

WORKING PAPER NO: 481

Expenditure Management in the Public Distribution System

Charan Singh

*RBI Chair Professor
Economics & Social Science
Indian Institute of Management Bangalore
Bannerghatta Road, Bangalore – 5600 76
Ph: 080-26993818*

charansingh@iimb.ernet.in

Anushi Shah

PGP Student, IIMB

anushi.shah13@iimb.ernet.in

Myanka Aggarwal

PGP Student, IIMB

myanka.aggarwal13@iimb.ernet.in

Padmakumar Nair

PGP Student, IIMB

padmakumar.nair13@iimb.ernet.in

Ritanshu Kashyap

PGP Student, IIMB

ritanshu.kashyap13@iimb.ernet.in

Shamil Mohamed

PGP Student, IIMB

shamil.m13@iimb.ernet.in

Shomrita Pal

PGP Student, IIMB

shomrita.pal13@iimb.ernet.in

Year of Publication –February 2015

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Abstract

Food subsidy is a significant part of the cost incurred by the national exchequer. The Public Distribution System (PDS) has been long criticised for its inefficient track record with enormous leakages. This is a significant loss to the country. One of the main reasons for existence of leakages in the PDS system is the price differential that exists between market prices of food grains and the price at which it is sold at PDS. Additionally, the PDS has also faced criticism in recent years with regards to the quality of food distributed through them, transparency in the distribution network, and lack of coverage for passing benefits to the lower economic strata.

This paper describes a new model for the PDS which makes use of technology along with appropriate process changes to address the issues plaguing the current system. It proposes changes to the manner in which food grains are supplied to Fair Price Shops (FPS) and last mile delivery of grains to entitled individuals. Together, it leads to the creation of a robust tight system aimed at effective delivery of benefits to the needy individuals without wasteful leakages. Moreover, the paper considers the fact that more than ensuring mere food security, it is also important to ensure that the needy receive a nutritious meal at an affordable price. For this, the paper recommends making use of the extensive reach of the PDS to distribute a more nutritious mix of food items to the poorer masses of the country. Usage of PDS as a tool to regulate prices of critical food items will also result in significant cost savings for the poor and the nation as a whole.

Key words: Public distribution system; Food Corporation of India; Food subsidy; Minimum support price; and food grains.

¹ The paper is based on field research and the field visit was undertaken in the Yeshwanthpur Wholesale Market, North Bangalore. The author would like to thank Shara Bhattacharjee for research assistance.

Introduction: Public Distribution System – A Few Suggestions

India's food subsidy scheme was put into place in order to bring about equity in distribution and accessibility to food grains. Food subsidy is administered in a dual way in India. It has a producer subsidy for farmers, by way of minimum support prices (MSP), and consumer subsidy by way of the Central Issue Price (CIP) at which the food grains are sold. The Food Corporation of India (FCI) procures food grains from the farmers at the MSP (set by the government) and further distributes them at the CIP to consumers who benefit from various government food schemes and programs. The consumer subsidy is absorbed by the FCI, which in turn is subsidised by the government for the difference between the MSP (and other procurement and distribution costs) and the CIP.

This seems to be an effective system for achieving a dual objective of increasing supply and bringing about equity in fulfilling demand. But much of the food subsidy program is subject to widespread debate. At the centre of this debate is FCI that has been blamed for operational inefficiencies and poor management of food stock that frequently leads to deterioration in the quality of food and inventory problems at various nodes of the distribution network. According to the estimates, the leakage in PDS system is as high as 90 percent in some states (Subramani, 2010). These inefficiencies have made subsidies a wasteful expenditure as it does not reach the intended beneficiaries through the PDS.

Other than providing food security, PDS system is also responsible for ensuring price stability in the economy. But recent incidents of high food inflation indicate that PDS needs to be seen as an important tool for targeting inflation. This paper also looks at various instances of inflation in the country and attempts to address the issue of inflation targeting using the PDS system.

Another important concern for a developing country like India is the increasing malnutrition in the country. India is ranked below many of the less developed sub-Saharan countries in terms of extent of malnutrition in the population. One-third of world's children suffering malnutrition belong to India.² While PDS was formed with the objective of providing food security to the country, it is important to go beyond this objective and look at the larger picture of nutrition security. With its wide reach, PDS can play an important role in achieving nutrition security for the Indian population if the current leakages are plugged, and the mix of items made available through the PDS is changed.

The objective of this paper is to examine the FCI and PDS and suggest ways for effective management of expenditure through use of technology. The paper further illustrates the use of the improved PDS system to regulate prices of critical fruits and vegetables which contribute significantly to rising food inflation - the cost of which is ultimately borne by the underprivileged of the country.

² UNICEF (2012).

The paper begins with an introduction to FCI and the PDS in Section II. These constitute the two most important players responsible for procurement and distribution of food grains across the country. In Section III, the paper discusses methods for improving the upstream supply chain of the PDS. A discussion on successful models implemented by Tamil Nadu and Chhattisgarh is followed by a proposal for a new model which leverages modern technology to contain leakages in the upstream supply chain. In Section IV, the last mile delivery of food grains, looking at various inefficiencies that the current system is facing has been discussed. This is followed by a proposal for set up of a new process which brings in more accountability while keeping the implementation reasonably simple. In Section V, the possibility of using PDS for inflation targeting and using its extensive reach to achieve a higher objective of nutrition security for Indian population has been explored. Finally, Section VI lays down implementation plan for the new PDS model.

Section II: Role of various governmental agencies in ensuring food security

Historically, in brief, government's involvement in food grain marketing began after the failure of food grain distribution system in the country led to Bengal famine in 1943. The job was delegated to department of food under ministry of Agriculture. The prices of food started rising again in 1957. The problem was attributed to an inefficient and disintegrated private food grain market and it was held that government should control and even trade in food grain market to make the system more efficient and aligned to the interests of the society.

Following this, FCI and Commission for Agricultural Costs and Prices (CACP) were founded in 1965. CACP's role was to advise government on pricing of agricultural commodities, including food grains. This resulted in creation of two food grain markets in India: a government controlled public food grain market and an open private food grain market. While there are a lot of competing traders in the private market, public market consists of just one player, that is, FCI.

Food Corporation of India

Until 1970's, FCI handled all cereals including coarse cereals, but narrowed down to just wheat and rice after 1980, although it continued to engage in some sugar distribution. Imports are completely canalized through FCI and private traders are not allowed to import food grains. Also, essential Commodities Act prohibits private traders and millers from stocking food grains beyond a stipulated limit.

The objectives of FCI were to ensure the following-

1. Price support to farmers (producers)

CACP advises a support price based on cost of production, changes in input prices, trends in domestic open market and international prices, demand and supply, the estimated effect of

changes in the support price on the industrial cost structure and the cost of living.³ Support price sets the floor to the open market price.

2. Food grain distribution at subsidized price targeting the poor

This was achieved through PDS, which had following objectives-

- a) Provide food grain to low-income consumers in order to maintain food availability.
- b) Stabilize food grain prices through PDS prices that are below open market prices.
- c) Transfer income to low-income consumers to raise their nutritional standards and equalize food grain consumption.

3. Buffer stock maintenance to ensure national food security

FCI is charged with the duty to maintain stock of food grains to ensure food security for the country. The motives of private and public storages are different. Private traders store in order to make profit from off-season price rises. On the other hand, public storage aims at reducing off-season prices. Public storage helps the producers during surplus years and consumers during deficit years.

FCI has a network of storage depots, including silos, godowns and an indigenous method developed by FCI called CAP (Cover and Plinth). CAP is the term given to storage of food grains in the open with precautions like rat and damp proof plinths, etc. covering of stacks with specially fabricated polythene covers. FCI has both owned and hired storage capacity and the latter constituting a higher percentage of total storage capacity. As on April, 2014, total owned and hired capacities amounted to about 15.6 million tonnes and 21.25 million tonnes respectively (Table 1).

Table 1: Year-wise installed storage capacity by FCI (Covered and CAP) in million tonnes

| Capacity | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Covered | | | | | | | | | |
| Owned | 12.93 | 12.94 | 12.95 | 12.97 | 12.97 | 12.99 | 13.01 | 13.00 | 13.00 |
| Hired | 09.90 | 09.34 | 08.71 | 10.12 | 12.89 | 15.46 | 17.21 | 20.99 | 20.86 |
| Total | 22.83 | 22.28 | 21.66 | 23.09 | 25.86 | 28.45 | 30.22 | 33.99 | 33.86 |
| CAP (Cover and Plinth) | | | | | | | | | |
| Owned | 2.21 | 2.29 | 2.20 | 2.17 | 2.51 | 2.62 | 2.63 | 2.64 | 2.64 |
| Hired | 0.51 | 0.63 | 0.03 | 0.02 | 0.47 | 0.54 | 0.75 | 1.10 | 0.39 |
| Total | 2.72 | 2.92 | 2.23 | 2.19 | 2.98 | 3.16 | 3.38 | 3.74 | 3.03 |
| Grand Total | 25.55 | 25.20 | 23.89 | 25.28 | 28.84 | 31.61 | 33.60 | 37.73 | 36.89 |

Source: FCI (2014).

