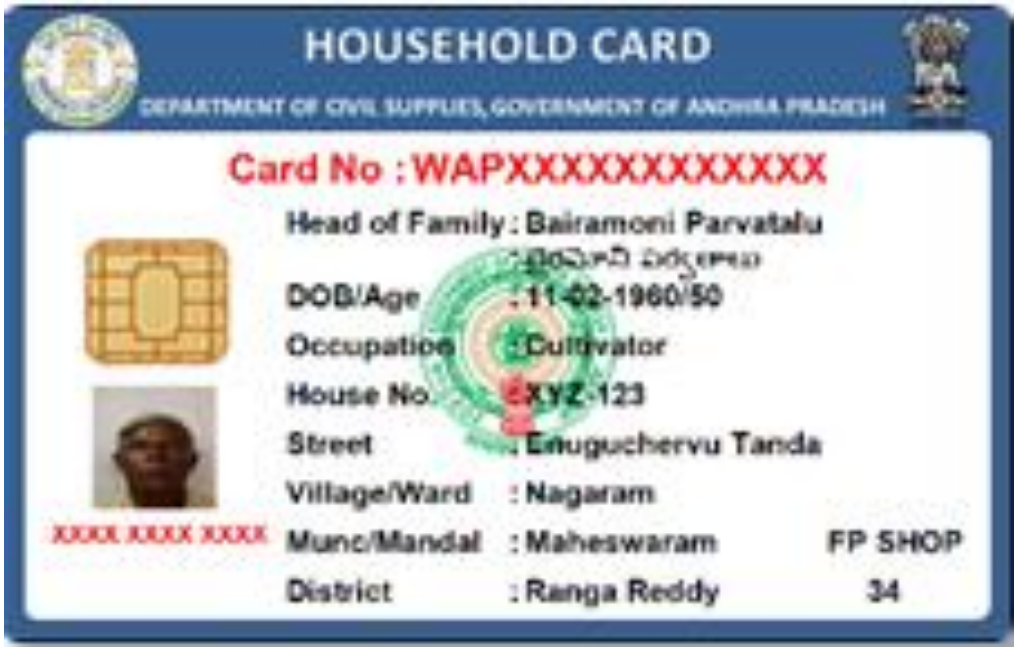

Figure 4.5 : Smart ration card (courtesy : Sreevan infocom)

4.7 Fair price shop automation:

Till now in some places the fair price shop are working on register based entry basis. Such practices only increase the leakages in the PDS system. To reduce this, an automated retail software-cum hardware is required keeping in mind the constraint of PDS system. Such devices are called Point of sale device.

4.7.1 Point of sale device:

A POS device is a single fully integrated machine having sufficient memory to store transaction data over a period of time. The objective of using this device is to track off-take of commodities by beneficiaries with precision and to thereby eliminate avenues for diversion of stock. The device has the capability of carrying out sales and billing transactions, and to print the receipt of a completed transaction. One of the examples can be seen in Figure 4.6.

The other main features of a POS device are:

- It is powered by a removable, rechargeable high capacity Li-ion battery, which supports 170-200 transactions. This device should be able to function for 5-6 hours before it requires to be recharged.
- It is a tamper proof device to protect data.
- Stores data of transactions carried out in the month.
- Can function off-line and the stored data can be transferred subsequently as and when connectivity becomes available.

Figure 4.6 : Point of sale device

4.7.2 InFlow Inventory (Point of Sale simulation software):

InFlow inventory is a inventory management program. InFlow was designed for small to mid-sized businesses looking for a simple, easy to learn and use solution to completely manage their inventory from purchasing to sales. At the same time, InFlow offers powerful features and reporting which would be expected in a complete inventory software solution In addition to keeping track of inventory, InFlow generates reports, purchase orders, sales orders, work orders, sales quotes, invoices and shipping docs. All documents can easily be previewed, printed or saved to a PDF file for simple sending to vendors or customers. The software also supports barcode integration, multiple locations, returns, multiple currencies and taxing schemes, unit converting, multi-level pricing, and custom fields. With inFlow, one's data is always his only and he can easily import and export though industry standard CSV. Backing up and restoring his data is just as simple making one click from the main menu. He can even set inFlow to automatically backup his entire database at regular intervals set by him. inFlow allows him to be professional with the ability to easily produce sophisticated business documents. He can also fulfill customer and vendor inquires more accurately and efficiently as all his data is stored in one location. He will stay knowledgeable using a dashboard that shows his important business info at a glance. Instantly see outstanding orders, a top 5 list and a customizable graph of cash flow, sales, profits and costs. He can export your reports to a PDF or Excel file for easy sharing. Improve his productivity by letting InFlow do his paperwork for him. Such software is required so that a proper and genuine record can be maintained and accessed whenever required.

