A STUDY OF SUPPLY CHAIN MANAGEMENT IN PUBLIC DISTRIBUTION SYSTEM

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Submitted in partial fulfilment of the requirements for the award of the degree of

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in

MANAGEMENT

by

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INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
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FEBRUARY, 2016

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled **"A STUDY OF SUPPLY CHAIN MANAGEMENT IN PUBLIC DISTRIBUTION SYSTEM"** in partial fulfilment of the requirements for the award of the Degree of Doctor of Philosophy and submitted in the Department of Management Studies of the Indian Institute of Technology Roorkee, Roorkee is an authentic record of my own work carried out during a period of July, 2010 to February, 2016 under the supervision of Dr. Rajat Agarwal, Associate Professor and Dr. Vinay Sharma, Associate Professor, Department of Management Studies, Indian Institute of Technology Roorkee, Roorkee.

The matter presented in this thesis has not been submitted by me for the award of any other degree of this or any other Institute.

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This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

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ABSTRACT

India is just six decades old country. The country is trying for overall development since the time of independence. India is home to world's largest section of bottom of pyramid population. Nation builders have constantly focus on development of this large group by providing basic security of food etc. and opportunities to grow to come out of vicious cycle of poverty. Public Distribution System (PDS) is one such scheme of Government of India (GOI) to provide food security to the poor people of the country. This scheme has gone through various transformations in last four-five decades with respect to scope, target groups and issues of subsidy etc. Economist, health experts, sociologists and experts of development economics has studied the working of PDS. But very few studies are available to handle the PDS as a Supply Chain (SC) activity. PDS as supply chain is studied in this research attempt.

The present study has described the SC of food grains under PDS. Though PDS in India provides many times to beneficiaries like sugar and kerosene oil also, but the present study is limited to food grains only. As a study under Supply Chain Management (SCM) principles, PDS can act on both aspects of efficiency and effectiveness. Efficiency deals with low cost of SC while effectiveness is related to provide food security cover to large number of population living under below poverty line (BPL).

The present study consider Customer Satisfaction (CS) as one of the objective of SC and some important dimensions like number of SKUs, flexibility, subsidy, on time delivery, direct cash transfer scheme, location of Fair Price Shop (FPS) and timely information are studied through a structured questionnaire. The study was conducted for poor people who unfortunately are also deprived of basic education facility and therefore, the questionnaire was administrated in Hindi language. A copy of sample questionnaire is also attached as annexure "A" of this dissertation. Data was collected from more than 300 beneficiaries of PDS scheme and simultaneously issue related to PDS distribution were discussed with government officials like District Supply Officer and Block Development Officers and local municipal councilors to know various challenges in existing PDS. The focus of all these discussions was mainly on SC prospective of PDS. The data was analyzed using SPSS and results of analysis is presented in

chapter IV of this thesis and attempt is also made to propose a System Dynamics (SD) model for PDS supply chain.

The study proposes some SC interventions for PDS so that some objectives can be achieved with lower cost so that extra resources can be used to increase the scope of PDS scheme. Finally the study proposes large number of future research directions including advance modeling of PDS supply chain enablers and barriers, scale development for performance measures, simulation of SD models etc. The overall study is divided into six chapters where chapters are arranged as introduction, review of literature, research methodology, results, discussion and finally conclusion, implications, limitations and future scope.

Keywords: Customer Satisfaction, Fair Price Shop, Public Distribution System, Supply Chain, Supply Chain Management, System Dynamics.

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LIST OF ABBREVIATIONS

APIC	American Production and Inventory Control Society
AMOS	Analysis of Moment Structure
BPL	Below Poverty Line
CAP	Covered and Plinth
CIP	Central Issue Price
CSCMP	Council of Supply Chain Management Professional
EDI	Electronic-Data interchange
EGC	Employment Guarantee Scheme
ERP	Resource Planning System
FAO	Food and Agricultural Organization of United States
FCI	Food Corporation of India
FPS	Fair Price Shop
FS	Food security
GOI	Government of India
GSCF	Global Supply Chain Forum
ISM	Interpretive structural Modeling
MILP	Mixed Integer Linear Program
MINLP	Mixed Integer Non Linear Program
MP	Madhya Pradesh
MSP	Minimum Support Price
MSSRF	MS Swaminathan Research Foundation
NAPM	National Association of Purchasing Manager
OEM	Original Equipment Manufacturer
PDS	Public Distribution System
PSU	Public Sector Enterprises
PSA	Product and Service Agreements
RTN	Resource Task Network

SC	Supply Chain
SCM	Supply Chain Management
SD	System Dynamics
SPSS	Statistical Package for the Social Sciences
SRM	Supplier Relation Management
STN	State Task Network
TCES	Tata Economic Consultancy Service
TPDS	Targeted Public Distribution System
TQM	Total Quality Management
TSCC	Total Supply Chain Cost

Chapter I

INTRODUCTION

1.1 BACKGROUND OF THE PRESENT STUDY

20^{th} century is known for the era of entrepreneurship and future of any economy depends upon an entrepreneurial society for which prospective entrepreneurs must be crafted in large numbers (Awasthi, 1992). It is a period of introduction of the term supply chain management (SCM) where the focus is diverted from manufacturing to the cost of logistics and transportation. All manufacturing as well as processing sectors were started thinking to improve quality, reduce production cost, minimization of waste, and product customization for staying competitive in the market. Andreassi (2003) analyze and discuss different characters related to innovation in various business, their advantages and disadvantages. India, a growing economy has a large potential for human resources as well as natural resources.

Agriculture or agribusiness is the backbone of any nation especially in India. Agriculture contributes about 13.7% to the total GDP of Indian economy and employs more than 55% of the total working population in India. About 65% of the total country population is dependent upon agriculture and allied business to make India among world's largest producer of many agriculture products such as pulses, wheat, fresh fruits and vegetables and other agriculture products. The surplus of various food products production can be managed to market within the country and internationally. Agriculture as industry facing one major single problem in our country India is the highly inefficient supply chain without which more than twenty present of food grains production of all food produced is wasted. By developing an effective and efficient network of supply chain management having advanced and latest state of art techniques, it is quite possible that India becomes the major food supplier of the universe to feed the world population.

1.2 SUPPLYCHAIN MANAGEMENT: AN OVERVIEW

In the present scenario of modern business having a rapid change of competitive environment has contributed to the development of strong supply chain networks. For a system or in any organization supply chain management (SCM) is a cross-functional approach used to manage the flow of goods and services. The concept of SCM manages the movement and

storage of raw material, movement of raw material at the different level of the process of inventory and movement of finished products from point of development to point of end customer or consumption in any system. Multidisciplinary approach in supply chain management strategies for any system are designed as innovative strategies which are helpful to provide differentiated solutions for the system that can help any organization to serve end users in an optimal fashion or provides a feasible solution. SCM is strategic and systematic effort of various business activities within and outside the organization to improve the long-run performance of the organization. So, for the effectiveness of any system as well as policy role of SCM has become very important and properly designed structure of supply chain must be understood for gaining the benefits of any system. Tasic and Andreassi (2008)analyze at the stage of uncertainty and without clear objectives; the role of decision process becomes important for an organization to evaluate and utilize its existing resources as best as possible for competitive achievement. For any service enterprises, Supply chain management has now become a new tool to achieve the productivity and competitiveness of the organization.

In Supply Chain Management, different areas of an organization are managed by strategic and systematic efforts of different business activities within and outside the organization to improve long run performances of business for achieving maximum benefits and to maximize customer satisfaction to make competitive effectiveness. Andreassi and Siqueira(2006) analyze that role of innovation and technology-based business is more important to achieve strategic competitiveness in present day to day scenario of business activities. Jain et al. (2010) studied the various component of SCM for different sectors and analyze that supply chain of the food industry is also an important field of study as a demand driven supply chain industry. SCM becomes a major application area in a system to manage the material, money, men and information within an organization to maximize customer satisfaction. According to Berry “The aims behind SCM is building trust, exchange of information as per requirement based on market needs, development of new opportunities or product and reducing base of supplier for a particular OEM (original equipment manufacturer) so as to release management resources for the development of long-term relationships”. As per guidelines of CSCMP, “SCM encompasses the planning and management of all activities required for an organization in sourcing procurement, conversion to finish product and logistics management and it integrates supply and demand management within and across companies". According to Handfield and Nichols (1999), SC includes all firms and activities related to the

movement of materials from the initial stage of raw material, through the process of finished product and distribution to the end customer, as well as the associated products and information flow, both up and downstream the supply chain of the system. SCM is a concept that driven in the manufacturing sector in early-1980s. The main goal of the SCM is to maximize the overall value of an organization. Chan and Qi (2003) identified that in any organization process of SCM consists of six major core processes in terms of the supplier, logistics related to the inflow of material into system or inbound logistics, manufacturing, logistics activities related to the outflow of finished product or outbound logistics, marketing and sales, and end customers. In last two decades, due to increases in worldwide trade competition and the introduction of information technology SCM literature has developed more rapidly. Recently, manufacturers and buyers organizations have started investment in their suppliers to improve performance by developing a long lasting buyer-supplier relationship (Austin, 1990).

1.3 SIGNIFICANT AREA OF SCM IN PUBLIC SECTOR UNDERTAKING IN INDIA

The role of proper and efficient SCM strategy is very important to build up and increase sustainable competitive advantages by cost reduction but maximum customer satisfaction for any organization. Srivastava et al. (2006) analyzed that public sector enterprises are the institutions servicing on behalf of GOI for the social and economic growth of the nation. Mahajan (2001) also an emphasis on the role of PSU in India and describes in order to fill public accountability and social responsibility of GOI, role of different PSU working in various sectors are very critical. Although the role of PSU is important in our country for strategic policy formulation perspective but Mishra and Mohammed (1994) criticizes the role of PSU and emphasis on the formation of joint sectors to achieve strategic achievements. Sankar et al. (1994) also describe that GOI is also planning for disinvestment of various PSUs to joint sectors to achieve economic growth of the nation. Mishra and Kiranmai (2006) studied the performance of different public sector enterprises on the state level and found that financial situation of such organizations is critical due to huge operational losses and various state governments are planning to restructure such organizations. There are various PSUs in our country India whereby proper use of SCM paradigm effectiveness can be increased much fold.

1.3.1 Petroleum Products

However some of the country petroleum products requirements are indigenously procured but in order to compete demand of the petroleum products of the country we are dependent on import of petroleum products and significant proportion of petroleum crude oil and finished petroleum products are being imported from other parts of globe to fulfill the demand-supply gap, which cannot be possible without a well-designed & feasible global supply chain system to provide a feasible transportation and distribution network to fulfill national and regional demands. In order to minimize transportation cost of petroleum products, with an adequate storage having the maximum production to cater the daily requirement of fuel station for sales point, a transshipment model of SCM was developed by Sharma and Jana (2009) for cost reduction and to improve services in the petroleum sector. Dey et al. (2001) developed a case study model to minimize the pipeline route selection for oil industry oil translation through petroleum pipeline to minimize the operation cost and effectiveness of business.