³ Gulati, Sharma and Kahkonen (1996).

An additional capacity of about 19.7 MT is in pipeline. Even with the increased storage, FCI capacity will not be sufficient to meet total storage requirements. For example, all time high stock levels achieved in 2012 was about 82.3 MT, while the current capacity is only about 50 percent of this.⁴

Transportation

Surplus food grain which is mainly confined to the Northern States is transported over long distance throughout the country to deliver to deficit states. Stocks procured in the markets and purchase centres is first collected in the nearest depot and from there dispatched to the recipient States within a limited time. Main transportation method is rail while coastal transportation modes are also explored.

Import of food grains

FCI also acts as the body responsible for food grain imports.

For FCI to be considered economically efficient revenues of FCI should cover its costs and the costs should be comparable to those of private traders. But it has been seen that operational costs of FCI has been much higher than those of private traders who work in a much restrictive environment than FCI. For example, FCI enjoys concessional freight and credit rates and is free from selective credit controls and movement restrictions. Economic cost of FCI comes from MSP, procurement and distribution costs while revenue comes from the weighted average of issue prices at which FCI has sold food grains to states. If per unit costs exceed the revenue, the difference is reimbursed to FCI by government as a consumer subsidy. FCI also incurs costs from carrying buffer stocks, which are also totally reimbursed by government. Hence total subsidy to FCI consists of- a) cost minus revenue, and b) storage costs of buffer stock.

Also, the gap between economic costs and revenues has been widening over the years.

Cost analysis

In this section, an attempt has been made to look at the various cost heads involved in the operations of the FCI. The various costs can be broadly categorized as procurement costs and distribution costs.⁵

a) Procurement costs

Procurement costs are costs associated with procurement of food grains by the FCI. This can further be classified as obligatory and non-obligatory costs.

- *Obligatory costs*

It consists of about 70 percent of total procurement costs and includes mandi charges, sales/purchase tax and cost of gunny bags. Obligatory costs are generally higher for FCI

⁴ Parsai (2012).

⁵ Gulati, Sharma and Kahkonen (1996).

compared to private traders due to strict adherence to mandi system and superior bags used.

- *Non-obligatory costs*

It consists of about 30 percent of total procurement costs and is controllable by FCI. This includes storage charges, mandi labour, internal movement costs etc.

b) Distribution Costs

FCI faces various costs associated with distribution of Food grains. Some of these are-

- *Interest costs*

FCI receives concessional credit through a consortium of Indian commercial banks and hence interest costs are significantly low compared to private traders.

- *Freight charges*

Freight charges are significantly lower due to usage of rail mode to transport food grains within and between regions. But physical losses and pilferage are high in rail mode compared to road mode. Hence freight differential goes down considering different aspects like quality of service, flexible freight structure, delays, transit losses and pilferage, difference in baggaging, etc.

- *Handling charges*

Handling charges include charges at mandis, ports and rail depots. The charges are almost the same for FCI and private traders.

- *Storage and transit shortages*

Storage losses occur due to loss of weight, infestation, deterioration of stocks and theft. Transit shortages occur due to missing wagons, natural calamities, theft and pilferage. These costs are higher for FCI compared to private traders. National policy on bulk handling storage and transportation of food grains was enacted with the objectives of minimizing storage and transit losses.

- *Administrative expenses*

FCI has higher administrative costs than private traders due to increased staff costs.

Public Distribution System

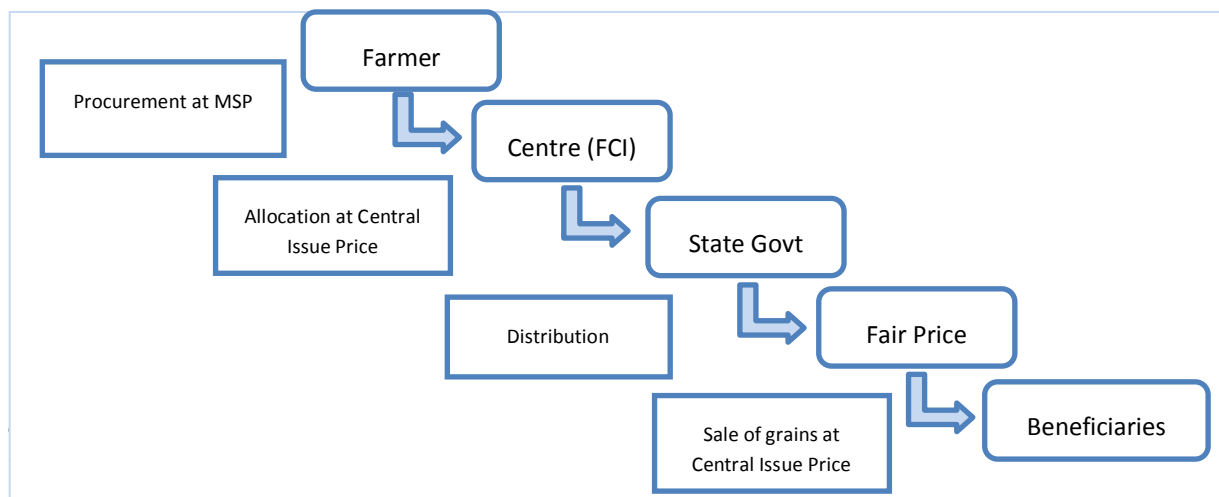
The PDS forms the distribution network for delivering food grains to the needy. PDS started in India during the British era during 1940's to address the need of distribution of food grains and other essential items during famines.⁶ The PDS was then concentrated around the urban parts of the country. Since then the PDS has evolved into a large network covering urban, rural, hilly and tribal areas. The last-mile delivery is done through Fair Price Shops (FPS).

Before 1992, the entitlements were general and any Indian citizen could benefit from them. This did not distinguish the population based on area or income. In 1992, as a measure towards improving the PDS and food security situation in the country, the Revamped PDS (RPDS) was launched. RPDS took an area specific view of the situation. The main aim was to strengthen the existing PDS system and extend it to far-flung regions of the country - such as hilly and tribal areas. Also as part of the RPDS, the central government identified and implemented area specific programs such as Drought Prone Area Programme (DPAP), Integrated Tribal Development Projects (ITDP), Desert Development Programme (DDP) and certain Designated Hill Areas (DHA). These projects were identified in consultation with the State governments.

The main focus of the TPDS was to identify the poor and hungry population and provide them with required food grains. While universal and revamped PDS did not consider the distribution of need for food grains, TPDS attempts to do that. The job of identification of Below Poverty Line families was given to the state governments (using the parameters provided by the Planning Commission). The scheme aimed to benefit 6 crore population through 5 lakh FPS.

In December 2000, the Antyodaya Anna Yojana was launched to active, identify and target the poorest of the poor set of population. They were given food grains at a highly subsidized rate of Rs. 2/kg. Initially the program included a population of 1 crore families, which has now increased to about 2.5 crore poorest of the poor households. The overall functioning of the TPDS is described in the flow diagram presented in Figure 1.

⁶Government of India, Department of Food and Public Distribution.

Figure 1: Supply chain of PDS in India

Source: Balani (2013).

Leakages in the PDS system

A study was conducted by the Planning Commission of India in 2005, and the report states that the current PDS system is highly inefficient due to the huge leakages in the system. The findings of the report state that off-take per household has improved over the years, but as of 2005, only 57 percent of BPL (as identified by the State governments) was covered by TPDS. Irregular delivery schedule is seen as a major reason for low off-take. This then leads to diversion of food grains. 36 percent of the budgetary subsidies are diverted out of the supply chain while about 21 percent end up with APL families. Moreover, it was found that FPS is generally not viable (returns less than 12 percent) due to razor-thin margins. Only 22 percent FPS were found to be viable. These were concentrated in a few states such as Tamil Nadu, Andhra Pradesh. In other states, it was found that they remain in business through diversion of food grains. Monitoring of FPS is also very irregular and ineffective in most states. The end result is that only about 42 percent of the food grains issued from the central pool reach the target population.

Table 2 shows the findings of the ORG-MARG study on state-wise leakage figures for rice and wheat.