For our study we have used free version of the software to test the working of Fair price shop. Considering fair price shop as distributor, FCI as vendor and valid ration card holder as beneficiary the entries are made into the software. The homepage of the inFlow inventory can be seen in Figure 4.7. The customer entries can be seen in Figure 4.8 by which sales can be generated. The POS system can generate a receipt and automate the bookkeeping reducing the time required for a transaction. The data on eligible beneficiaries for the next month is transferred to the POS each month with the offtake information for the previous month is collected. Apart from ensuring accurate beneficiary offtake recording, these systems present an effective way of communicating the entitlement to the beneficiary that remains a critical problem despite various efforts by the Governments and other agencies.

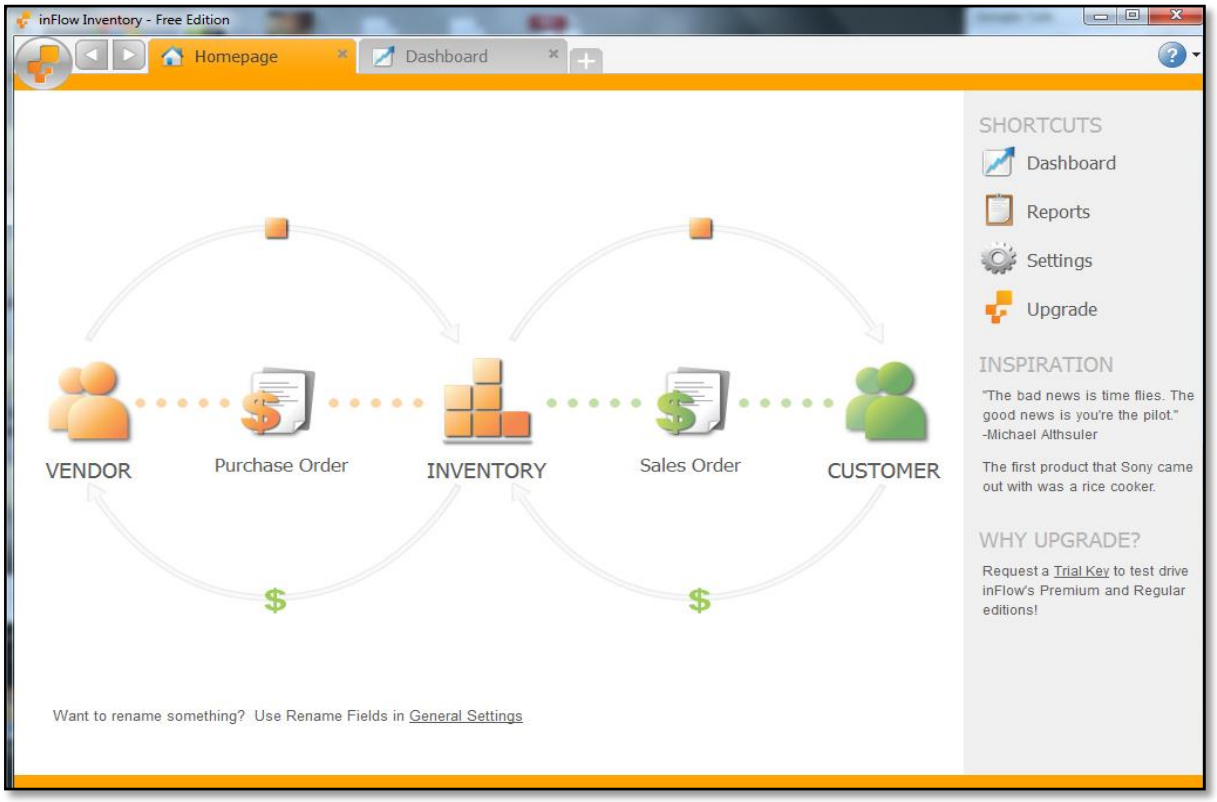

Figure 4.7: Inflow Inventory home page

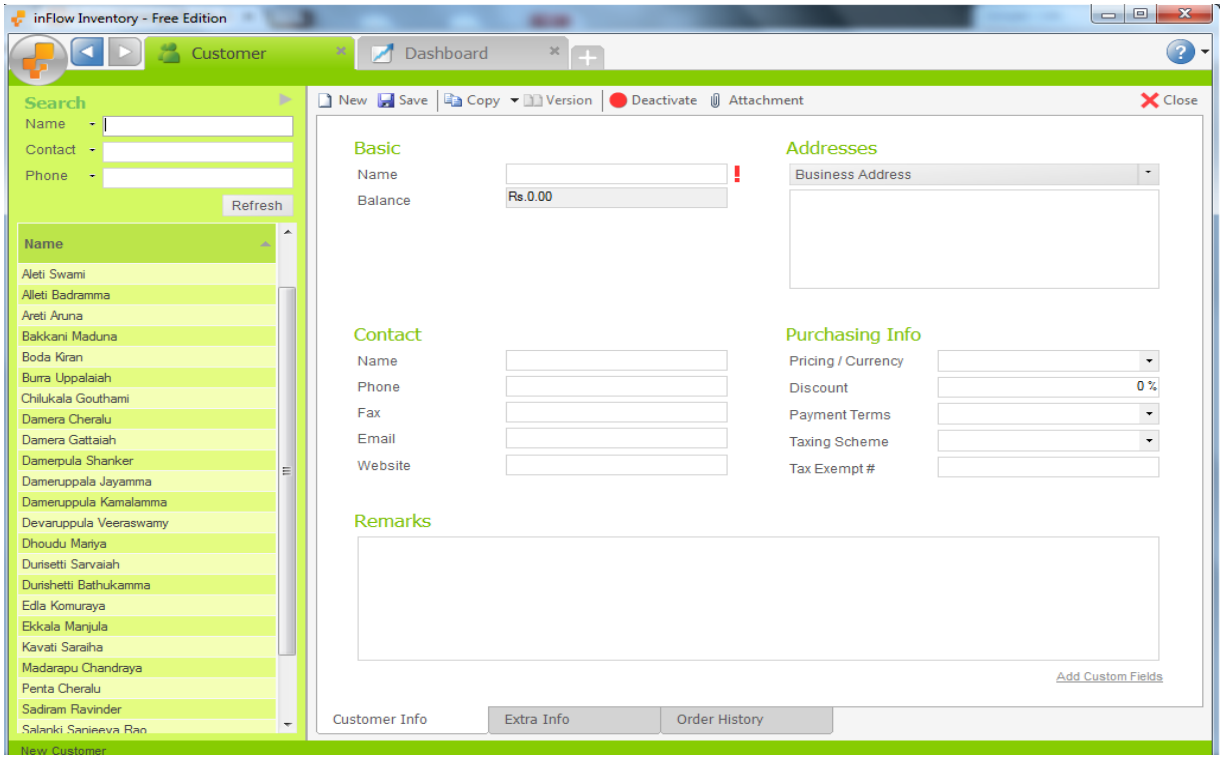

Figure 4.8 : Beneficiary details of particular Mandal in the district

4.8 Integration of POS device with district zonal office:

After the transaction for particular days from POS, it needs to be send to zonal office where that information can be updated on the central district database. In zonal office, concerned administrator will copy the information from the POS to database and that data will be uploaded on the portal.