1.3.2 Public Health Services

Hospitals, medical centers, dispensaries and other medical welfare schemes run by the government of India are the backbone of nation health services. As many PSU's are major players in pharmaceuticals industry so a system of integrated supply chain network having these PSU's as one channel with network of hospitals and other medical care centers as another channel of SC can be developed for the procurement and distribution of life-saving drugs with other medical requirements to achieve the objective of public health services.

1.3.3 Banking and Financial Services

By the liberalization of the government of India policies and due to the globalization of the world economy, it becomes important for the banking sector to provide better facilities to the customers as per changing requirements. To provide the effective services which can meet the end objective as per customer expectations entire system of operation needs to be redesigned as per the techniques of SCM compatible to needs of end users.

1.3.4 Import and Export

Import and export are the two basic important dimensions of any organization & nation. Government sectors also play an important role as a time to time essential materials such as

crude oil, steel, food grains, life-saving drugs, defense items, coal and other import by the government as per requirement and surplus items are exported like mica, iron ore etc. A proper negotiation with optimal delivery and distribution system with taxation planning through strong SCM paradise is required to achieve goals.

1.3.5 Postal Services

In the new era of business development role of postal services becomes very important, it becomes a need for this sector to provide best speedy and economical facilities as per changing requirement of customers to stand in the market and to face competitors. For providing effective services, the system must be designed with proper SCM strategies to compete with other local and global players.

1.3.6 Food Grains Procurement and Distribution

The uniqueness characteristics of food industries is very massive and diversified in nature and these type of industries can be categorized into different categories which are as fresh food product industry, industry related to organic food products, processed food product industry, industry related to livestock food product, food grains industry and each and every segment of these different category of industries required different supply chain strategies at different stages of process starting from procurement and sourcing to management of inventory to warehouse or storage management to labeling and packing management and finally the most important pat of management as distribution to end consumer through various channels. As agriculture is a basic backbone industry for any nation where the different types of products (crops) produces at different regions of the nation based on the geophysical characteristics of that particular region; the agriculture products (crops) that are produced in one region of any country may need to be transported far away to another region of the same country to fulfill the food requirements in that particular region of country. Therefore, the role of a strong supply chain policy becomes more important to maximize customer satisfaction to make the competitive effectiveness of any policy. Srivastava et al. (2006) define the uniqueness of competitiveness of agricultural export organizations of South Africa and there strong SCM network to achieve self-sufficiency in international trade. A unique network managed by GOI for the distribution of food grains in India known as Public Distribution System (PDS) is among one of the biggest distribution network in the world having its own uniqueness to fulfill the food requirement of a huge population of the country to achieve food security in the nation.

There are other public sector enterprises like Food Corporation of India which is involved in the process of public distribution of food as key channel partner as responsible for entire procurement of food grains and their storages in different parts of the country through their channel partners. A strong supply chain policy for the locations of warehouses in various regions of the country, a proper distribution map for optimal distribution of the procured food grains among these warehouses and to the retail ration shops managed under public distribution system is required for the distribution of that food to beneficiaries. Any failure in any of the channel of such system from different stages starting from procurement level to transportation and then warehousing and then again transportation for distribution through public distribution system can lead to large scale scarcity and may be a cause of famine in the affected part of the country.

1.4 PUBLIC DISTRIBUTION SYSTEM: AN OVERVIEW

One of the most important policy of Government of India (GOI) to achieve food security in the entire nation through the distribution of subsidized food grains to the poor people of the country, especially to an economical weaker section of the population, is public distribution system (PDS). PDS is a distribution network managed by GOI to distribute some specified quantities of selected commodities at an affordable price on which subsidy is provided by the government of India through rationing to the people of the country for their basic requirement of food. Historically, the major objectives behind development of the policies like PDS have been (Bapna, 1990):

- To maintain the stability of price in the open market.
- To increase the welfare facilities for the needful.
- To maintain check during a situation of scarcity or rationing.
- To keep a check on private trade.

PDS was first introduced in India under the rule of British Government during the period of 2nd World war in the city of Bombay and later extended the coverage of policy to six more cities of the country and some other regions (George, 1996). A price support for producers cum consumer subsidy program of PDS as in its present form is the result of critical food scarcity or famine at national level during the 1960s (Radhakrisan et al.,1997). From the year 1960 to 1991, four major phases have been identified in the history of the PDS in India (MSSRF 2001) during which PDS has faced several changes to convert into a universal

distribution program for the poor Indian population for the provision to provide cost effective subsidized food and it becomes a major component of the GOI strategy to focus to alleviate poverty. This policy of PDS system has undergone several drastic changes as per strategic planning of GOI with every lap of the five-year planning system in the country. As per plan of GOI seventh planning commission strategy, it was specified that the PDS would be a permanent feature of the GOI strategy to control prices of food grains, reduce day by day price fluctuation in the open market and to achieve an equitable distribution of essential goods (Venugopal, 1992). Functioning of PDS was criticized widely for its failure to target the population living below the level of the poverty line, its urban bias, improper or less coverage the part of the country where the highest density of the poor rural population belongs and improper management of logistics and unaccounted arrangement for distribution of deliveries. Realizing the feedback from 1-6-2007 restructured the concept of PDS and launched Targeted Public Distribution (TPDS) Scheme to be applicable throughout the country to better target the achievement of the policy. Under the new strategy of TPDS, population below poverty line (BPL) would be identified in every and every state of the India and each and every BPL family would be benefited by a certain quantity of subsidized food grains to meet their dietary requirement at a specially subsidized price (Singh & Kumar, 2011). The scheme of TPDS is effective all over the India. Fig 1.1 shows the different channel partners working together from farm to end consumer for the success of PDS to provide food security for each and every person of the country through the world largest channel of public distribution managed by GOI through different channel partners.

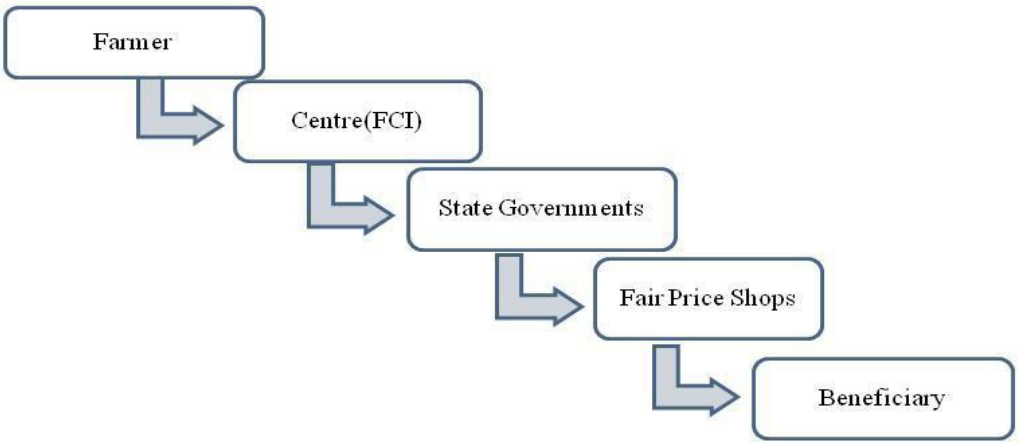


Fig 1.1 Different channel partners of PDS

1.5 FOOD SECURITY

Out of the many challenges faces the world today, Security either in terms of human or food is found to be one of the major strategic challenges faced by all the major economy of the world. A huge amount of budget allocation is spent by all countries on the issue of security of their population either from increased terrorists or to provide safe and nutrient food to the country people to fulfill their basic dietary requirement especially in developing countries. Across the world to provide Food security is among the major strategic planning of nations which are fundamentally interlinked with other strategic challenges of economic and climatic changes of global importance. It has been noticed from the numbers of documents adopted by the united nation that from long times the challenges of food security has been discussed throughout the world at different levels to provide the rights to adequate food for all living human on the planet and to be free from hunger. Nevertheless, by the early 1990s, it has been estimated that there were still more than 800 million poor people around the world, out of which mostly are from the developing countries, who failed to have sufficient food to meet their basic nutritional needs. In order to face this major challenge and to secure the world population from hunger, a summit is organized in Rome in 1996 by Food and Agriculture Organization (FAO) in which delegates from 194 countries took part and during which a common declaration known as the Rome Declaration on World Food Security was drawn up. As per the declaration of the food security resulting, by the Rome, world food submits a definition of world food security was developed. According to that, "Food security can be said to exist when all living individuals of the planet earth, at all times, have social, physical, and economical access to, secure, sufficient and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO, 2009). Three major dimensions of food security are identified as availability, accessibility and affordability of safe and secure food for all. Thus, a country can be ensured to be a food secure country only if (a) enough quantity of food is available for all living persons (b) all persons have the easy accessibility or capability to buy food of acceptable quality as per need and (c) there is no barrier for people of a nation on access to food. (Ray, 2011)

Food Security is associated with physical, social and economic access to sufficient secure and wholesome nutritious food for all (FAO, 2009). The availability of such food to people who have challenges on the social and economic front should get the benefit of physical access is the key to any distribution system. Throughout the world, governments have adopted

different mechanisms to ensure availability of food grains to its population, particularly to poor people. To manage global food security, development of a distribution channel as per systematic framework has become a strategic priority worldwide for the global economic community. We in our country (India) having more than one billion population to feed as per their need becomes a major challenges and pressure to face. Launched by GOI as per their policy formulation in 1997, Targeted Public Distribution System (TPDS) seeks accountable and transparent distribution of food for the poor and economically weaker section of people. By the proper implementation of TPDS, GOI aims to fulfil the gap to face the challenges of efficient and accountable distribution of food which can ensure poor people of India to have regular access to the physical and economical quantity of sufficient food to meet nutritional needs. (Kattumuri, 2011).

India and China, two major economies of the world are among the biggest to face the pressure and challenge to feed over half of the total world population. Although through agricultural and economic growth achieved by India after independence, country has achieved self-sufficiency in food grain production and surplus stocks of food grains are available in the FCI storage locations across the country, but due to inefficiencies of operation and entrepreneurial abilities, most of the utilization of the resources invested by GOI are not targeted to the correct beneficiaries to ensure food security.

1.6 PDS – KEY TO FOOD SECURITY

Having a network of more than 4.99 lakh fair price shops (FPS), distributing per annum products worth more than Rs. 33, 00,000 lakh, the Public Distribution System (PDS) in India is perhaps the biggest distribution network of its type in the world. Public Distribution System (PDS) in India is considered to be most important distribution network to achieve food security in the country managed by Ministry of consumer affairs, food and public distribution under the leadership of GOI and jointly managed with different state governments across the country as per guidelines of GOI, which promises basic requirement of food to cover 3,300 lakh poor people living in India. In addition, it ensures the accessibility to food to the general public at an affordable price. It means PDS serve as a channel of safety net policy for the individual's Indian people which are poor and nutritionally at risk and also helpful to assists in eradicating poverty from the country.