Table 2: Findings of ORG-MARG study on state-wise leakage for rice and wheat

| SI. No. | State/UT | Diversion (%) | |
|---------|---------------------------|----------------|----------------|
| | | Rice | Wheat |
| 1 | Andaman & Nicobar Islands | Negligible | Negligible |
| 2 | Andhra Pradesh | Negligible | No Consumption |
| 3 | Arunachal Pradesh | 64.1 | 96.2 |
| 4 | Assam | 37.2 | 100 |
| 5 | Bihar | 14.7 | 44.7 |
| 6 | Chandigarh | No Consumption | No Consumption |
| 7 | Chhattisgarh | 33.4 | 71.4 |
| 8 | D&N Haveli | 48.5 | 69.4 |
| 9 | Daman & Diu | No Consumption | No Consumption |
| 10 | Delhi | 10.5 | 25.1 |
| 11 | Goa | 42.9 | No Consumption |
| 12 | Gujarat | 16.2 | 24.4 |
| 13 | Haryana | No Consumption | 74.2 |
| 14 | Himachal Pradesh | 58.2 | 34.1 |
| 15 | Jammu & Kashmir | 64.3 | 13.5 |
| 16 | Jharkhand | Negligible | 37.5 |
| 17 | Karnataka | Negligible | Negligible |
| 18 | Kerala | Negligible | 42.6 |
| 19 | Lakshadweep | Negligible | No Consumption |
| 20 | Madhya Pradesh | 48.3 | 44.7 |
| 21 | Maharashtra | Negligible | 25.6 |
| 22 | Manipur | 97.7 | 100 |
| 23 | Meghalaya | 61.3 | 100 |
| 24 | Mizoram | 52.6 | 100 |
| 25 | Nagaland | 88.6 | 100 |
| 26 | Orissa | Negligible | No Consumption |
| 27 | Pondicherry | Negligible | No Consumption |
| 28 | Punjab | No Consumption | Negligible |
| 29 | Rajasthan | No Consumption | 59.0 |
| 30 | Sikkim | Negligible | 100 |
| 31 | Tamil Nadu | Negligible | No Consumption |
| 32 | Tripura | 3.8 | No Consumption |
| 33 | Uttar Pradesh | 32.4 | 59.1 |
| 34 | Uttarakhand | 53.3 | 58.1 |
| 35 | West Bengal | 34.9 | 86.6 |
| | ALL INDIA | 39 | 53.3 |

Source: Planning Commission (2005).

The following tables show different groups in which states are divided according to the intensity of the problem of leakage.

Table 3: State-wise and source wise total leakage estimates

| Abnormal leakage (More than 75%) | Very High Leakage (50%-75%) | High Leakage (25%-50%) | Low Leakage (Less than 25%) |
|---|---|--|--|
| Bihar and Punjab | Haryana, Madhya Pradesh and Uttar Pradesh | Assam, Gujarat, Himachal Pradesh, Karnataka, Maharashtra and Rajasthan | Andhra Pradesh, Kerala, Orissa, Tamil Nadu and West Bengal |

Source: Planning Commission (2005).

Table 4: State-wise and source wise leakage estimates at FPS level

| Very High Leakage (50%+) | High Leakage (25%-50%) | Moderate Leakage (10%-25%) | Very Low Leakage (Less than 10%) |
|---------------------------------|-------------------------------|--|---|
| Bihar, Haryana and Punjab | Rajasthan and Uttar Pradesh | Andhra Pradesh, Gujarat, Karnataka, Kerala and Maharashtra | Assam, Himachal Pradesh, Madhya Pradesh, Orissa, Tamil Nadu and West Bengal |

Source: Planning Commission (2005).

Section III: Improving the PDS

This section analyses two successful models of PDS implemented by Tamil Nadu and Chhattisgarh for improving the supply chain of PDS. This is followed by evaluation of a few alternatives for preventing leakages which have been discussed in the previous section. The section concludes with a recommendation for setting up a revamped upstream chain which makes use of latest technological advances.

Tamil Nadu Model

Tamil Nadu is today seen as one of the few states who have implemented PDS in an effective manner. The state has gone ahead with Universal PDS instead of Targeted PDS. This was done due to difficulty in identifying and targeting the BPL households. Universal PDS eliminates the risk of non-inclusion but increases the burden on the PDS system a lot.

The Tamil Nadu government sees an expenditure close to Rs. 4000 crore for food subsidy (Vyadhianathan, Radhakrishnan, 2010). It delivers 3,17,000 tonnes of rice to more than 1.97 crore card holders through 31,439 FPS outlets in 32 districts of the state. In addition to rice and wheat, Tamil Nadu government also distributes sugar, kerosene, wheat products, pulses and palmolein through the PDS outlets.

The various measures taken by the State government to minimize diversion are:

1. Transportation of commodities from the 310 warehouses spread across the state to various outlets is done using trucks. The trucks have to adhere to route charts. These charts display the route to be taken by the trucks along with details of commodities carried by the truck. Any government official or elected representative has the authority to check the truck on suspicion of diversion of food grains.

2. Opening of control rooms in every district to receive and act on information about diversion of food grains.
3. GPS based vehicle movement monitoring is being run on pilot basis in districts of Krishnagiri and Thiruvallur.
4. Introduction of online go-down monitoring systems to capture all transactions taking place in various warehouses.
5. Tight monitoring of FPS through use of technology has been introduced. SMS based FPS stock monitoring has been set up by the Cooperative Department. This enables tracking of stock of the commodities at every FPS. As a result of this tracking system, replenishments are faster and it is difficult to divert food grains from FPS. A sudden increase in off-take from a FPS brings the FPS under the scanner of the vigilance department.
6. Handheld billing machines with GPRS connection have been installed in all FPS in Chennai to help monitor sales and stock levels on a real time basis.
7. Electronic weighing machines are provided in every FPS to avoid short measurement related complaints.
8. Online portal for grievance registration has been set up and is being actively monitored by the concerned authorities.
9. Most of the FPS' are run by the government or its agencies. While most shops run at losses, the state government has been providing these shop owners with a subsidy amounting to Rs. 300 crores to cover costs related to wages, establishment costs etc.
10. Criminal prosecution is launched against shop owners indulging in malpractices. Vehicle permits and licenses are cancelled if truck drivers are found diverting food grains.

Chhattisgarh Model

The Chhattisgarh government started undertaking PDS reforms since 2004.⁷ The PDS network currently covers about 36 lakh households. The development of Chhattisgarh model can be described as follows:

1. Ownership of FPS was transferred to community run institutions like gram panchayats, forest councils employing tribal, women self-help groups etc. This led to increase in accountability. Shops run by private owners who did not live in the same village were not open all days of the year, but community owned shops were accountable to the villagers and hence performed better.
2. The PDS commissions were raised from Rs. 8 per quintal to Rs. 35 per quintal. This move was done to address the issue of losses in running a FPS. Seed capital of Rs. 75,000 was also

⁷ IBN (2011).

given to open new PDS outlets. The government spent about Rs. 80 crore per year for this purpose.

3. Raids were conducted to crack down diversion and re-selling of rice by rice mill owners.
4. Centralized re-printing of BPL cards was carried out to remove the ghost card holders.
5. Apart from the BPL families identified, the state extended the facility by adding automatic inclusion of old, destitute, disabled and primary tribal groups.
6. The charge of transportation of food grains was taken out of private players and given to Civil Supplies Cooperation. This was done to stop diversion of food grains before they reach the PDS outlets.
7. Web based application was deployed to track the procurement, transportation and delivery of food grains.
8. Awareness programs such as "Chawal Utsav" were launched to bring in awareness among people about their entitlements. This also increased transparency of the process.

Recommendation- Extensive use of IT based solutions

Advances in information and communication technology can help make the system more efficient and transparent. IT solutions help in re-engineering government business processes and adapting it for focused service delivery. IT can help in operationalizing right to information to public through online grievance redressal and such similar systems. IT will also help institutionalize reporting through a management information system. But integrating IT systems right to the last mile end point fair price shop level is a difficult but necessary prerequisite for the system to be completely effective. Moreover, economic, infrastructural and physical constraints like lack of power and connectivity in remote rural and hilly areas, huge investments involved and vast expanse of the country are a few major hurdles for a full-scale implementation of IT solutions.

The following model illustrates the proposal for addressing leakages in the upstream supply chain from procurement till delivery at the individual FPS. It aims to bring together some of the best features of the solutions discussed above, while also addressing the fundamental cause for leakages in the system.

The main reason for diversion of food grains at various stages of the supply chain is the existence of price differential between subsidized FPS prices and market prices along with retention of ownership by FCI.