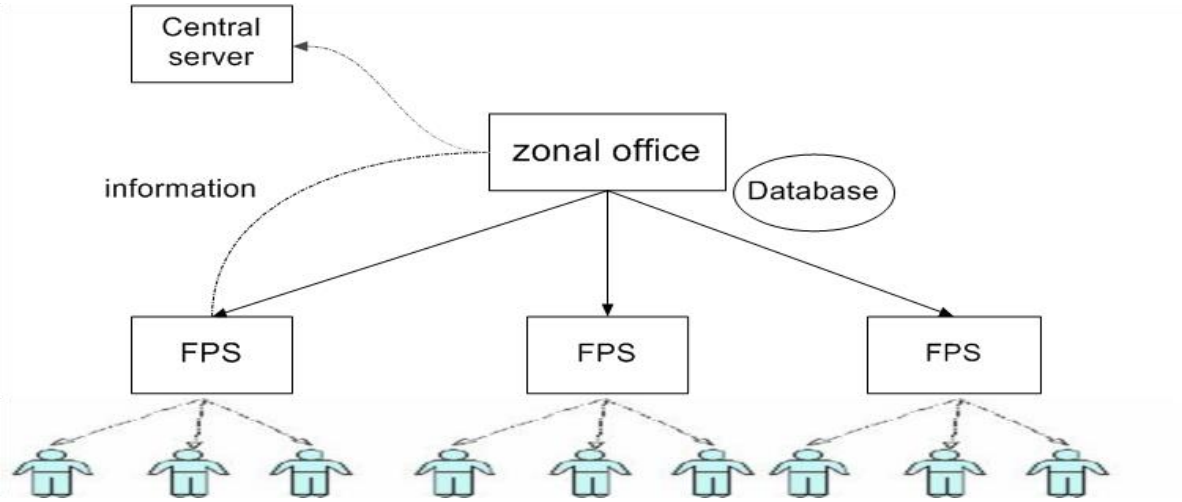

Figure 4.9: Integration of POS device with public district portal

The problem in real time update as of now is the electricity problem in villages etc. So for this we have written the coding in php (pre hypertext processor) language by which data can be uploaded in the csv (comma separated values) format. This format will then show on the district portal. After that zonal administrator will refresh the data and Pos device will be ready for next set of transactions.

It is important to note that such data changes can be made by the concerned authority only. The flow chart for the information flow can be seen in Figure 4.9.

4.9 Allocation details of food grains:

In this part it is shown how much food grain is allotted to different Mandals by the state government. allocation details of inventory can also be seen by clicking on corresponding mandals

Mandal list :

Select ▼ Go

This data is collected from district collectorate office to test our system. The files are imported into the central district database. The Shop numbers are assigned on the smart card of the user. The details of the corresponding mandals can be seen in Figure 4.10, 4.11 and 4.12.This will generate the allocation details for different mandals of the district. The distribution is done on the basis of different cards like BPL, Annapurna , Anthyodaya, White cards. Some of the examples are given below:

Allocation details in Atmakur mandal

S.No.	FPShop No.	Total BPL Cards	Annapurna (AAP)			Anthyodaya (YAP)			White Cards (WAP)				
			Cards	Units	Rice Quota (In Kgs.)	Cards	Units	Rice Quota (In Kgs.)	1M	2M	3M	4M	Rice Quota (In Kgs.)
1	1	607	0	0	0	63	197	2,205	76	123	107	144	6,756
2	2	592	3	5	30	55	172	1,925	51	107	106	161	7,088
3	3	429	2	2	20	31	113	1,085	25	53	81	135	5,696
4	4	683	3	5	30	39	79	1,365	53	105	119	207	8,932
5	5	419	0	0	0	30	111	1,050	30	78	85	114	5,228
6	6	505	5	5	50	39	129	1,365	32	82	101	149	6,320
7	7	508	1	1	10	31	79	1,085	28	72	110	154	6,712
8	8	641	1	1	10	56	192	1,960	35	103	127	191	8,104
9	9	745	4	5	40	66	226	2,310	43	158	145	209	8,920
10	10	654	7	7	70	44	108	1,540	44	125	123	189	8,116
11	11	260	0	0	0	18	65	630	11	35	43	94	3,524

Figure 4.10. Allocation details of Atmakur Mandal

The details will comprise of total cards available in each mandal. for that mandal allocated quota of food grains. Apart from this at different FCI stock points maximum capacity of grains that can be stored.