India is a nation having more than one billion people with over more than 300 million people having no sufficient food to live and the number of them has barely declined over the last three decades of development. Therefore, it becomes essential and strategic priority of GOI to provide essential facilities to such people for their basic requirement of living and under the Eleventh Five Year Plan of GOI a strategic planning is proposed for reducing the numbers of such poor families. It is clearly mentioned in GOI policies that rapid and systemic growth will be essentially required to reduce the number of the poor population for the reduction of sustainable poverty; the eradication of poverty is the main slogan of the 11th five-year plan. The public Distribution system is one of the strategies to eradicate the poverty in India. In India even after half a century of independence and after implementation of several five-year plans for the growth of the nation and reduce poverty still a major percentage of people estimated to be about 42% of total Indians are living below poverty line (BPL). Therefore, in the strategies formulation for the growth of the country, the thrust was focused on eliminating poverty. Blasco and Zolner, (2010) analyze that role of different business activities by different nations and its relationship with society for SCR perspective to achieve strategic competitiveness. In the direction of poverty alleviation, the PDS is one of the instruments in country development processes. India continues to be a land of extremes. Extreme poverty persists besides new-found opulence and riches. Starvation deaths are still reported, but not because of lack of food grain availability. Rather, due to the paucity of purchasing power. For the last 50 years, India's food grain production had remained stagnant. But the poorer have been getting richer and the nutrient intake of a large number of people has improved. And the public distribution system has been one of the harbingers of this change.

As per statistics of world agriculture forum (FAO 2010), India is the second largest producer of world major food staples wheat and rice. With a average monsoon season in fiscal year ending June 2011, India agriculture production of wheat accomplished an all-time high record cultivation of 85.9 million tons having a increase of 6-3% from the previous year wheat production while rice output in India also achieved a new world record of 95.3 million tons having about an increase of 7% from the year earlier. On an average, during the fiscal year ending 2011 Indian farmers produced approximately 80 kilograms of rice and 71 kilograms of wheat for each and every member of Indian population during the year which is sufficient for the people of the country to survive. But due to poor and insufficient infrastructure of storage facilities and distribution network management issues, our country experiences some of the

huge losses of food grains in the world which are very harmful to the growth of the nation. In order to achieve the fair concept of food security, an effective and efficient management strategy is required to provide essential food to every person at every time at an affordable cost must be an essential strategic prerequisite. To achieve the task is quite essential to relieve poverty.

In the context of achieving the goal of food security and alleviation of poverty at national level, it is vital to take a look at the "efficiency and efficacy" of the entire distribution channel of PDS, which has been working as the food access mechanism for several decades. Proponents of its own successor and the rationing system, the PDS, claim that these two measures have played an important role in completely eliminating the risk of famines and ensuring higher levels of household food security. On almost all physical counts, the performance of the PDS has remained good. It has made remarkable growth in the quantum of food grains distributed under its aegis. The volume of grains distributed as a percentage of total production has also been on a sustained upward curve. However, the availability of food grains for the food grain distribution under PDS as a percentage of production of food grains during a year and procurement of food grains by GOI agencies has been fluctuating time to time and continues to be a problem area. This has led to a huge pile up in food grains leading to wastage and rotting grains in FCI warehouses and even outside in the open. Reasons aside, the accessibility to food grains at affordable prices by the Indian poor has been growing. Not just the statistical availability. This seems to have resulted in major changes in the food intake in the country's population. Although much more remains to be done, large segments of India's poor seem to be relatively better off and country's poor still have a lot to hope for poverty reduction.

1.7 STRUCTURE OF PUBLIC DISTRIBUTION SYSTEM

The organizational setup of PDS in our country is jointly governed by both central and respective state governments in their states and both share their responsibilities as per basic guidelines of GOI for the distribution of food grains to the population of the country for their basic needs. The major responsibility of center government is to procure food grains from farmers through a nodal agency as FCI at a minimum support price (MSP) and issue to different state governments at central issue prices (CIP) as per their requirements. The Food Corporation of India (FCI) a nodal agency developed by the central government, which is responsible for procurement of food grains from producers and to provides availability of food

grains to the state government storage locations. Mahajan (2004) describes that role of PSU for public accountability is important to implement various policies of GOI to achieve competitive achievement. The objective of the FCI is

(i) To procure food grains from farmers across the country on MSP fixed by GOI.

(ii) To maintaining a level of operational and buffer stocks of food grains as per norms of GOI to ensure food security in the country.

(iii) To allocate food grains to different state government as per allocation.

(iv) To distribute and transport food grains to the state government storage locations.

(v) To provide food grains to different states of the country as per their allocation from GOI at the CIP for the distribution through PDS and other welfare schemes.

As FCI provides food grains to state governments from their storage points to the storage points of the state government now it becomes the responsibility of state government for further delivery of food grains as per their policy from their storage centers to each fair price shop dealers to distribute under PDS from where consumers buy the food grains at subsidized prices as fixed by central government. At each stage of the entire process, there are monitoring agencies to take care as to reach the proper food grains to beneficiaries.

Figure 1.2 shows the basic organizational set up of PDS in our country which is a joint venture of central as well as state government with distributed responsibilities among them to ensure food security in the country. In principle, the central government is responsible for the procurement of food grains through its nodal agencies and to allocate food grains to different state government as per their requirement based allocation. State Governments are responsible for distribution of food grains to the beneficiary through PDS shops and to keep monitoring on the distribution network.

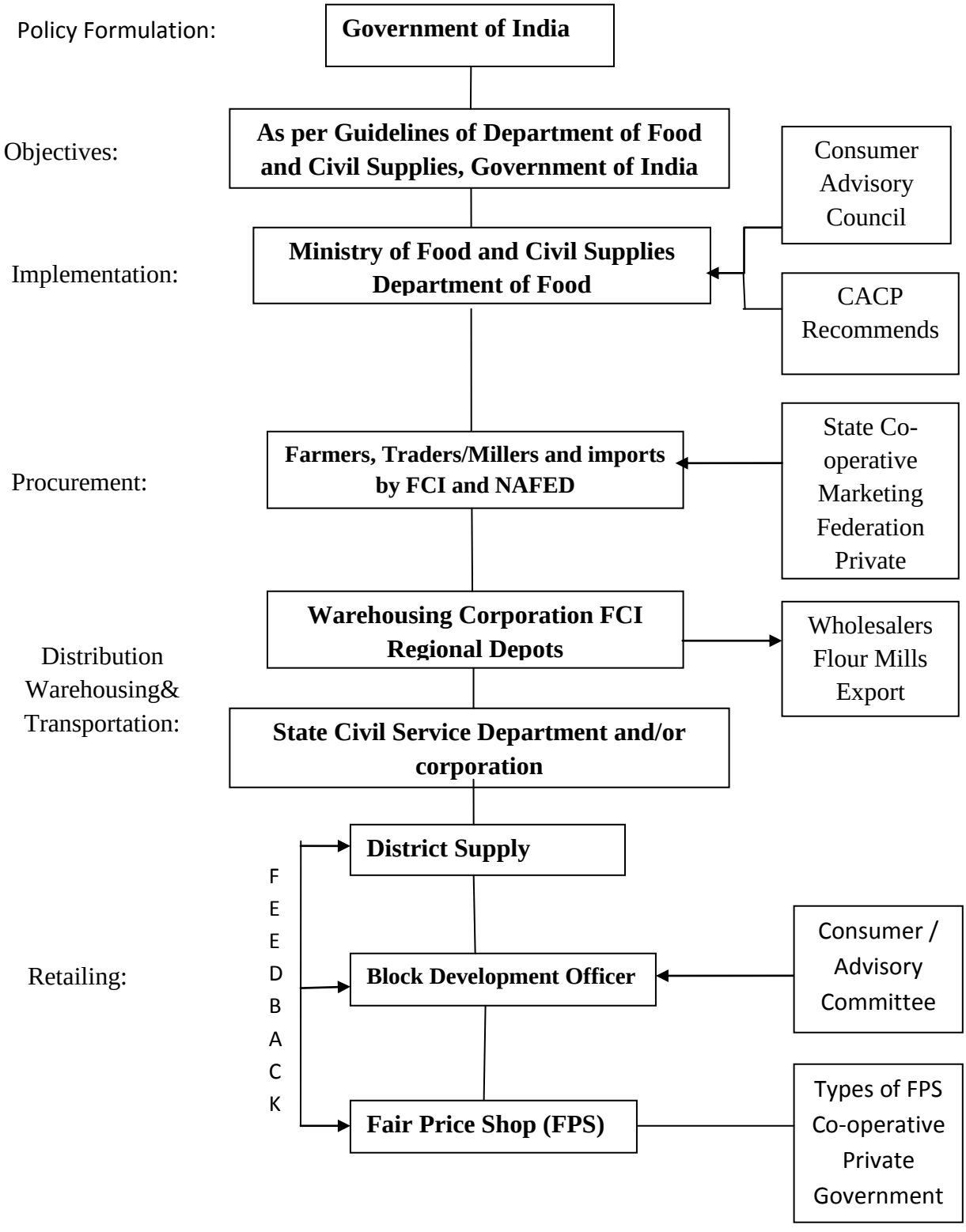


Figure 1.2 Organizational Structure of PDS in India

1.7.1 Procurement of Food Grains from Farmers

As per guidelines of GOI, FCI as a nodal agency is responsible for the procurement of food grains directly from the producers at Minimum Support Price (MSP) in order to distribute under PDS to the poor people of the country to meet their nutrient demand. The MSP is the price fixed by central government time to time at which the FCI procure the different crop directly through FCI centers from agriculture producers. Typically the MSP fixed by GOI is always higher than the current open market price of that particular crop as it is intended to fixed higher price by GOI to provide better price support to farmers to maximize production and to make a check on private traders. The objective of the FCI for the procurement and storage of food grains is

(i) To maintain the required minimum buffer stock limits of food grains to achieve food security in the country.

(ii) To distribute food grains to states as per their monthly allocation for distribution under PDS.

(iii) To cater food grain requirement of the country during alarming situations as wars, natural disasters, low production due to atmospheric conditions etc.

(iv) To provide food grains in the open market to maintain price stability in the market.

1.7.2 Storage of Food Grains

Not only for the distribution of food grains under various welfare schemes of government, the central government also maintains minimum buffer stocks of food grains at a various storage location of FCI for sudden emergencies or critical situations. All such quantity of food grains is procured and stored as per norms of the central pool stock. FCI is the main central government nodal agency responsible for the procurement from farmers and storage of food grains in the central pool account. As per the storage policy guidelines of the central government, agriculture products are generally stored in safe and secure covered storage sheds, silos, and also in the open area as Covered and Plinth (CAP) during the peak season of procurement. As FCI has insufficient storage capacity especially at the time of major crop seasons to store the stock of food grains procure under central pool stock of GOI. During these situations, FCI hires storage spaces from various other government undertaking agencies as the

central and state warehousing corporations, available spare storage capacities of various state government agencies and other corporate sectors storage spaces as per requirement.