This section proposes the following changes to the existing system:

1. Transfer of ownership from one entity to the other at every stage of the PDS system at prevailing market prices.

2. Use of Radio-Frequency Identification (RFID) tagged sacks to track the flow of goods along with efficient inventory management.
3. Use of banking system to compensate the FPS owners based on actual sales of food grains.

The following details are presented for a better understanding-

Procurement

At this stage, FCI must tag each procured sack of food grain using a RFID tag which will contain important information related to time and place of procurement, price information, type quantity and quality related information etc.

a) Transportation

The transportation agency must buy the food grains from the procurement centre at the market price and transfer it to the FCI godown. The FCI godowns at each state will receive the goods after paying the market price for the same along with transportation charges. Any losses in this stage must be borne by the transportation agency.

b) Storage at FCI godowns

At the FCI godowns, which are government owned/operated entities, the supervisor's salary incentives should be tied to the losses incurred at the godown. At reception, FCI godown must scan and record the receipt of each sack along with all the associated details. It should also record details such as time of receipt, FCI godown details, quantity received etc. This information will be used for reconciliation with the previous stages. The losses incurred would be evident from the outflow of goods from the godown along with inventory of goods held at the godown. The process of reconciliation is made easy with the use of RFID tags.

c) Fair Price Shops

At the Fair Price shops, again the receipt of food grains must be followed by scanning to RFID tags to make a record of quantity received, time of receipt, quantity received etc. Payment at full market rate must be made by the FPS owner to the transportation agency based on the amount of food grains actually received. The fair price shop owner is required to have an account with a bank, through which he will be compensated for the payment made based on actual sales recorded.

d) Centralized IT infrastructure

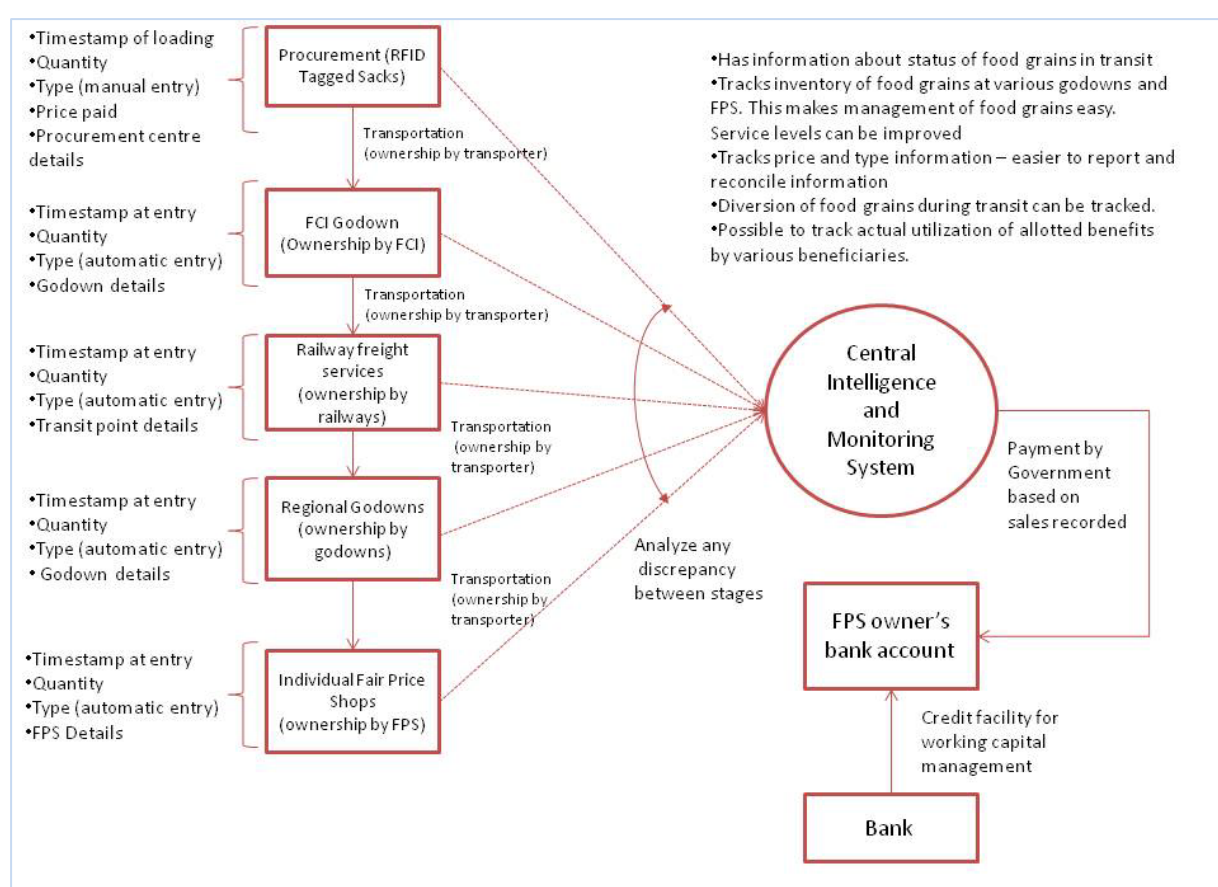
A centralized IT infrastructure needs to be set up to track the movement of goods (using RFID tags) and detect discrepancies, if any, from one stage to the other. This system should

also be used to compensate the FPS owners based on amount of actual sales done (refer to section II for details on reconciliation of sales). This system can also be used for planned procurement, effective inventory management and distribution of food grains to areas which are in most need of food supply.

This scheme requires the FPS owners to have a bank account, but does not require every ration card holder to have a bank account.

Figure 2 represents the model for improving the upstream supply chain of PDS.

Figure 2: Model for improving upstream supply chain of PDS



Source: Author's Proposed Plan.

Section IV: Improving the PDS – Last Mile delivery

In the previous section, the paper focused on diversions that take place in the upstream supply chain of the PDS. But it is also important to look at the last mile delivery of food grains. The PDS has faced challenges in terms of identification of beneficiaries and actual delivery of benefits to the intended recipients. Studies have shown that food grain leakages arise due to two reasons:⁸

⁸ Nagavarapu and Sekhri (2011).

1. Errors in the allocation of the BPL cards by officials or creation of ghost cards. While some of these errors must be systemic, in terms of not updating the database, deliberate actions by local authorities could play a major role. It has been noted that the current implementation results in error of exclusion of BPL families and error in inclusion of beneficiaries (APL families are included). This shows the extent of misclassification of population, when the idea of TPDS is based on effective targeting of poor.

The state-wise classification of estimated targeting error is shown in Table 5.

Table 5: State-wise estimated targeting error

| States | Exclusion error | Inclusion error | Shadow ownership error |
|------------------|-----------------|-----------------|------------------------|
| Andhra Pradesh | 3.2 | 36.39 | 0.0 |
| Assam | 47.29 | 17.16 | 12.3 |
| Bihar | 29.81 | 12.2 | 13.55 |
| Gujarat | 45.84 | 9.78 | 11.87 |
| Haryana | 27.9 | 14.16 | 0.42 |
| Himachal Pradesh | 8.86 | 20.39 | 7.01 |
| Karnataka | 23.38 | 42.43 | 20.58 |
| Kerala | 16.28 | 21.04 | 4.05 |
| Madhya Pradesh | 19.61 | 12.49 | 5.27 |
| Maharashtra | 32.69 | 11.11 | 4.34 |
| Orissa | 26.56 | 16.78 | 8.37 |
| Punjab | 7.75 | 12.33 | 0.0 |
| Rajasthan | 16.73 | 5.22 | 0.0 |
| Tamil Nadu | - | 49.65 | 10.2 |
| Uttar Pradesh | 26.75 | 13.25 | 10.5 |
| West Bengal | 31.74 | 10.23 | 4.69 |

Source: Planning Commission (2005).

Table 6 shows the leakage through the ghost cards.

Table 6: Leakage through ghost cards

| Very High Leakage (+30%) | High Leakage (10%-30%) | Moderate Leakage (less than 10%) |
|--|---|---|
| Assam, Himachal Pradesh and Madhya Pradesh | Bihar, Gujarat, Karnataka, Maharashtra, Orissa, Uttar Pradesh and West Bengal | Andhra Pradesh, Haryana, Kerala, Punjab, Rajasthan and Tamil Nadu |

Source: Planning Commission (2005).

2. Selling of the food grains in the open or black market due to the existence of a price differential.

The following central issues are pivotal to the food subsidy discussion:

- Poor supply chain management, leading to overstocking of food grains at certain nodes of the distribution network. This might also lead to open market selling in order to dispense the stock.