The details about the depots available in the Warangal district and their capacity are published so that public can know where there stock points are situated. Such details are accessible on the main webpage of the district portal under the tab FCI godown details. The data is shown in Figure 4.11.

Accessibility to such information will help in giving the much needed transparency that is required.

SNO	depotname	district	covered capacity(MT)	type
2809001	HANAMKONDA	Warangal	2000	Owned by csc
2809002	WARANGAL RURAL	Warangal	350	Hired - by csc
2809003	GHANPUR STN	Warangal	1000	Hired - by csc
2809004	WARDHANNAPET	Warangal	500	Owned by csc
2809005	KODAKANDLA	Warangal	500	Owned by csc
2809006	JANGOAN	Warangal	1000	Hired - by csc
2809007	MAHABUBABA	Warangal	500	Owned by csc
2809008	CHERIAL	Warangal	1000	Hired - by csc
2809009	THORRUR	Warangal	1000	Hired - by csc
2809010	MARIPEDA	Warangal	1000	Owned by csc
2809011	KOTHAGUDA	Warangal	400	Hired - by csc
2809012	NARSAMPET	Warangal	1000	Hired - by csc
2809013	PARKAL	Warangal	1000	Owned by csc
2809014	CHITYAL	Warangal	250	Owned by csc

Figure 4.11 : FCI godown details in Warangal.

Post automation of allocation order, the process of release of commodity for FCI shall be automated. By implementing this module, State will be able to consolidate and track the delivery of various commodities against allocation order/release order. Information related to commodity off-take is made available to State agencies through website/ online application. After generation of release order and commodity off take from FCI godowns. This module capture operations like receiving commodity from FCI, receiving payment from State agencies/ FPS dealer, issue planning at State depot, generation of delivery order**.** This module will help the State to ensure the availability of stock position information at all levels, tracking of food grain movement and reduce the time and effort for data consolidation & sharing. The total data is kept month wise as well for better understanding and transparency. for this user has to select the month and total summary detail can be seen month wise for different Mandal and blocks. This data can be verified with total Mandal wise data for any discrepancies. Such incidents can be reported if any through proper grievance redressal mechanism.

Allocation details in Warangal district

S.No.	NAME OF THE MANDAL	TOTAL BPL CARDS	Annapurna (AAP)		Anthyodaya (YAP)	white cards		Crippled Weavers		Allotment of Sugar in Qtls	Allotment of Redgram Dall in Q	Allotment of P.Oil in Liters	Allotment of Wheat in Qtls
			Cards	Rice Quota (In Qtls.)	Cards	Total White Cards	Rice Quota (In Qtls)	No. of Crippled Weavers	Net Allotment in Qtls				
1	2	3	4	5	6	13	14	15	16	17	18	19	20
	WARANGAL DIVISION												
1	Atmakur	17,295	54	5.4	1,361	15,880	2,170	10	2.5	86.48	86.48	17,295	0
2	Dharmasagar	19,579	66	6.6	1,677	17,836	2,446	0	0	97.9	97.9	19,579	0
3	Geesugonda	17,285	35	3.5	1,142	16,108	2,222	0	0	86.43	86.43	17,285	0
4	Ghanpur(Stn)	24,704	40	4	1,992	22,672	3,144	11	2.75	123.52	123.52	24,704	0
5	Hanamkonda	66,125	111	11.1	3,700	62,314	8,820	2	0.5	330.63	330.63	66,125	200
6	Hasanparthy	20,193	42	4.2	1,531	18,620	2,516	1	0.25	100.97	100.97	20,193	0
7	Parvathagiri	11,410	25	2.5	870	10,515	1,491	14	3.5	57.05	57.05	11,410	0
8	Raiparthy	14,307	42	4.2	1,048	13,217	1,815	5	1.25	71.54	71.54	14,307	0
9	Sangem	16,137	36	3.6	1,229	14,872	1,906	0	0	80.69	80.69	16,137	0
10	Warangal	73,466	159	15.9	5,240	68,067	9,832	36	9	367.33	367.33	73,466	300
11	Wardhannapet	18,592	77	7.7	1,570	16,945	2,457	17	4.25	92.96	92.96	18,592	0

Figure 4.12 : Summary details of Warangal district (snapshot)

In the summary details, all the mandals information is clubbed to generate the cumalitive information about the district. Such information then can be sent to the state and central government as there in the procedure. This information can be procured monthly wise in excel format as well. In Figure 4.12, we can see the details for particular month for Warangal district.