1.7.3 Allocation of Food Grains to States

As per guidelines of GOI, Ministry of consumer affairs, food, and public distribution is policy maker for the allocation of food grains from the central pool account of food grains to the various state governments for distribution under various beneficiary schemes as to achieve food security. On the basis number of identified beneficiary in each state, FCI is responsible for providing food grains to state government storage allocation.

1.7.4 Food grains distribution to end consumer

The responsibility of food grains distribution under PDS is jointly managed by central as well as state government as per organizational structure and policy of PDS. The performance of any system can be measured on the basis of day to day working of the system (Sharma and Bhagwat, 2006), operational efficiency of the various channel partners of the system and overall competitiveness in the market. FCI is responsible for providing food grains to state government storage points as per allocation of food grains. As FCI supplied food grains to state government storage points it becomes the responsibility of concern state government for the distribution of food grains to end consumer through fair price shops on a monthly basis at subsidized prices from these PDS shops. The role of a fair price shops (FPS) run under the policy of PDS is very critical and these shops are basically the backbone of the whole PDS network to ensure food security to the economically weaker section of the population in the country. The owners of these PDS ration shops are licensed by different state government under the PDS (Control) Order act, 2001 to distribute essential commodities of food grains at prices fixed by central government and different state government agencies at state level, district level and gram panchayat level are responsible for checking the activities of fair price shop owner.

1.8 PRICING OF FOOD GRAINS: MSP, CIP AND FOOD SUBSIDY

FCI is responsible on behalf of the central government for the procurement of food grains directly from agriculture producers at the MSP. Minimum support price (MSP) is the price at which central government purchase food grains directly from producers, these prices (MSP) are typically higher than the market prices as to encourage the agricultural activities in the country. For different agricultural commodities, MSP is fixed time to time by central government on the basis of cultivation cost of various crops at different parts of the country and

other climatic factors which vary time to time and place to place. Price at which food grains are distributed through fair price shops to end consumer under PDS is much lower than the market price. The center government provides agricultural commodities to state government at a subsidized price, known as central issue prices (CIP) for agriculture products. The amount of subsidy provided by the GOI on food grains is the difference between the total costs incurred by the center to procure agriculture commodities on MSP (including additional costs) and the central issue price. Central government provides food grains to different state government at a uniform fixed issue prices (CIP) for distribution under PDS to achieve food security. As GOI providing food grains under PDS at minimum subsidized price to fulfill the basic need of people living under BPL and MSP of different agricultural commodities are increasing time to time and also operational and another infrastructure related cost for the procurement and distribution of food grains under PDS is increasing day by day, (Table 1.1 defines procurement cost of food grains by GOI for) due to this burden of subsidy is increasing on GOI day by day which becomes very critical for the whole GDP of country. Table 1.2 describes the increasing burden of food subsidy on GOI during previous years.

Table 1.1: GOI Economical cost of food grains (Rs/quintals)

Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Rice						
Pooled cost	1446.53	1512.20	1633.83	1788.96	1925.52	2067.74
Cost of Procurement	313.09	313.09	383.76	435.13	462.13	493.37
Cost of Distribution	223.49	260.74	287.28	374.26	430.26	532.62
Net Economic cost	1983.11	2122.94	2304.87	2598.35	2817.91	3093.73
Wheat						
Pooled cost	1064.32	1119.18	1219.41	1273.57	1346.64	1397.19
Cost of Procurement	212.38	235.68	263.35	331.81	339.00	360.54
Cost of Distribution	217.65	240.39	269.81	326.87	361.92	442.22
Net Economic cost	1494.35	1595.25	1752.57	1932.25	2047.56	2199.95

Source: Food Corporation of India, Annual Report, 2015-16

Table 1.2: Amount of food subsidy released by GOI year wise

Financial Year	Amount of Subsidy on Food Grains (Rs. In crore)	Annual %Growth in Subsidy
2005-06	23071.00	-10.39
2006-07	23827.59	3.28
2007-08	31259.68	31.19
2008-09	43668.08	39.69
2009-10	58242.45	33.37
2010-11	62929.56	8.05
2011-12	72370.90	15.00
2012-13	84554.00	16.83
2013-14	89740.02	6.13
2014-15	107823.75*	20.15

Source: Department of food and public distribution

Note: * fig till 09 January 2015

1.9 SIGNIFICANCE OF SCM IN PUBLIC DISTRIBUTION SYSTEM

For the success of any distribution network role of supply chain management and strategies have always been a vital part. Our nation India is leading in World for Producing fresh fruits and vegetables, pulses, wheat, rice and other food grains. Besides all these achievements of production in our country malnutrition is a very Common alarming phenomenon. Almost 21% of total population of the country is malnourished and about 60% of the child population in India are underweight and malnourished. According to World Bank, almost equal to 3% of country GDP productivity losses in our country due to stunted growth, iron deficiencies and iodine deficiencies.

There is a remarkable growth in Agricultural Productivity of various commodities in the past 40 years which contributes significantly towards bringing the nation from deficit to surplus in food grains production and to provide food for everyone. Besides all these the availability of food remains a problem for many households in India. The main reason behind this cause is a lack of proper strategies of agricultural sector due to poor logistics network, an inefficient chain of traders, lack of proper warehousing and cold storage facilities, poor and insufficient food packaging. Zolner (2014) analyze for the achievement of strategic competitiveness of any policy implementation boundaries between corporate or government and local level issues must be well defined. The agricultural production is mainly categorized in some sub-systems as input supply, production, processing, sales and distribution to needful as to provide quality food in time as per requirement. Coordination between these subsystems is very poor throughout the supply chain of agriculture sector in India and most of these components act independently and not properly coordinated and due to this agriculture sector operates inefficiently at every stage of the supply chain.

The government of India spends thousands of crores rupees every year as a subsidy to provide food for every citizen through various welfare schemes, besides these about 26% of our population lives below poverty line having no sufficient food to eat. Due to unorganized SCM of PDS, it puts an excessive burden on exchequers hence objectives of PDS are not achieved. The PDS in not properly equipped with modern and proper facilities of transportation and storages which are the two basic needs for the working of SCM of any working organization. Proper SCM of PDS will make India a food secured country. The whole concept of the supply chain of the policy of PDS should be restructured to improve the system effectively to make a proper supply chain from producer to consumers. Fig. 1.3 defines the basic structure of supply chain of PDS in our country.

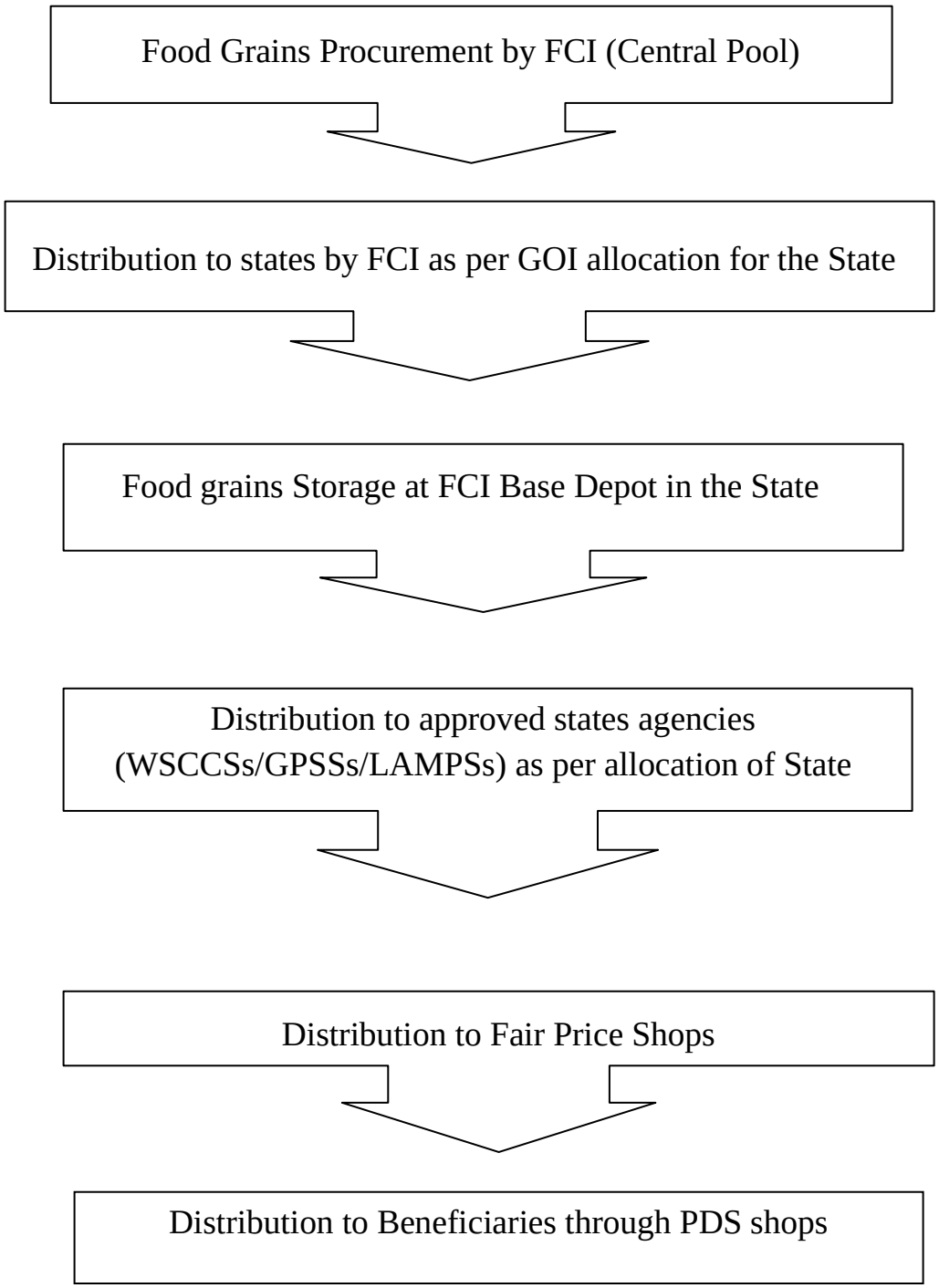


Figure 1.3 Supply Chain Structures of PDS in India

1.10 ORGANIZATION OF THE THESIS

Chapter 1

This chapter includes the introduction of SCM and PDS, importance of the topic, briefly explains the overview on PDS. It also includes the role of SCM in achieving food security, current PDS structure, and role of different channel partners of PDS and a brief discussion on food security. After an introduction, research has been divided into six chapters; literature review, methodology, statistical analysis, results and discussion and the last chapter is a summary conclusion, implications, and scope for future work.