- Lack of transparency in the distribution network to track the effectiveness of the supply in meeting equitable demand as proposed by the food subsidy program.
- Lack of availability of clean and sizeable go-downs for effective stock keeping and storage, leading to a deterioration of the food grains before reaching the end consumer.

Each of these issues point out to the need for revamping the distribution system in order to make it more effective for the lowest economic strata of the country.

Table 7 shows the state-wise distribution of the additional unintended subsidy because of leakages error.

Table 7: State-wise additional unintended subsidy due to leakages error

| Balance sheet of central pool BPL food grain (Kg./ BPL family/annum) | | | | Central unit subsidy for BPL-State wise (Rs./Kg.) | | |
|--|------------------------------------|-------------------------------------|--|--|------------------|---|
| State | Off-take by states Govt. (2003-04) | Off-take by identified BPL families | Food grains not reaching the poor households | Total central subsidy for Off-take by identified BPL | Intended subsidy | Unintended subsidy/ Additional deliver cost |
| Andhra Pradesh | 466.16 | 197.65 | 268.51 | 13.75 | 5.83 | 7.92 |
| Assam | 490.76 | 227.32 | 263.44 | 12.59 | 5.83 | 6.76 |
| Bihar | 138.13 | 12.24 | 125.89 | 50.98 | 4.52 | 46.46 |
| Gujarat | 320.24 | 169.47 | 150.77 | 8.77 | 4.64 | 4.13 |
| Haryana | 416.16 | 138.79 | 277.37 | 12.44 | 4.15 | 8.29 |
| Himachal Pradesh | 492.22 | 266.14 | 226.08 | 9.19 | 4.97 | 4.32 |
| Karnataka | 480.80 | 139.91 | 340.89 | 18.78 | 5.46 | 13.31 |
| Kerala | 407.58 | 248.58 | 159.00 | 9.56 | 5.83 | 3.73 |
| Madhya Pradesh | 365.57 | 124.04 | 241.53 | 14.53 | 4.93 | 9.6 |
| Maharashtra | 347.29 | 227.27 | 120.02 | 7.32 | 4.79 | 2.53 |
| Orissa | 276.37 | 175.88 | 100.49 | 9.16 | 5.83 | 3.33 |
| Punjab | 364.24 | 38.25 | 326.00 | 40.15 | 4.22 | 35.93 |
| Rajasthan | 366.53 | 238.43 | 128.10 | 6.39 | 4.16 | 2.23 |
| Tamil Nadu | 525.95 | 181.14 | 344.81 | 16.93 | 5.83 | 11.10 |
| Uttar Pradesh | 285.16 | 92.73 | 192.43 | 14.13 | 4.6 | 9.54 |
| West Bengal | 336.78 | 246.19 | 90.59 | 6.63 | 4.84 | 1.79 |
| Total Average of Sixteen States | 380.0 | 160.25 | 219.75 | 12.24 | 5.16 | 7.08 |

Source: Planning Commission (2005).

The Issues in Last Mile Delivery

In terms of last mile delivery, two major issues that have been identified are as follows:

a) Entitlement for eligible households

The lowest economic strata, that are in need of the food grains, are not getting access to the same in the PDS. Several issues such as inaccurate identification of BPL households, creation of counterfeit ghost cards and lack of availability of low price grains at the FPS are the cause of this issue. As a result, the food subsidy has become regressive to a large extent.

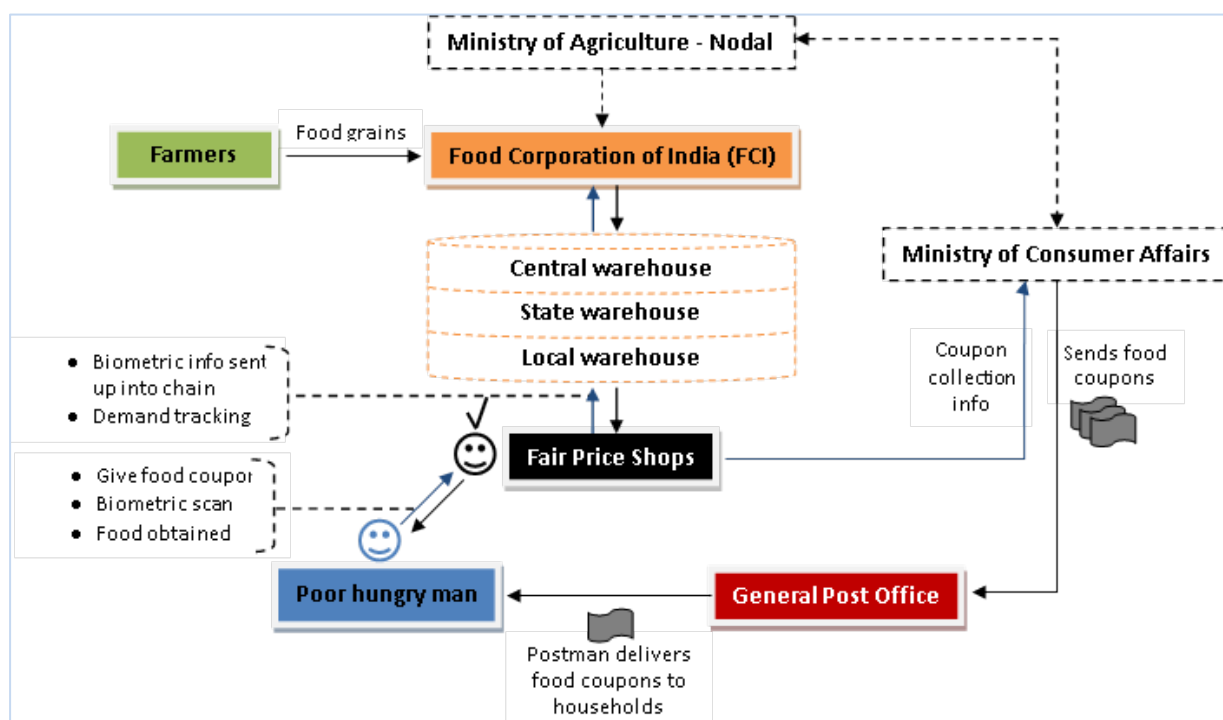
b) Poor quality of food at the FPS

One of the biggest criticisms of the PDS revolves around the poor quality of the grains and foodstuff that reaches the FPS, particularly in more remote areas. Research suggests that the reason for this is the excessive stocking and surplus inventory at various points along the distribution system. Ineffective demand estimation, coupled with the pressure to maintain the MSP has led to this major problem in the PDS.

Recommendation: A 'Robust' PDS model for efficient last mile delivery

In policy debates regarding the food distribution system, two broad camps have emerged that propose separate solutions for the aforementioned issues. The first camp talks about a complete overhaul of the PDS, and its replacement with food coupons and direct cash transfers. On the other hand, the second camp proposes greater transparency and monitoring of the existing system.

A solution can be considered that combines the ideologies of the two camps and uses simple technology to improve the efficacy of the PDS. The solution consists of three primary stakeholders – the Ministry of Consumer Affairs (Department of Food and Public Distribution) together with the Ministry of Agriculture, the national post office system and the FPS. With effective use of information technology, a system that effectively plugs all gaps in the supply chain can be conceived (Figure 3).

Figure 3: The revamped model for last mile delivery using Information and Technology

Source: Author's Proposed Plan.

The following are the solutions provided for improving the efficacy of the PDS-

1) Food coupons through the post office system

The post offices are the most far reaching entity on the rural map. Under the proposed system, post offices would be given the responsibility of distributing food coupons every month to rural households, disbursed by the Ministry of Consumer Affairs, for all individuals entitled to the food subsidy. Post offices are geographically closest to the general public and the postman continues to be the trustworthy fellow who shall deliver food coupons to the households identified as true beneficiaries under the food subsidy program. As the food coupons are named to the respective family heads, factors such as coupon trading amongst villagers, creation of ghost cards or false entitlements, lack of internet connectivity for live data tracking are prevented, and every entitled household effectively receives its ticket for a claim in the food subsidy program.

2) Biometric scanners at the fair price shops

The *Aadhaar* card campaign has made significant progress in centralising the database of all Indian citizens, including fingerprint biometric data. Biometric scanners at the fair price shops could enable every citizen holding the food coupon (received using the post office system) to claim and verify the collection of food grains from the shops. On receipt of the desired level of food grains, the coupon holder would scan his or her fingerprints at the fair price shop to

validate the end-point sale to the beneficiary. This transaction data would be relayed upward and tracked by the Ministry of Consumer Affairs to identify possible gaps in the delivery of the food grains. Additionally, this system ensures that only the deserving beneficiary receives the quantity of food grains he or she is entitled to.