4.10 Security and privacy issues of the portal:

There are some information that we want that it is not accessible to public but it can be shared between the privileged user. For such purposes, there are some modules or web pages that are only accessible to the few persons. Such person has been generated username and password which they have to use to enter those pages. The administrator has the authority to change or remove such user depending on the situation. The Login menu is shown in Figure 4.13.

Figure 4.13 : Login page

As far as security issues about the portal, only the administrator can make the changes that are required. The page after the login will consists of various details regarding the pds system that administration think are necessary to keep out of the public. Such details can be kept in these portions.

4.11 Grievance redressal mechanism:

Grievance Redressal process takes care of the grievances filed by the PDS beneficiaries and various private dealers / agents involved in the PDS process. Once data of beneficiary and PDS stakeholders (like Offices, FPS, Depot, Card Type, etc.) gets digitized, States will be able to automate grievance redressal process. These complaints shall get auto forwarded to the concerned officials responsible for their redressal. For getting the details the person has to enter its information, by which he will get the complaint-id. That id will generate flag into the system for concerned authority. So, that there will be accountability of the complaint redressing officer. The webpage can be seen in Figure 4.16. These are the services given on the web portal for the convenience of the citizens. The details about how the PDS works directories of the concerned officers. Links to the other departments. Information about Warangal city. Important circular and notices that need to be displayed from time to time. These services are just to make the PDS system system more citizens friendly. Other details can also be added time to time. Such changes can be done only by the administrator with permission from the concerned authorities. The objective of such miscellaneous information is to keep the citizen upto date and inform. Figure 4.15 shows such representation.