Chapter 2

This chapter contains the overview of the literature, theoretical foundations, and growth of PDS and SCM in our country over a period of time, the construct of study and identification of research gap. The basic history of PDS in our country is also included in this chapter. The major focus of literature is from the year 1990 onwards. The literature has been classified on the basis of journal contribution, researcher's contribution, top 10 keywords, types of documents and government reports.

Chapter 3

This chapter includes the objectives of the research and how to achieve the objective by different methodologies. Each objective has been evaluated by different methodologies. The hypotheses have been developed on the basis of objectives. The details about techniques used for analysis has also been provided.

Chapter 4

This chapter demonstrates the statistical tools and techniques to test the hypothesis and details descriptive analysis of data.

Chapter 5

This chapter contains the overview of interpretation of the data on the basis of statistical tools. Interpretations of the results are discussed briefly on the basis of hypothesis testing.

Chapter 6

The chapter provides the summary conclusion and result of the thesis. This chapter also provides managerial implications, limitations, and scope of future work.

Chapter II

REVIEW OF LITERATURE

2.1 IMPORTANCE OF LITERATURE REVIEW

For any research problem, review of related literature is an important factor which entails methodical recognition, location and examination of literature having essential specifics associated with the research question. Literature review of any research question can be described as written text explaining the research plan or report that discusses the complete research objective. The information can be gathered from related writings, theories, assessments, monographs, government reports, theses, other studies, and media. A major objective of a literature review is to find out how much work has been carried out in relation to the research topic, which gives a picture of what has been done and what needs to be done in the area of study. In order to develop a logical framework for any study, a well-organized literature review related to the research objective is more preferable to a review containing many irrelevant studies.

For a quality study, an early review of related literature is very important as it serves the following functions:

- A review of literature identifies suppositions made in relation to the research questions which enable preparation of an appropriate research proposal with a centralized approach.
- The literature review provides related fundamental knowledge to back the intended study.
- Review of literature helps researchers recognize existing gaps in literature which can be filled through the proposed study.
- Review of literature helps researchers elaborate research questions which further helps in formulating hypotheses and a logical framework for the research problem.

2.2 METHODOLOGY OF LITERATURE REVIEW

Review of literature entails critical evaluation of pertinent literature (research or otherwise) available on the study topic taken from different sources. A systematic approach is likely to be considered to generate a review to properly understand the research problem. In the present chapter, literature on SCM and practices of SCM in different areas related to agricultural supply chain is examined along with a brief study on PDS in India. Pertinent findings, observations and additional aspects are also mentioned.

This chapter provides a detailed summary on the notion of supply chain management and public distribution system. Section one presents a historical synopsis of supply chain management as a new dimension of management while second section discusses public distribution system

2.3 SUPPLY CHAIN MANAGEMENT

2.3.1 Introduction

Supply chain has been understood thus: "A network of organizations that are involved, through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hand of the ultimate consumer" (Wilson, 2007). Competitiveness of a firm may be highly benefitted by a supply chain. It entails whole range of activities concerning transformation of raw material to finished goods, and their delivery to consumers (Christopher, 1998). Several stages are inherent to a supply chain, such as: warehouses, manufacturers, retailers, distribution centers, suppliers, and customers.

Fig. 1.1 shows flow of raw material starts from initial suppliers to the end user in the SC of a system. It is clear that flow of information and flow of material are in opposite directions. An organization possessing a comparatively effective and efficient SC holds an advantage over its competitors. Therefore, as a way to gain competitive strategic advantage (Mentzer, 2004) supply chain management has assumed much importance for organizations across industries.

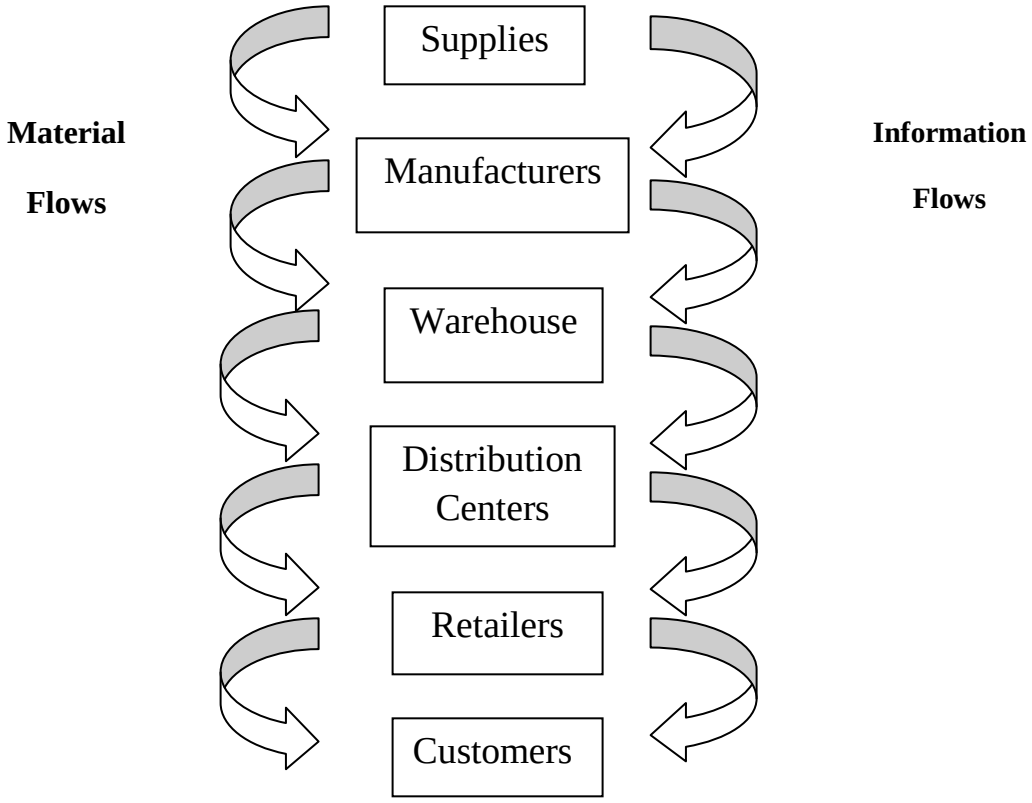


Figure1.1 Structure of a Supply Chain

SCM as a concept has gained much attention from consultants, academics, and practitioners (Feldmann & Müller, 2003; Tan et al. 2002). SCM as a source of competitive advantage in a highly competitive market has been acknowledged by several organizations (Jose, 2011). SCM has been viewed from several perspectives in various studies (Croom et al. 2000) from different fields such as logistics, transport, buying, management of trading, marketing, operations management, theory of organization and managerial information systems. Fundamentals of SCM can be found in studies on channels (Bucklin, 1966) and analysis of systems integration (Forrester, 1969) which date back to the 1960s. "Supply chain management" as a term expanding beyond the "logistics" concept (Cooper et al., 1997) emerged in 1980s (Keith and Webber, 1982; Jones and Riley, 1985). By 1990 onwards, it gained attention from academia and industry alike. However, a universal definition of SCM still remains elusive.

The CSCMP (Vitasek, 2010) defined SCM as: "Supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and all logistics management activities. Importantly, it also includes the coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Supply chain management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model (Wein and Liu, 2005). It includes all the logistics management noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, and finance and information technology." Cox and Blackstone (2005), describes that as per APICS Dictionary, SCM as "the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally".

SCM is still in its initial evolutionary phase (Gibson et al. 2005). SCM lends structure to "business ecosystem idea" and offers procedural structure for organizations to co-exist instead of compete (Bechtel & Jayaram, 1997). Counselors put forward the terminology while educationalists suggested framework and theory for implementing SCM. "Supply chain

management" as a term emerged in 1982 (Oliver & Webber). It was about 1990 when educationalists explained SCM with a hypothetical perspective to distinguish from conventional terms and methods (like logistics) to include management of flow of material and related flow of information (Cooper et al., 1997). In last two decades, SCM has gained much research attention (Ashish, 2007).

Other analogous definitions also exist and have been widely accepted. SCM is defined by (Simchi-Levi et al., 2003) as "A set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements." Christopher (2005) asserted that SCM is "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole."

Stadtler (2008) stated that SCM was "the task of integrating organizational units along a supply chain and coordinating material, information and financial flows in order to fulfill (ultimate) customer demands with the aim of improving the competitiveness of a supply chain as a whole." Simchi-Levi and Kaminsky (2000) gave the following definition of SCM: "The integration of key business processes among a network of interdependent suppliers, manufacturers, distribution centers, and retailers in order to improve the flow of goods, services, and information from original suppliers to final customers, with the objectives of reducing system-wide costs while maintaining required service levels".

CSCMP (2004) defines SCM as: "SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities, including coordination and collaboration with suppliers, intermediaries, third-party service providers, and customers". Cooper et al. (1997) asserted that SCM entailed managing and integrating whole group of business practices which enabled supply of value added products, services and information to customers. While there may be a slight difference in phrasing, all the aforementioned definitions highlight the significance of coordination, integration and communication between operations and companies that generate value for consumers (Gillyard, 2004). Some more definitions of SCM as suggested by different researchers are given in table 2.1 as follows.

Table 2.1 Definitions of supply chain management	
References	Definition of SCM
Keith & Webber (1982)	Describes as a chain developed for the linkage through networking begins from the initial raw material supply to process and manufacturing and ends with the delivery of goods and services to customers as per need.
Jones and Riley (1985)	SCM is an integrated direction having focus on the planning and control of managerial implementation related to materials inflow from suppliers to out flow to final consumer.
Ellram (1991)	SCM in an organization is basically a network of different channels having an interaction with each other to provide product or service to the end users, having a networking from the initial stage of raw material to end supply.
Lee and Billington (1992)	SCM is a system based on networking starts from the procurement of raw materials, conversion to intermediate and finished end outcome, and finally distribution of finished end outcome to end users.
Braun et al. (1994)	Objective of SCM is to develop new products as per market need, building trust between different channel partners, utilization of trade information's, and restructuring the supplier – OEM base for maximum utilization of available resources for competitive development of long term relationships.
Saunders (1995)	SCM is an external Chain or linkage built up in any organization from initial source of procurement of basic raw material to process of manufacturing, assembling and finally distribution to retailing to end users.
Tan et al. (1998)	SCM encircle the management of materials from the source of initial supply of raw materials to distribution of finished goods which includes possible reuse and recycling. SCM organize by how organizations utilize possible resources to enhance competitive advantage. SCM is a philosophy related to management which joins all channel partners of an organization together with the common goal of increasing efficiency for competitive advantage in market place.
Christopher (1998)	An organized network of different channels having upstream and downstream involvement in the various activities and process to manufacture in the form of end outcome and services as per market need to ultimate users.
Kennedy (2003)	SCM comprises of set of different channels which includes raw material suppliers, logistics channels, manufacturers, distributors and retail channels, required for the flow of materials, products and related information in a system.