3) Demand tracking at every level

One of the central issues in the PDS was the supply of poor quality food. The major reason identified for this was inefficient demand estimation, leading to overstocking of grains at various nodes of the supply chain. Now, with the transaction data from the FPS, the FCI would be able to estimate demand for individual territories and plan its purchase accordingly, thereby minimising overstocking at its warehouses. This would lead to a system that would aim to reach the same level of demand planning sophistication as that of the Chinese manufacturer who gets notified when a sale of its pen is made anywhere in the US.

Several features of this system make it a watertight method of streamlining food distribution. Data of the number of food coupons distributed by the post office and the food coupons collected by the FPS is reported to the nodal ministry, the Ministry of Consumer Affairs. The tallying of these accounts is independent of the FCI, thereby nullifying the scope for coupon misuse or misplacement. The Ministry can then inspect any inconsistencies in the off-take of food grains using this coupon data. Secondly, the usage of the post office system ensures that the beneficiaries regularly receive their claim to the benefits regardless of supply side problems. This would necessitate the FCI to get their act together to provide a satisfactory level of performance. A critical aspect of this solution is its immediate applicability. The government proposed core banking solutions for post offices, and the electronic systems present in most fair price shops, shows that the infrastructure required for this system is already in place, making rapid implementation possible.

While the proposed solution tackles several inefficiencies in the PDS, there is no denying that it brings with it several challenges. Validation and update requirements for biometric data, ensuring uptime and maintenance of biometric scanners, and managing the increased working requirements of the post office, are to name a few.

Section V: Using FCI and PDS system for regulating prices of fruits and vegetables and to ensure nutritional security

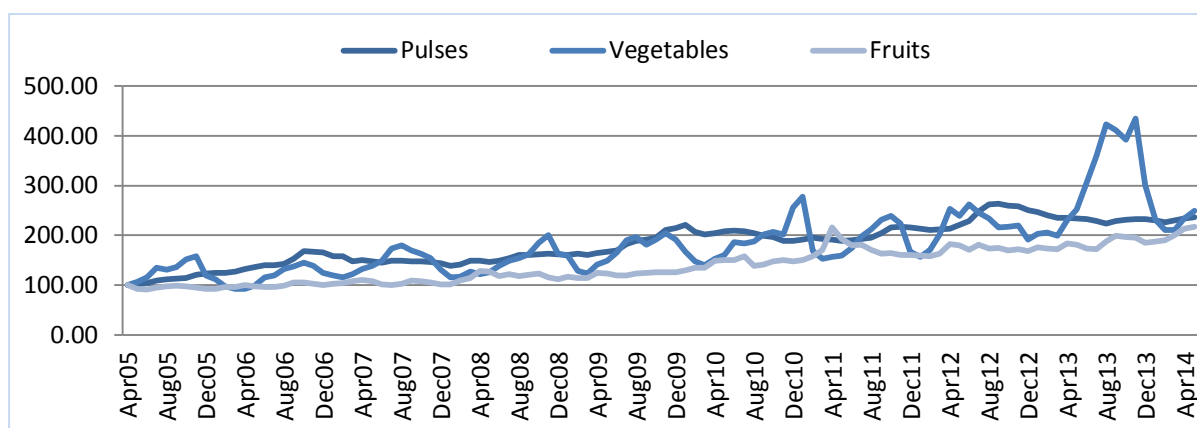
The objective of establishment of PDS goes beyond mere food security, to stabilize food grains market and to ensure that the country also achieves nutritional security. The commodities acquired through the FCI's effective price support operations like MSPs are disbursed through the PDS. Currently, the MSP policy covers 23 items including rice, wheat, pulses and oilseeds. Subsequent analysis in our study shows that from an inflation perspective, the price of items currently under the

purview of the government's MSP policy have displayed a very steady upward trend, whereas price of vegetables which are not included under the MSP policy display tremendous volatility (Annex I).

The cost savings generated from plugging the leakages in the PDS system can be utilised to support the prices of vegetables like onions and potatoes (which now form a part of the list of Essential Commodities List), which our analysis shows contribute heavily to food price shocks. Considering the high levels of poverty in India as well as the contribution of household spending on food, a persistently high level of food inflation is undesirable. Addition of onions in the PDS would help reduce the problems of variability in prices and thus have a positive impact on food inflation as well.

Upon the segregation of the Wholesale Price Index into the Pulses Price Index, Vegetables Price Index and Fruits Price Index, it can be observed that the prices of fruits and pulses exhibit an upward trend that is significantly volatile (Figure 4). This can be attributed to the increasing demand for protein rich food and healthy items like fruits, indicating a shift in the Indian diet. Vegetables constitute an important and consistent part of the Indian diet and increased volatility in vegetable prices indicates momentary supply side shocks followed by an increase in supply, which causes the price to go down.

Figure 4: Pulses, Vegetables, Fruits WPI (April 05 - May 14)



Source: RBI Database.

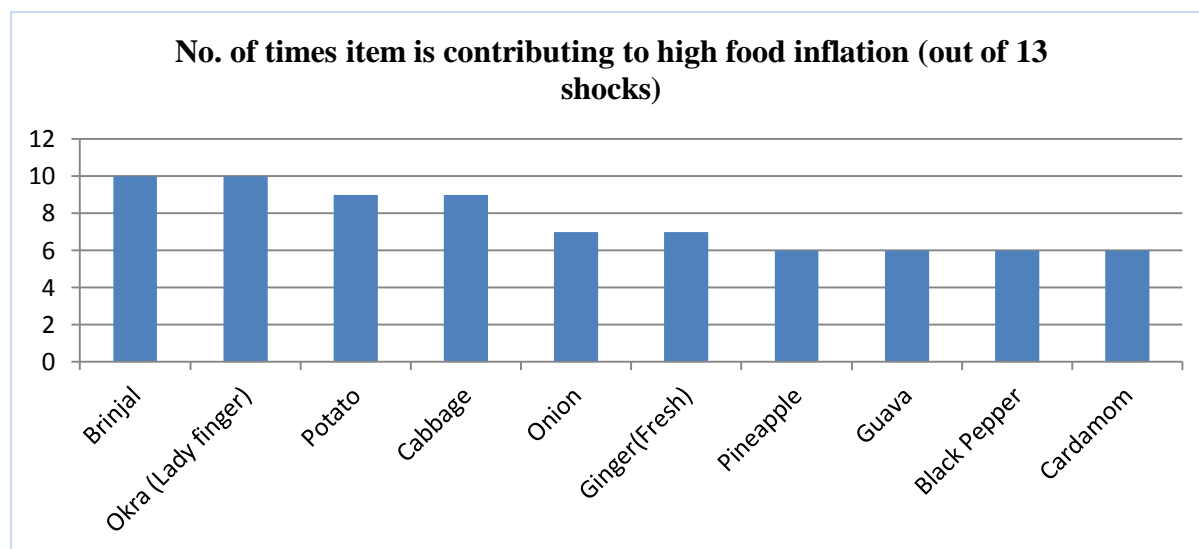
Variability in production, areas under cultivation and yields have contributed to erratic supply of vegetables. Production and yields are very vulnerable to weather shocks. To illustrate, in 2012 the massive price movements in onions was due to muted supply as a result of both drought and excessive rains in Maharashtra. The infrastructure for cold storage, cold chains and drying technologies is inadequate. As a result these weather shocks are immediately transmitted to the market in terms of price rise. The supply chain remains populated with a host of middlemen who charge on a commission basis and erode the farmer's margin, who ultimately do not benefit much from the price rise, contrary to general belief.

Food Price Shock Analysis

To identify the commodities, 13 recent episodes of food price shocks were analysed in detail. Food price shocks were defined as instances when the percentage increase in the food inflation index was more than 3 percent of the previous month's index.

The number of items responsible for high food inflation is presented in Figure 5.

Figure 5: Select Commodities



Source: RBI database.

Figure 5 shows the top 10 commodities, which have contributed to food price shocks the maximum number of times. Perishable items like brinjal, okra and cabbage topped the list, followed by non-perishable items like potato, onion and ginger.