Figure 4.14 : Grievance redressal Mechanism

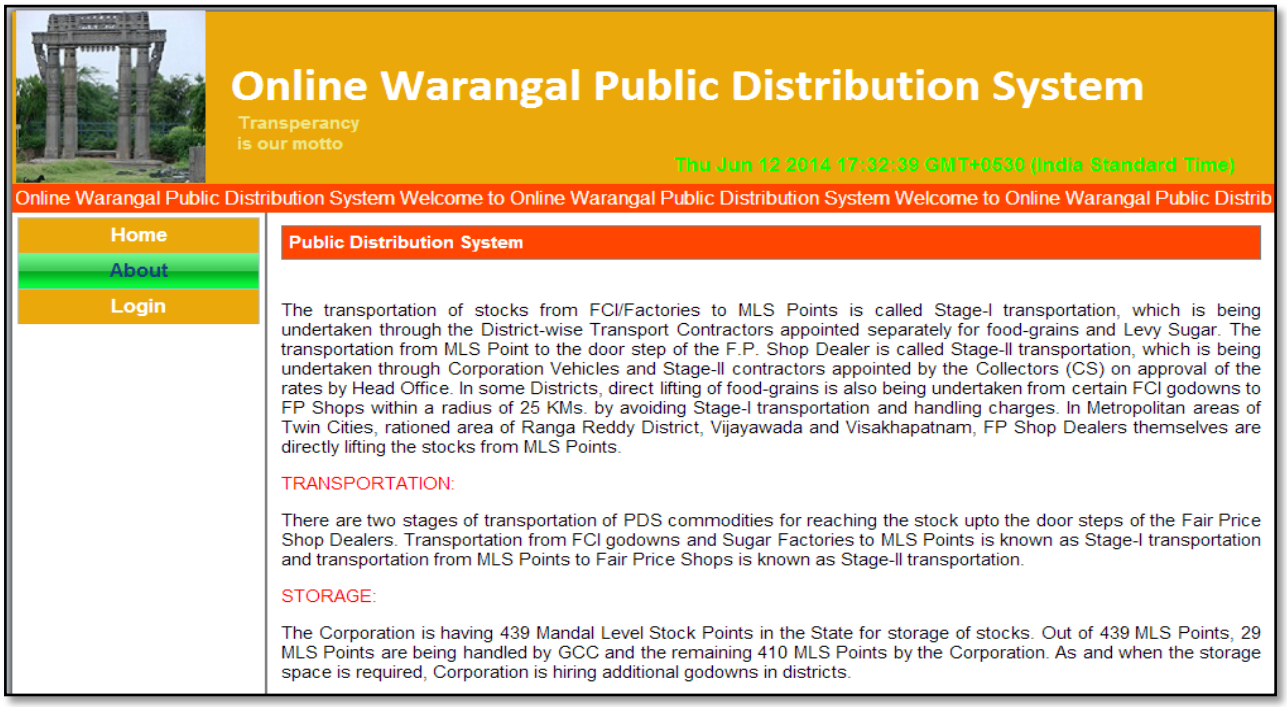

Figure 4.15 : Information about the PDS system

5. PROJECT ANALYSIS

We are making a shift from local decentralised system to the centralised inventory system. The system implements a centralized inventory system on a database that has inbuilt functions for cross referencing entries. This linking will ensure that a uniquely identified person's good is accessed. Dynamic database inventory of all transactions in the PDS provide a huge boost to the system's accountability and transparency that will certainly help in streamlining the system.

5.1 Market Analysis:

The PDS system can be implemented in India across 5 lakh FPS shops. As every state today wants to curb the leakages in the PDS system. They are trying new techniques by which they can curb this menace. Such system can be used in other e-governance schemes as well.

5.2 Technical Analysis:

The project requires certain Information Technology infrastructure:

At **Fair price shops** POS device is required for doing the operation. Also at each fair price shop, Point of sale device should be inputed with details of ration card owner. The details of the card holder will be reflected in the system through which the authentication can be made of the owner. At **mandal level / zonal offices**, desktops / laptops would be required for data entry, online management of ration card, generating online allocation of food grains, utilization reporting and monitoring the operations of TPDS in respective District/UT.

At **District level office**, like Mandal office will require desktops, cloud enabled server or infrastructure, central database storage server, application software's. Bandwidth/ connectivity is required for interlinking the different server, software and application.

Finally it can be linked to the state database for overall allocation in the states.

Technical support:

To achieve these computerisation of PDS, we require that the existing officials, staff and other stakeholders including FPS dealers are also equipped to handle & bring about this change. The States/UTs would assess the overall requirements in terms of training and capacity building for all stakeholders associated with the PDS operations. Accessing the detail of Fair price user can be seen in Figure 6.1