2.3.2 Major Components of SCM

It is clear from definitions given above that SCM is concerned with several issues in various stages of the supply chain. The following six crucial components of SCM (Cappello et al. 2006) and the combination and synchronization among them have received significant research attention:

- Management of Service level which includes customer segmentation (Chen, 2001), management of services (Boyaci, 1998) etc.;

- Management related to supply order and demand as per requirement which includes marketing, planning and future market estimation (Aviv, 2001), management of inventory (Lee and Billington, 1992; Cachon and Fisher, 2000), supply order generation and execution of order (Akhil and Sharman, 1992) etc.;
- Management of Production planning with proper configuration of networking (Pyke and Cohen, 1994; Tuma, 1998), planning of manufacturing with strategic scheduling (Shapiro, 1993; Shah, 1998; Kallrath, 2002b; Kreipl and Pinedo, 2004; Maravelias and Sung, 2009), execution of orders as per demand (Dickersbach, 2009), etc.;
- Management of supply which includes required source planning (Kingsman, 1986; Bonser and Wu, 2001), management of performances of channel partners (Prahinski and Benton, 2004), etc.;
- Management of distribution network including configuration of networking between different channels (Chopra, 2003; Jayaraman and Rose, 2003; Amiri, 2006), management of handling of storages (Frazelle, 2003), logistics (Morash and Clinton, 1997; Wilson, 2007), etc.;
- Strategic planning of SCM and policy execution having coordination with various internal processes, networking with information technology systems and coordination with organization system and performance. (Chandra and Fisher, 1994; Thomas and Griffin, 1996; Erenguc et al., 1999; Frohlich and Westbrook, 2001; Gunasekaran and Ngai, 2004; Power, 2005).

2.3.3 Evolution of Supply Chain Management

SCM is still in its early evolutionary phases (Gibson et al. 2005). It lends shape to the "business ecosystem idea" as well as offers procedural structure for organizations to co-exist instead of compete (Bechtel & Jayaram, 1997). Advisors put forth the expression while educationalists suggested hypothetical framework for implementing SCM. "Supply chain management" as a term emerged in 1982 (Oliver & Webber). Around 1990, educationalists explained SCM theoretically to distinguish from conventional terms and approaches (like logistics) to include management of material and related information run (Cooper et al. 1997). In last twenty years, SCM gained much research attention and popularity (Ashish, 2007).

SCM as a concept has gained significant consideration from academics, counselors, and practitioners of business (Feldmann & Müller, 2003, Tan et al. 2002). Several companies

recognize that SCM may provide sustainable competitive advantage in an intensely competitive market (Jones, 1998). Literature has considered SCM from different perspectives (Croom et al. 2000) like operations management, logistics, and transport, organizational theory, marketing, managing information systems, and purchasing and supply management. Different eras of revolution in the history of SCM are evaluated by Jain et al.(2010) as described in table 2.2.

Table 2.2: Different era of SCM Evolution

1	Era of creation	In early 1980s an American industrial consultant developed the terminology of SCM. However, from the beginning of 20th centaury the methodology of supply chain in management, was of strategic implementation world wide especially by the starts and development of the assembly line in manufacturing processes.
2	Era of integration	With the development of EDI during 1960s, development of concept of SCM was highlighted among various field of manufacturing and services and reached to a new height during 1990s by the development of ERP systems.
3	Era of globalization	This era of the globalization of SC in management starts with the achievements of goal of enhancing competitive advantage through value addition in products and reducing prices through global resourcing of materials.
4	Era of specialization Phase – One	During early 1990s organizations starts focus on core competencies through models of specialization. They starts working on vertical integration, elimination of non-core and loss making operations, and starts outsourcing of non core operations to achieve strategic competitiveness.
5	Era of specialization Phase -Two	Beginning of 20th century, a start of the use of SCM concepts in service industry which includes specialized sectors as logistics, brokerages, warehouse management, distribution and also planning, collaboration, execution and performance measurement to achieve competency in market place.
6	SCM 2. 0	By the increase in use of information technology through web system and development of technology based programming increases creativity, world wide collaboration of companies, sharing of required and advance information, and strategic collaboration among different channels.

In the pre-globalized era, poor transportation technology resulted in every community consuming what it produced. The steam revolution enabled railway and ship cost effective transportation which further led to possibility of separation between consumption and production (Bhatnagar, 2014). Due to competitive advantage by cost reduction, economies of scale increases which lead to profitability of separation. At the same period, The "Industrial Revolution" of Great Britain starts which provided strategic cost benefits in industrial production (Balani, 2013). As a result of this industrial revolution Britain worked as an importer of different raw products from various developing countries as well as an exporter of

finished industrial goods. During the middle of 19th century other European developing countries and the companies of United States also started growth in industrialized in strategic manner and took up identical international business patterns (Baldwin, 2012). This resulted to start a new sustainable era of specialization, having large-scale manufacturing growth, and new technology innovation and huge gains in economy that leads to further many fold innovative economical growth in European countries, North America and Japanese industry. During this revolution era, manufacturing and industrial activities of other developing regions in Asia, Africa and Latin America failed to achieve advantages of innovation. Industrialization activities in "North" and de-industrialization of "South", mainly in India and China, suppose to huge economy divergence between country organizations. "Globalization's first unbundling" by Baldwin (2006) enhanced the significance of closeness in manufacturing process and separates with consumption pattern. Development of global trade all around the globe and revolution in logistics sector world-wide incentivized huge manufacturing growth, which leads to an competitiveness in joining together products, population, technology, skill, education, economy, and low of information (Svedberg, 2012). Closeness reduced cost and risk of such complex operations, and led to joining together of all stages in separate industrial organization, often grouped locally in manufacturing sectors. Historically, world-wide trade between different countries entailed import and export of finished manufactured goods between nations on the basis of comparative and strategic advantage, as determined by evaluated on the basis of advance in technology (Ricardo) or factor endowments. Freedom to participate in global markets internationally gave organizations the opportunity to obtain unpredictable growth in economy which, in turn, flourished intra-industry trade (Krause, 1997). It included involved business transactions of various components by organizations in different countries around the world. Thus, it can be said that globally, supply chains existed in advanced nations. Business trade relation between Canada and United State of America in the automobile sector of industries and intra EU trade in plant and machinery are two major strategic international trade examples (Baldwin, 2012). Majority of the sourcing of products as international level was pushed by firm-level specialization and excellence. For example, in case of automobile air conditioning systems, the French firm Valeo is pioneered in the market through excellence. While other firms of same automobile sector from Swiss, Italy and Germany manufactured their own air conditioning system to achieve economies of scale and "learning-by-doing"

implied it would be cost effective to import these automobile components from France (Baldwin, 2012). Industrial organizations as local winners in manufacturing sectors of various components were key to the "horizontal" internationalization of SC among high-salary, advanced growth of economy. Recently, import and export of finished products at global level between developed and economical growing countries, especially in context of Asia (Ando and Kimura 2003), as foreseen by Ricardo and Hecksche Ohlin, has become trade of less focus. Fragmentation of manufacturing facilities at international level leads to manufacturing or services activities in house in combination with those performed internationally, has assumed prominence. This is a digression from the "Fordist" manufacturing process exemplified by the automobile sector in USA, where all economic activity was conducted within a single organization situated on one place or in closeness (Feenstra, 1998).

Organizations throughout the globe add value to global supply chains by accomplishing tasks related to production of a finished good and its export. This may include services vital to intermediate inputs in further manufacturing. Grossman and Wassick (2011) developed the word "task trade" to describe this advance version of trade at international level while others describe this phenomena as "vertical specialization", "off shoring", "outsourcing", "production sharing", "slicing the value chain' and delocalization". Trade in tasks can be performed through long term contracts between organizations in different nations at international level, through FDI or through an intermediate channel of references having a linkage between them. For FDI, multinational investment companies having their business head offices based in one country will establish their operations in another country under their managerial and ownership strategic control. These types of "vertical" FDI are often performed by advanced economies' firms through their huge investment in developing countries. A multinational investment firm is likely to invest and operates through FDI in other non-home country in the activities of subsidiary only if the operational cost is competitively than the cost associated with an long term manufacturing or service contract (Hamill , 1997).

SCM warrants efficient modeling of the intricate manufacturing and supply systems (Chandra and Fisher, 1994; Erengüç et al., 1999; Chen, 2010). Considering uncertainty of market need, model predictive control (MPC) is an approach widely applied to sustain desired levels of stock. PDS also is necessary for supply chains confronted with volatility in demand (Babbar and Prasad, 1998; Toomey, 2000; Syntetos et al. 2009; Fiestras-Janeiro et al. 2011).

SCM concerns itself with combination of flow of material and information across whole SC as a competitive strategy (Childhouse, 2003) in PDS.

Majority of existing literature on planning and programming has focused on distinct/individual processes (Pinto and Grossmann, 1998; Cerdá et al., 1997; Karimi and McDonald, 1997; Zhu and Majozi, 2001; Chen et al., 2002; Castro and Grossmann, 2006; Erdirik-Dogan and Grossmann, 2007, 2008b; Castro et al., 2008; He and Hui, 2008; Marchetti and Cerdá, 2009a).

2.3.4 Review of Literature and Key Ideas of SCM

Tan et al. (1999) with respect to PDS, sought to associate specific SCM procedures with performance of firm. They particularly assessed influence of quality management, supply base management, customer relationship procedures and PDS effectiveness on a firm's financial performance. Results revealed certain features of management related to quality as usage of performance related data for management of quality, managerial commitment towards quality, and participation of quality division, and managerial social responsibility which showed positive associations with enhanced performance of PDS (Gillyard, 2004). Thus, the significance of supply chain management underscores that companies keenly focus on the management of supply chains to heighten performance.

According to GSCF, supplier relations management means "the supply chain management process that provides the structure for how relationships with suppliers are developed and maintained". Grossmann and Wassick (2011) state that supplier relationships were handled through a group of people with various functional backgrounds and agents of other organizations in the supply chain. Thus, management of supplier relationships is directed by several activities as purchase input, functional activities, transportation and warehousing, finance, research and development, sales, and marketing. Supplier relationship management activities are better carried out through cross functional coordination and information from suppliers and customers (Wang, 2007).

Sahinidis and Grossmann (1991) proposed a comprehensive MINLP model to address the issue of cyclic multiproduct production organizing on a continuous parallel line. To accomplish the task a generalized Benders decomposition based method was used. Kondili et al. (1993b) targeted issue of short-term scheduling of multiproduct energy-intensive continual

plants to minimize the total cost of energy and changeovers, while meeting consumer orders under established time limits to enhance efficiency of PDS.

Pinto and Grossmann (1994) sought to target the issue of optimizing cyclic program of multiple product continual units with numerous phases interrelated by intermediate inventory tanks, thereby expanding the work done by Strauss & Thomas (1995). The comprehensive MINLP model thus proposed had ability to manage intermediate storage and cyclic changeovers.