The Onion Story

Among all the vegetables, the case of onion, in particular is very interesting. Onions are considered an indispensable ingredient of most Indian cooking. From the rich to the poor, onion will, in some form or the other, be a part of the diet of most Indians. Extensive use of onion can be rationalised because of many medicinal properties and it can be used as an antibiotic, as an antioxidant as well as for inhibition of cancer and detoxification. It also lowers blood sugar, lowers cholesterol, improves immunity and helps protect the liver.⁹

Based on the 2012-13 production numbers, China is the largest producer of onion in the world, followed by India and together they account for more than 47 percent of the world's production. At 168.13 lakh metric tonnes, India accounted for 20 percent of world production in 2012. However, on

⁹ Tiwari (2013).

productivity India ranks much lower than a lot of other countries with a productivity of only 16 metric tonnes per hectare in comparison to USA which has a productivity of 55 metric tonnes per hectare. Even China has a much higher productivity with 22 metric tonnes per hectare.

Onion is cultivated all over India with 67.25 percent production (2012-2013) coming from the states of Maharashtra, Madhya Pradesh, Karnataka and Andhra Pradesh. India is the second largest producer of onions in the world and the third largest exporter of onions (Table 8).¹⁰ As a percent of the total production, almost 9-10 percent of onion is exported from India. However, since last year, India has been importing onions to meet shortages.

Table 8: Main Types of Onions produced in India

| Sl. No. | Variety | Season | States in which produced | Measure | Characteristics | Keeping Quality | Average Yield per hectare |
|---------|----------------------------|----------------------|---|--------------------------|---|-----------------|---------------------------|
| 1 | Agrifound Dark Red | Kharif season | All over the country | 4-6 cm with tight skin | Moderately pungent, maturity in 95-110 days | Average | 300-400 quintal |
| 2 | Agrifound Light Red | Rabi | All over the country | 4-6 cm | Maturity in 110 – 120 days | Good | 300-325 quintal |
| | | Late Kharif | Nasik district and Maharashtra | | | | |
| 3 | Red | Rabi | Northern, Central and Western | 5-6 cm | Most preferred by consumers because of attractive red color, maturity in 110-120 days | Good | 220-250 quintal |
| 4 | Agrifound White | Late Kharif and Rabi | All over the country – mainly Maharashtra, MP and Gujarat | Medium 55-60g | Silvery white color, maturity in 110-130 days, good variety for dehydration | Good | 100 quintal |
| 5 | Agrifound Rose | Kharif season | Cuddapa and AP | 2.5-3.5cm Flattish round | Pickling type, maturity in 95-110 days | - | 190-200 quintal |
| | | All seasons | Karnataka | | | | |
| 6 | Agrifound Red (multiplier) | Kharif and Rabi | Tamil Nadu, Karnataka and Kerala | Bulblets size 3.64 cm | Matures in 65-67 days after planting | - | 180-200 quintal |

Source: Gummagolmath (2013).

The harvesting cycle of onion in India differs in each state (Tables 8 and 9). Onion is harvested depending upon the purpose for which the crop is planted. Onion crop is ready for harvesting in five months for dry onion. However, for marketing as green onion, the crop becomes ready in three months after transplanting.

¹⁰ Gummagolmath (2013).

Onion crop follows vegetable crops such as cauliflower, tomato and potato, which require large quantities of organic manures. As a winter crop, it follows cereals, groundnut and cowpea while as a summer crop it follows paddy. The ideal soil for onion production should be deep friable, highly fertile, sandy loam to clay and rich in humus. Onions are one of the main vegetables which are cultivated under the drip irrigation scheme.

Table 9: Production Cycle of Onion

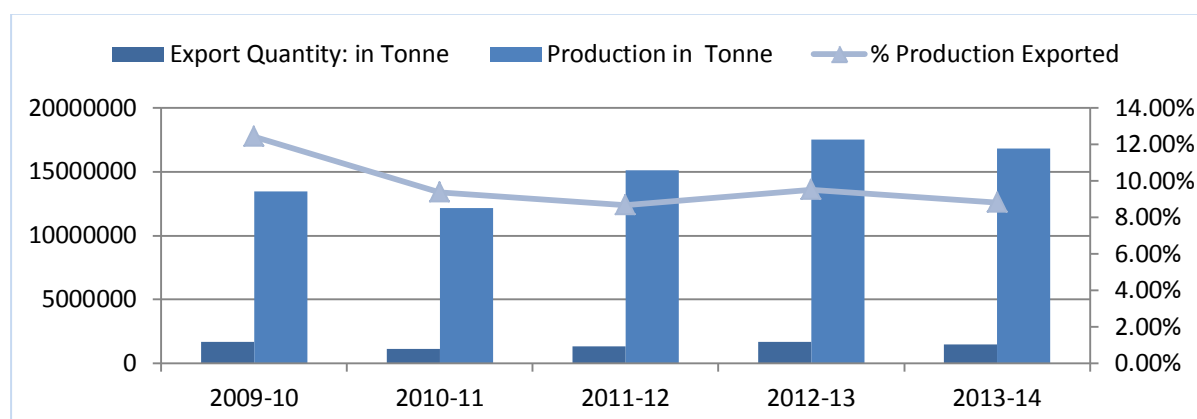
| State/Season | Month of sowing | Month of transplanting |
|--|-------------------|------------------------|
| Maharashtra and Gujarat | | |
| Kharif | May-June | July-August |
| Late Kharif or early Rabi | August-September | September-October |
| Rabi | November-December | December-January |
| Tamil Nadu, Karnataka and Andhra Pradesh | | |
| Early kharif | February-April | April-June |
| Kharif | May-June | July-August |
| Rabi | September-October | November-December |
| Rajasthan, Haryana, Punjab, Uttar Pradesh and Bihar | | |
| Kharif | May-June | July-August |
| Rabi | October-November | December- January |
| West Bengal and Orissa | | |
| Kharif | May-June | July-August |
| Late kharif | August-September | September-October |

Source: Gummagolmath (2013).

Trend of Export and Import of Onions

India is the second largest producer of onions in the world and the third largest exporter of onions¹¹. The top 5 countries where Indian onions are exported are Bangladesh, Malaysia, UAE, Indonesia and Sri Lanka. As a percent of the total production, almost 9-10 percent of onion is exported from India. However, since last year, India has been importing onions from Afghanistan, China, Egypt, Bangladesh, Iran, and Pakistan.

Figure 6: Export Quantity of Onions in Tonnes



Source: APEDA Database.

¹¹ Gummagolmath (2013).

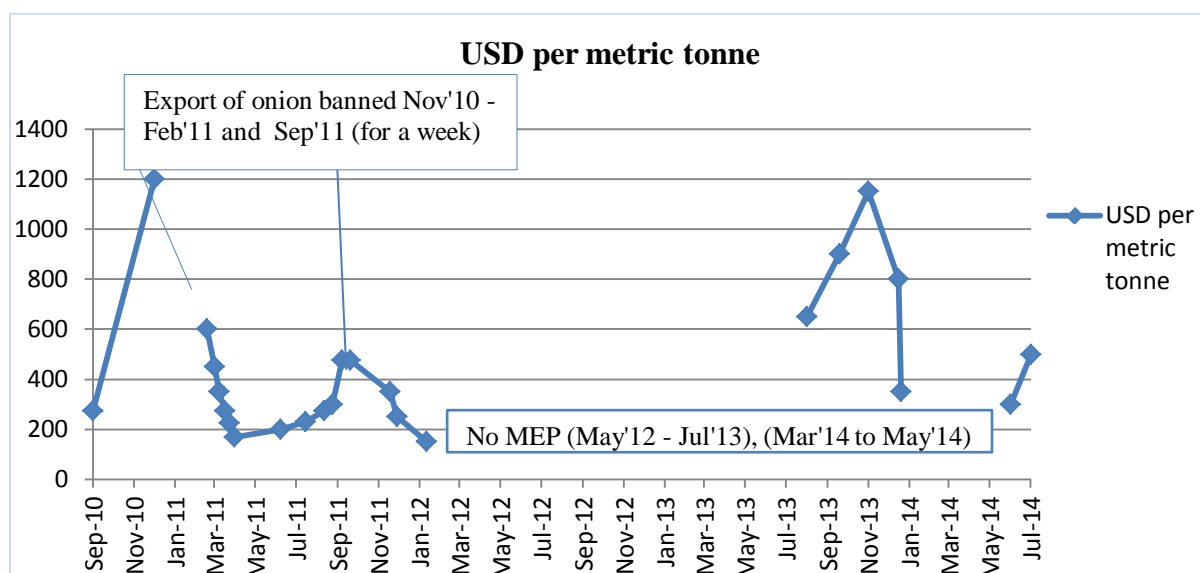
Anti-Inflationary Measures by Government

The government's initiatives towards controlling onion price rise can be bucketed into following:

1. Domestic Price Regulation through MIS, NAFED and NCCF.
2. Intermittent bans on exports and Minimum Export Price Regulations.
3. Controlling Import Duties for onions.
4. Storage Initiatives by NAFED, Central & State Warehousing Corporations, NHM.