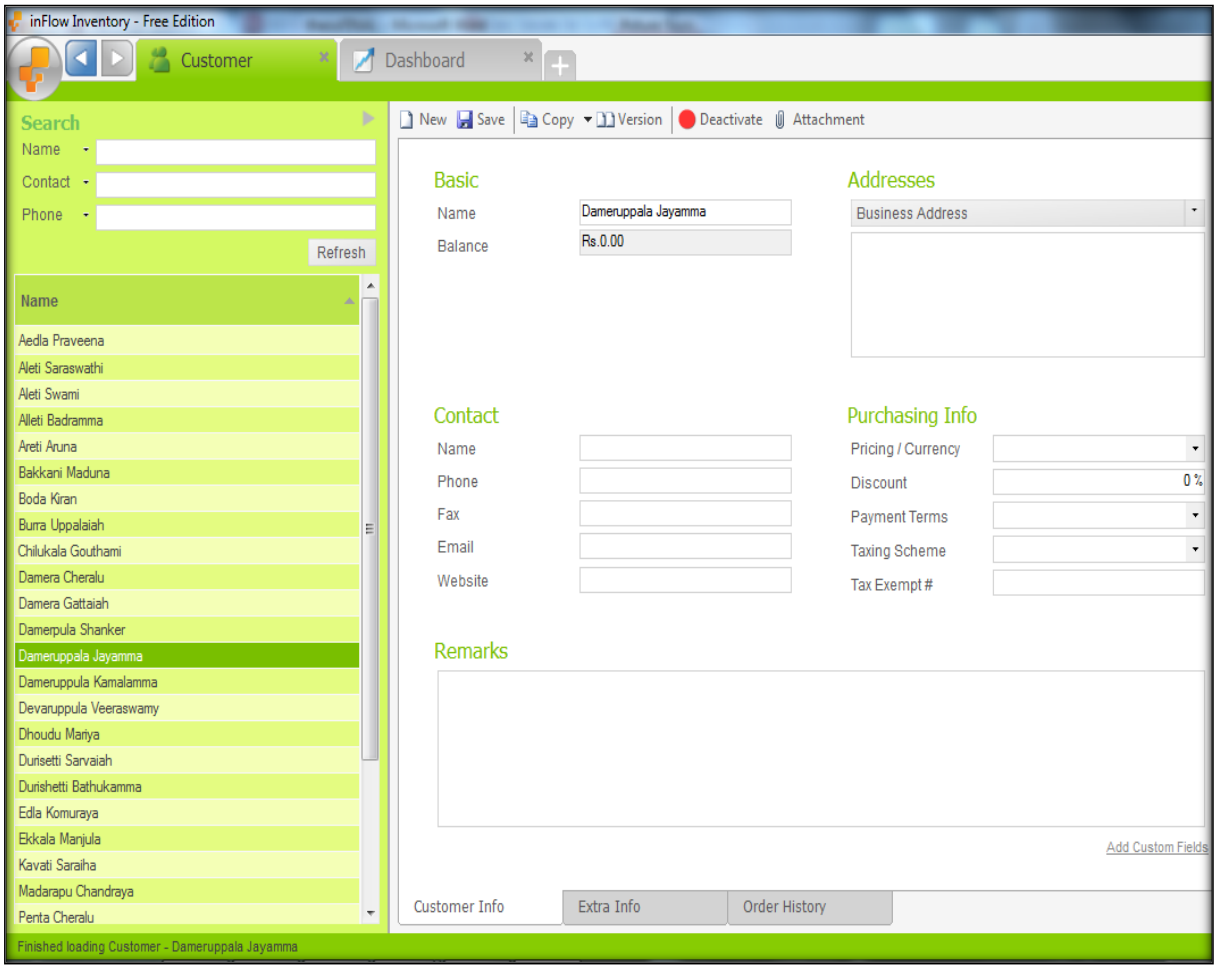

Figure 5.1: Addition of the customer in the POS device.

6. CONCLUDING REMARKS

In this paper, the authors had made an attempt to implement a cloud based supply chain system that will enhance the current state of working of PDS supply chain in the Warangal District. The unified data of inventory at one place will help in eliminating the leakages that are there in the system. The system will also eliminate the bogus cards in the system by using the smart ration card. Integration of district portal with Fair price shop is done. The web portal will give access to all the information citizens requires about their account and inventory intake.

The whole system can be accessed with full privileges to few higher authorities like District Magistrate, FCI administrator with all firewall protection for security. Following information is available on public portal- State-wise Stakeholder Report, Ration Card Report, Allocation Details, Godown Report. Grievance redressal mechanism is in place which will look into the complaints of the citizens.

Online registration and management would improve the efficiency of the system, and enable the timely distribution of food grain to the beneficiary. Delays in movement and off-take of grain could be identified by delays in authentication and immediately flagged on the system. This would also create new spaces for civil society to engage and monitor delivery of entitlements to the poor. Such system will definitely help in curbing the menace of corruption in the supply chain of PDS in Warangal district.

7. FUTURE SCOPE

The use of Smart card -based authentication across the supply chain gives governments the opportunity to link such authentication to a cloud-based management information system (MIS) within the PDS. An Smart Card-linked MIS would enable the PDS to address broader procurement, storage and monitoring challenges. Registration and procurement orders could be managed online, enabling decentralized, and more local procurement Inventory management could be

streamlined and handled online in real-time. This would also enable the PDS to implement state wide information systems that link all ration shops in a state, and give beneficiaries more flexibility in how they collect their entitlements, and from which ration shop.This system can also be further use for domestic L.P.G distribution. The transportation of inventory from one place to another can also be modelled and incorporated in the system. The other beneficiary schemes of government like Mahatma Gandhi Rojgar guarantee yojna (MNREGA) can also be incorporated. Ration card generation Mechanism can also be integrated so that customer can get their ration card at home without any hassle

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