Karimi and McDonald (1997) taking a continual time representation as basis, proposed two MILP conceptions for comprehensive short-term programming of a single-stage multiple product facility with multiple parallel semi-continuous approach to control the inventory at a minimum level, transition, and shortage costs. Ierapetritou and Floudas (1998) put forth a continual-time MILP formation taking STN representation as basis for short-term programming for multi-phase continual approach and mixed production establishments concerning continuous and batch activity. The formation proved able to manage minimum storage and maintenance schedule. Mockus and Reklaitis (1999), establishing an objective to maximize profit in PDS supply chain, took into account a general MILP formation in planning processes of multiple product/multiple purpose batch and continual plants.

According to (Mentzer et al. 2001) supply chain exists even if an organization does not dynamically manage the chain. Boddy et al. (1998) revealed that above fifty percent of the participants in their study thought that their organizations failed to successfully implement SC associatioship. Spekman et al. (1999) observed that nearly 60% of SC partnerships were likely to be unsuccessful. Deloitte consulting survey disclosed that merely 2% of North American producers rated their SC as world class even though 91% considered SCM key to organizational accomplishment (Thomas, 1999). It can be said that while significance of SCM to firms has been acknowledged, effectual supply chain management has not been widely adopted yet.

Lee et al. (2002) analyzed the programming issues in single-stage and continual multiple product strategy on parallel lines with intermediary due dates and particular limitations on minimum run lengths. The suggested MILP formation remarkably decreased size of the model and assisted in food grain acquisition, storage, inter-state transport, distribution to

different states and supply of food (Karimi and McDonald, 1997; Ierapetritou and Floudas, 1998).

Alle and Pinto (2002) on the basis of the Travelling Salesman Problem (TSP) formulation, suggested an MILP model towards concurrent programming and optimization of working conditions of continual multiple stage multiple product plants with intermediate storage. The model also assisted in PDS networking. The suggested formulation was faster and capable of resolving problems bigger than the model put forward by Pinto and Grossmann (1998).

Méndez and Cerdá (2002b) built an MILP continual-time short-term programming formation taking into account sequence based changeovers times and particular fixed delivery schedule for export orders in make-and-pack continual manufacturing establishment to fulfill all end-product demands with least dynamic scheduling. In another study, (Méndez and Cerdá, 2002b) proposed an MILP statistical formation for short-term programming of resource based multiple product plants with continual procedures, taking continual time representation as basis that accounted for sequence dependent changeover times and limited storage. The aim was to augment profits from product sales while meeting specific least product prerequisites.

Munawar et al. (2003) took into consideration cyclic programming of continual multiple stages multiple product establishments functioning in a hybrid flow shop, wherein operations in the plant were an amalgamation of serial and parallel modes. A generalized concurrent programming and manufacturing optimization MILP model was proposed for these types of plants considering serial and equipment dependent changeover times.

Alle et al. (2004) expanded the models proposed by Pinto and Grossmann (1994) and Alle and Pinto (2002) and suggested an MILP model for cyclic programming of washing and manufacturing operations in multiple products multiple stage plants with performance decay, with continual time representation as basis. This entailed assembling people, training, goods, investment, information and technology for easy operation of PDS.

Castro and Novais (2007) utilized a novel multiple-time-grid MILP formation founded on RTN process representation for periodic scheduling of multiple stages, multiple product continual establishments with parallel equipment units dependent on series based changeovers. Chen et al. (2002) put forward a slot-based MILP model for medium-term scheduling of single-

stage independent unit continual multiple product establishments on the basis of a hybrid individual time representation. Erdirik et al. (2008a) built upon their earlier work (Erdirik et al. 2006) from independent unit to parallel units.

Hoffman (2007) observed that production system and structure of supply chain developed over time from sequential to global supply chain. This made business environments more dynamic. Fewer breaks between producer and consumer improve supply chain efficacy. Industries aim to strike balance between supply and demand. TQM tools and techniques would be the future of extant chains. To determine optimal levels of industry profit, corresponding program and most favorable cycle time for a given recycling policy, Castro et al. (2008a) suggested a RTN-based continual -time formation for most favorable periodic programming of a continual mill of tissue paper. Bose and Bhattacharya (2009) proposed an MILP model on the basis of STN representation for optimal programming processes in cascaded continual manufacturing units having set intermediate storage, several upliftment schedules and concurrent influx of input to determine influence on PDS.

Erdirik et al. (2008a) suggested two-level perishing process which enabled integration and optimization of scheduling and planning of independent stage independent unit multiple product continual establishments manufacturing numerous products dependent on sequence-dependent changeovers. Shaik and Floudas (2007) used STN based unit designated event based continual-time representation to present an MILP model for short-term programming of continual procedures. . The proposed model considered several storage prerequisites like restricted, infinite, dedicated, and no transitional storage policies, and allowed individual dependent variable processing rates, sequence-dependent changeovers, and the option of bypassing storage which can also be considered for smooth operation of PDS. Shaik et al. (2009) built upon work done by Shaik and Floudas (2007) and developed methodical structure for short-term and medium-term programming of a large-scale industrial continual establishment to adjust to particular demands of unit. A variant of a literature rolling-horizon based decomposition scheme was initiated to resolve overall medium-term scheduling problem effectually.

2.3.5 Supply Chain Management: Issues and Challenges

Krause (1997) observed supply chain executives of NAPM from various industrial organizations to determine results of vendor development processes and see if firms were content with results. Findings revealed that vendor performance enhanced due to efforts towards supplier relationship management. Buyers were of the opinion that supplier management efforts with one vendor resulted in remarkable improvements in percent on delivery schedule time, cycle of order execution, incoming defects and percentage of complete supply of orders in one time. Also, buying firms were largely satisfied with the results of efforts made for supplier development program.

Krause and Ellram (1997) observed 527 high-level supply chain executives, also associated with NAPM to test if success of buying organizations varied with degree of success of vendor relationship efforts and if it founds to be true then to recognize possible causes that contributed to the perceived success or failure. It was found that the ratio of success in supplier development program varied and they divide the executives into two different groups those organizations that had successfully adopted supplier development programs and those firms that had partly gained from program and achieved low rate of success.

Krause et al. (1998) compared supplier relationship management practices of service and manufacturing organizations. The two groups were compared on the basis of satisfaction drawn from supplier relationship management endeavors considering performance goals constituted of supply base reduction, enhanced management ability, increased financial strength, and increased technical ability; and performance goals that include cost, delivery performance, quality, and service/ responsiveness.

Dyer et al. (1998) stated that strong relations are forged with a few important suppliers on the basis of the value they offer to the firm over periods of time while customary relations are sustained with others. Managements recognize these target vendors as a group of strategic importance to fulfill part of firm objective. Supplier relationship management (SRM) groups collaborate with important vendors to formulate product and service agreements (PSA) in order to fulfill organizational requirements of specified vendors. Standard PSAs are formulated for sections of remaining vendors. SRM concerns itself with forming and handling PSAs. Teams collaborate with major suppliers towards improving processes, and eliminating requirement

based inconsistency and non-profitable based practices (Wilson, 2007). The key objective is to formulate PSAs having influence on key business enablers relevant to firm and vendors. Performance reports are drawn to assess influence that individual vendors have on a firm's profitability and the influence of the firm on profits of vendors (Lambert, 2008). Supplier relations handling entails operational and strategic components. Croxton et al. (2001) bifurcated the SRM process in two parts: strategic process wherein firms set up and tactically handle the process; and operational process involving fulfillment of the process after its establishment. ***Reviewing corporate, marketing, manufacturing and sourcing strategies comprise the first stage of the strategic sub-process.*** It is in this phase that the supplier relationship management team determines supplier sections essential to the firm's present and future success. A review of these strategies enables managements to identify suppliers with whom long run relations could be established (Lambert, 2008).

Identifying selection criteria for vendors comprise the second stage of the strategic sub process. Such segmentation is done to see which suppliers must be recipients of customized PSAs and which others must be classified to get standard PSAs. Possible criteria could be: stability and growth ; significance of the required service level; profitability; volume purchased from the supplier; complexity and compatibility of supplier process execution; ability and compatibility of supplier technology; capacity available from vendor; and vendor's anticipated quality levels (Burt, 2003).

Providing strategy for the level of customization in the service and goods agreements comprises the third strategic sub-process. It entails development of differentiation alternatives and consideration of cost and revenue implications of every alternative as such. To this end, the team takes into account the cost and quality implications of the differentiation alternatives, and determines limits for level of customization (Lambert, 2008).

Developing framework of metrics forms the fourth strategic sub process. These metrics must represent the vendor's influence on firm performance and the reverse relationship. The supplier relationship team is responsible for making sure that metrics considered to assess supplier performance are not in opposition with metrics employed in other procedures. Managements should make sure that all external and internal measures drive coherent and appropriate behavior (Lambert, 2001).

Developing strategy to share the gains with vendor for improving the process comprises the fifth sub-process. Objective is improving processes such that they are advantageous to both parties. If suppliers don't stand to benefit from these enhancements, they might not fully commit to the achievement of these goals. The level of operation in the SRM process concerns itself with development and implementation of PSAs.

Differentiating suppliers forms the first operational sub-process. Segmentation of suppliers is done based on parameters established in strategic procedure. A new model widely accepted today by firms for supplier segmentation takes into account substitutability and/or availability of offerings; and strategic significance of vendor's offering (Rackham, 2008).

Preparing the supplier/segment management team is the second operational sub-process. These are cross-functional teams which represent each of their functional areas. Every team is committed to one particular supplier and regular meetings between them are held. Where whole supplier segments are concerned, one team handles several suppliers and handles standard PSAs for the section (Lambert, 2008).

Reviewing the policy of supplier within the system is the next operational sub-process. Teams assess vendors or supplier segments to establish their role in supply chain. Teams also strive towards identifying opportunities for improvement (Lambert, 2008).

Identifying opportunities with supplier's forms fourth operational sub-process. In this phase, teams collaborate with every supplier or supplier segment to towards developing improvement opportunities. As such chances might emerge from any supply chain handling procedure, supplier groups must interact with every other procedure group (Lambert, 2008).

The last operational sub-process comprises of ***developing agreements for service and goods and information sharing strategy.*** A group formulates PSA for their vendor or supplier section. Commonly advantageous PSAs are developed for major suppliers, and pledge from vendor's internal function gained (Lambert, 2008).

Mentzer (2001) suggested that strong relations with suppliers were essential to effective management in the international environment. Organizations today have shifted their focus from associating with several suppliers, to maintaining strong relations with some good quality vendors (Kalwani & Narayandas, 2007). Organizations have started to implement relationship with vendors as a technique to attain competitive advantage (Ballou et al. 2000).

Gunasekaran & Ngai (2004) argued that a tactical association stressed on long-term associations among active business channels and "promotes mutual planning and problem solving efforts". Strategic associations among firms enable shared advantages and consistent alliance in major strategic fields such as markets, products, and technology. Organization-supplier strategic partnerships enable firms to work in proximity and effectively with a few suppliers as opposed to working with several suppliers chosen only on the basis of cost (Ashish, 2007).