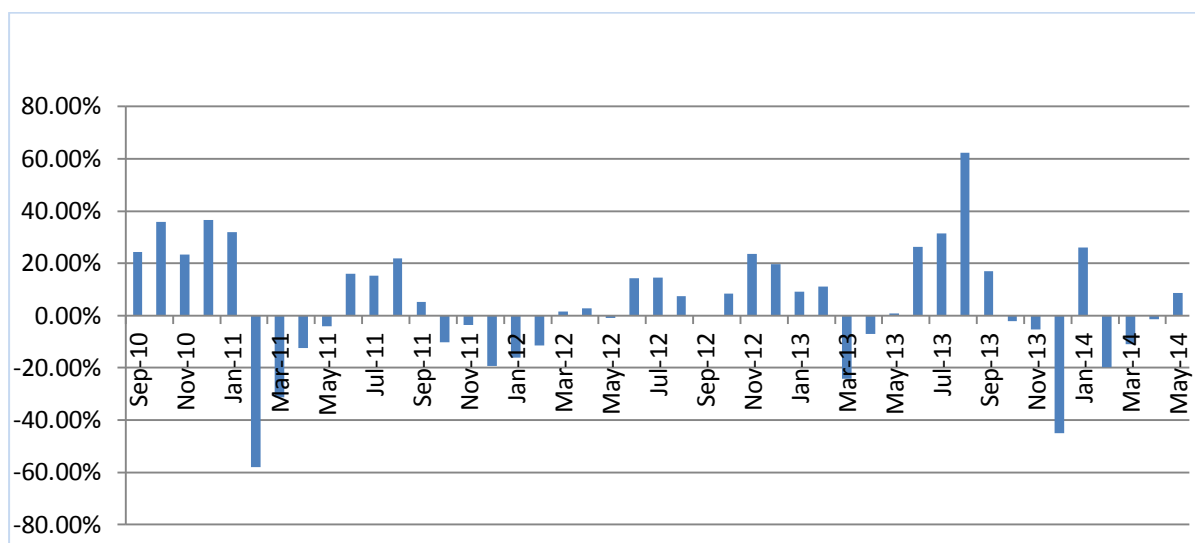
One of the most recurrently used techniques of dealing with inflation in onion prices is setting of the minimum export price (MEP). An attempt has been made to plot the MEP for onion from September 2010 till May 2014 by linking it to the movement in inflation (Figure 7). It has been observed that there is a direct correlation in the rise in inflation and the rise in MEP over the last 4 years.

Figure 7: Minimum Export Price of Onion



Source: DGCT Circular, Ministry of Commerce and Industry.

Figure 8 presents the percentage change (month on month) of the Wholesale Price Index (WPI) of the onion.

Figure 8: Onion WPI– Percentage change (month–on–month)

Source: RBI Database.

In the recent months, speculations regarding shortage of rainfall, has led the prices to shoot up again. The new government has conducted several raids at trader premises to check upon their compliance of stock limits and also opened up shops within government premises to facilitate sale of potato and onion at minimum possible prices. However, as discussed, storage happens at the farmer level too, and therefore these raids might not be effective in containing hoarding.

Recommendations

From the point of view of expenditure management, inclusion of onions in the PDS commodity list could help in stabilizing the supply as well as the prices of onions. It is necessary that the government looks at improving the nutritional value of the PDS basket and introduction of highly volatile items such as onions, potatoes could be a considered as a first step towards achieving nutritional balance. This will in turn reduce the steep costs involved in ensuring the supply through imports as well as reduce the impact of the variability in prices of onions on food inflation.

Currently NAFED procures onions under the Market Intervention Scheme (MIS) on an ad-hoc basis from states. This helps anchor price expectations and stabilizes prices. New schemes incorporating MSP's for onions for regular procurement and distribution should be initiated for making price stabilization more effective. It is time for the FCI to shift its focus from cereals to other commodities such as onion which have been highly volatile and have affected the overall price level, even compelling RBI to raise interest rates. Attaining the price stabilization goal will help create a further stimulus in the improvement of the distribution system.

Section VI: Phase wise implementation and Conclusion

Section II and III of the paper suggested various ways in which technology can be used to increase the efficacy of the food distribution system. However, the setting up of IT infrastructure must be carried out in a phased manner. Here, an approximate stage wise implementation and roll-out of the two recommendations is suggested.

Phase 1 – Basic setup of proposed technology systems

- Development of software necessary for the centralized IT infrastructure for the RFID system implementation is the first step to be considered. This should be carried out in parallel with consolidation of *Aadhaar* card database for BPL households. Identification of BPL households for coupon entitlement is very important for success of last mile delivery scheme. Training of postmen and FPS shop owners for the new distribution and delivery system must proceed hand in hand with purchase of biometric scanners, RFID scanners and electronic weighing machines.
- Rollout of new RFID tagged sacks, biometric scanners at FPSs and coupon despatch to post offices must happen in a region wise manner. Pilot programs must be carried out in selected states or regions with considerable BPL households to check for viability.
- Final stage of phase one would involve phased rollout of new PDS system across all states and union territories.

Phase 2 – Use of more sophisticated technology for effective management of new system

- Replace offline and manual coupon system with electronic cards for BPL households once legitimacy of the coupon system in terms of entitlement is established.
- Provide internet access to FPSs to enable live sales data recording and identity verification using the central intelligence and monitoring system. Integrate RFID and consumer profile data to ensure a live and watertight PDS.

This paper suggests several innovative ways to regulate and manage expenditures in the PDS that have been spiraling out of control owing to the massive leakage, gaps and inefficiencies that exist in the present system. The recommended solution is to implement a new model which makes it mandatory for each stakeholder at different stages of the supply chain to assume ownership of the goods. This model also makes use of modern technology to track inventory and ensure demand-supply matching. At the consumer end, the model suggests a changed distribution system making use of food coupons. It also makes use of biometrics and UID to identify consumers and prevent diversion of food grains to people who are not entitled.

The paper further suggests use of PDS as a tool to keep inflation under control. Fruits and vegetables contributed significantly to the high inflation numbers seen recently in the country. Within this category, onions and potatoes are the essential goods which are responsible for sudden increase in prices. Having a quick and sturdy distribution, mechanism will make it possible to introduce such goods easily and regulate prices and availability of these goods when necessary. In the long run, this also provides a valuable tool to target malnutrition which is a millennium development goal for the government.

The implementation of this new technology enabled PDS, while challenging to set up, would go a long way in not just curtailing expenses but also to bring about transparency and equity in the provision of the important commodity for the entire population of our country.

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Annexure I

A note on visit to the Yeshwanthpur Wholesale Market

An attempt was made to interact with several farmers, tradesmen and commission agents of Yeshwanthpur Wholesale market, North Bangalore, in order to understand the price determination of onions in these markets.

Bangalore receives onions from Maharashtra and Gujarat from December to August. As per our conversation with the farmers, the produce is fresh till March after which the stored onions make their way to the markets till the next harvest of the Kharif season when fresh onions are received from Karnataka. The farmers follow the market news and try to influence supply of onions and potato when the prices in the market start rising. The market is auction based, and is purely driven by supply-demand, irrespective of where the supply is coming from.

Generally, hoarding is quickly blamed for price fluctuations in onions and is often confused with storing. The crop cultivation has a specific cycle, and to maintain year round availability, farmers, traders and middlemen are compelled to store these commodities. The storing happens at each level of the supply chain including the farmer and not just the middlemen or traders. From the farmer's perspective, if the current wholesale price is too low, it makes business sense for him to wait for it to rise and then sell it in the market. Of course, there is a trade-off as longer the product is stored, it loses water content and weight, reducing overall revenue, not to mention the added warehouse or cold storage rental expense. Often the farmers allow the onion to stay underground and do not pluck it until the prices are favourable, but they run the risk of spoilage and sprouting.

Currently the process of dissemination of prices is an informal process. The farmers/ traders contact the commission agents in a particular Mandi, and fix a range of acceptable prices. If the commission agent does not achieve that price for one day, the stock will be sold next day at the best available price. This system reflects gaps in the transmission of price information to the farmers. There is a potential possibility of agents' collusion in the determination of prices in this manner hampering the revenue potential for the farmers.

A more robust system of information exchange throughout the supply chain will eliminate the pressures on prices created by hoarding. Farmers should receive remunerative prices for their produce. The current informal system of dissemination of prices in a Mandi could be formalized through an internet database updated on a regular basis. Farmers could be sent daily updates through SMSes on the prevailing market prices in a region and on an average in the country, thus allowing a fair auction process.