Humphreys et al. (2004) investigated the role played by management of supplier relations in a buyer–supplier performance context in order to analyze the view of a buying firm considering a sample of 142 organizations of manufacturing electronics products in Hong Kong. Analysis suggested that relations with specific vendor development and associated infrastructure issues related to vendors (vendor development strategic program, top management support to SCM team, effective interaction and information sharing between buyer-vendor, commitment of long term relationship between buyer-vendor, initial evaluation of vendor capabilities, strategic objectives of vendor, and trust between two) were significantly and strategically correlated with measurement of perceived buyer-vendor performances .

Li and Chan (2004) investigated the part of SRM played in buyer vendor performance from a buying organization's point of view with a survey of 200 organizations of manufacturing industrial consumer products in Hong Kong.. It was discovered in particular that supplier strategic objectives, transaction-specific supplier development and trust considerably factored in predicting supplier performance enhancement. It was also discovered that supplier strategic objectives, transaction-specific supplier development and trust played a role in the prediction of improvement in buyers' competitive advantage. With respect to predicting of buyer-vendor relations enhancement, transaction-specific supplier development and infrastructure factors of supplier strategic objectives and trust played a role.

Haralambides and Gujar (2011) investigated the financial sector meltdown brought about by the real estate bubble in USA. Its repercussions on real economy, specifically in Europe, are still to be understood. This entails understanding long term effects on international ocean transportation, ports and distribution of global production. The economic meltdown resulted in international shipping and port segments having considerable overcapacity. While

radical cost cutting methods were adopted on one hand, deliberate, frequently agreed upon, and coordinated deduction of supply on another hand followed. A combination of such measures and restored demand are slowly resulting in higher prices demanded by transport service providers. Considering the nation's area, populace, and geographical disparities, India's dry ports (inland cargo consolidation and distribution centers) are viewed by the government as a centre of export-led growth and economic development (Haralambides & Gujar, 2011). Both private and public sectors view the organized development of dry ports as the sole means of alleviating congestion pressure at coastal ports, thereby enhancing supply chain efficiency. Nevertheless, dry port development and operations continue to be governed by the public sector, under prices, capacity, land acquisition policies and other factors that made private sector participation dicey and unappealing. The study advocates decentralization through competition-enhancing Public-Private Partnerships (PPPs) to rationalize dry port capability and price. The study makes suggestions towards legal, regulatory and general economic policy interventions on the basis of global best practices, considering the Indian context.

Sichinsambwe (2011) discovered that supplier relation programs were common than believed, and their names subject to what the particular program emphasized. Further, the organization implemented six month to more than four year program and formed permanent organizational units to manage supplier relationship programs.

2.4 REVIVAL OF THE PUBLIC DISTRIBUTION SYSTEM

PDS is a one of the major safety net program of GOI that seeks to address issues related with removal of poverty (Mooij, 1994), and is a key form of government intervention to stabilize the food grain market. Originally, PDS aimed at stabilization of food grain prices and supply management. The central government intervened in the food grain market by declaring minimum support prices (MSP) and acquiring surplus food grain (Helen & Neil, 2012). These grains were provided to different state government for distributing through network of FPS developed under PDS at subsidized fixed prices. The GOI however, evaluate and altered the distribution guidelines of PDS during the economic reforms of 1997, when a targeted PDS (TPDS) was introduced under which food grain was to be allotted to states on the basis of estimated populace living under poverty line (Kannan et al, 2000). Central and state governments along with union territory administrators are responsible for functioning of the

PDS. The central government is responsible for acquiring, storing and transporting food grain from the point of purchase to central warehouses. It is responsibility of administration of State governments and union territories for the distribution of these food grains from the warehouses of central government to the end consumers through PDS. PDS entails a network of 478,000 FPSs distributing over 200 million tones of food grain worth over INR 15,0000 million (Masiero, 2011), supporting nearly 400 million citizens. . PDS also offers subsidy dependent on the degree of acquisition of food grain and associated goods under PDS and similar initiatives. The estimated budget for subsidy (Vyas, 2005) during 2008-2009 was about INR 370 billion. As an estimate about 64% of India's rural budget is spent subsidy provided for food grains. Food share has been considered an inverse indicator of welfare (Deaton, 1997). Empirical research on working of PDS represents that through purchasing of food grains under PDS, the poor have not been benefitted greatly (Gaiha, 2002). There is no significance of public participation in policy formation of PDS. Not even in an advisory role. The target population for which these subsidized food grain and other items are sent is not involved in planning of distribution of these items, their quantity, quality and costing (Jain, 1989). Operational details of PDS vary across states and on the basis of state government policy cooperative societies and FPS dealers are responsible for distribution of PDS food grains and other items as per direction of monitoring agencies (Vyas, 2005).

Pricing of various communities distributed through PDS are fixed by GOI based on evaluation of present and estimated costing of present market by the government. Due to formation of norms of buffer stocks helps when unexpected and unanticipated events arise by making demand and supply match, thereby stabilizing inter-seasonal demands. It is the part of central government responsibility to ensure inter-state transportation of food grain to maintain demand and supply in the different regions of the country (Indarkant, 2000). Such food grain transportation entails operational cost. This cost when added with procurement price becomes more than cost at which the food grain was made available for distribution under PDS. The entire supply chain of PDS is carried out by public partnership at different levels. Involvement of public partnership would enable farmers to decide cropping patterns corresponding with the transpiring demand for various agricultural goods (Gargi, 2012). Comparative stability in food grain prices is easier and sustainable to attain and involves less cost via irrigation and technology in underdeveloped areas. PDS workings are flawed at every step in supply chain

and occur in different ways. Such flaws may appear at the store level when as a result the food grain fails to reach the targeted FPS. It is also possible that FPS trader does not pass a portion of assigned grain to open market. FPS owners might also engage in corruption with district supply authorities. The leakage in the policy of PDS may also occur at the initial level of consumer where the recipient purchases the food grain but sells it at inflated price in open market (Idrakanth, 1997). Leakage in PDS working may occur because the commission earned by FPS operator is very less, and he finds it hard to live on it. Public and private players acquire grain at almost similar prices. Grain distributed via PDS is of low quality and reflects inefficient operations. Government significantly subsidizes grain to make basic food items available to people at lesser prices. If subsidy in food is lessened, it harms the poor even if they are not beneficiaries of the subsidy (Gummagolmath, 2013). On the other hand, farther reach of PDS renders it effectual as compared to other government schemes of welfare initiatives such as EGS. Effective targeting of population and enhanced distribution systems would make PDS more effectual in rural areas. It is noteworthy, however, that a combination of PDS and other policies aimed at lowering poverty and improving healthcare are required to resolve the food security issue in India (Dev & Suryanaryana, 1991). Among those who gain from such state of affairs, others are hurt by grain misappropriation. Change in affairs would warrant political will and mindset above personal interests (Mooij, 2001). Proper analysis and integration of PDS operations may lead to improvement. Acquisition, storage, inter-state movement, and allocation and distribution to states through FPS are not issues to be viewed in isolation, and must be treated holistically. PDS in Madhya Pradesh comprises 39 base storage points of food grains, 25 general storage points, 14 subsidized depots, 185 centers for distribution of food grains under PDS, about estimated total 15,000 FPS and 58 mobile ration shops working on trucks in tribal areas for distribution. In 2002-03, Madhya Pradesh possessed about 6.05 million people as beneficiaries under PDS to whom about 2.54 million tones of food grains should have been distributed as per policy (Dre'ze, 2004). However, as per reports distribution was of only 0.88 million tones of food grains, having a deficit of 1.66 million tones. Population of MP complains about lack of information related to distribution and pricing structure of food grains under PDS (Right to Food Campaign Madhya Pradesh Support Group, 2004). Table 2.3 shows studies on issues associated with Indian PDS. It is clear that majority of studies carry an economic perceptive. Only very few researchers have observed PDS from supply chain perspective.

Analysis of the entire operation of PDS from a supply chain perspective is a gap in literature. The present study seeks to address these gaps.

Table 2.3 Major findings on PDS

S. No.	Reference	Major findings by Researchers
1	George (1979)	Distribution analysis of food grains through PDS and its effect on distribution of income in the state of Kerla
2	Howes and Jha (1992)	An urban bias is observed in whole operation of food grains distribution under PDS.
3	Krishna (1993)	On analysis it was observed that beneficiaries under PDS should be targeted through total population of country for better implementation of targeted policy.
4	George (1996)	Effect of subsidy on food grains through PDS and its benefits on production of food grains in country.
5	TCES (2000)	Analysis of diversion of food grains distribution under PDS at national level in almost all states.
6	NIRD (2003)	Study of leakages and diversion of food grains to open market and improper partial distribution of food to beneficiary.
7	Annual Report of Planning Commission (2005)	Analyses found due to poor infrastructure, correct identification of PDS families and diversion of food by PDS channel partners more than 58% of food grains of PDS having huge subsidy are diverted to open market.
8	Sirivastava et al. (2006)	Deep analysis of SCM of food grains under PDS in Uttar Pradesh and reports found deliver mechanism is found to failed to implement the policy for targeted population due to lack of administration coordination and accountability.
9.	Subramani (2010)	A estimated consumption and requirement per capita in Indian context under critical assumptions.
10	Meenakshi (2011)	Benefits of PDS are not targeted properly and urban populations are benefited more than poor rural and tribal population of actual need.

2.5 INTERNATIONAL EXPERIENCE OF STRUCTURAL ADJUSTMENT IN PDS

International experience of Mexico, Zambia, Jamaica, Tunisia and Sri Lanka was assessed to determine the influence of structural adjustment on food subsidies, consumption, and nutrition and food security of vulnerable populace. They showed structural adjustment policies made economic and social inequalities worse and inflicted hardship on poor. Structural adjustment involves deduction in food subsidy and a shift towards targeted schemes in several nations Introduction of food stamps or coupons has been a way of cutting down subsidy. The influence of structural adjustment on food subsidy and security is evident by experiences in Mexico, Sri Lanka, Jamaica, Zambia and Tunisia. These nations were chosen because in all these countries major changes were made in food subsidy programs in terms of structural adjustment, and except Tunisia, all other countries resorted to the food stamp system.

2.5.1 Mexico

Mexico was forced to cut expenses after debt crisis of the 1980s. Budgetary pressure forced changes in distribution policy of food grains by moving focus from general to targeted schemes. CONASUPO or the national basic food Company undertook import, processing and distribution of subsidized foods through a national chain of stores Swaminathan and Madhura (2000). To pay the debt, food subsidies were reduced by 80 per cent. In 1986, targeted food stamps were introduced. Targeting was done thus: based on income criterion; geographic targeting; a component of self-targeting as households needed to register at regional CONASUPO offices for food stamps. The policy change associated with subsidized food led to decline in patterns of consumption and nutrition.

2.5.2 Zambia

Zambian economy witnessed second stage of growth from 1974 to 1990s after which there is sudden fall of economy into debt. Various programs related to structural adjustment were initiated. Adjustments were made to minimize subsidy for maize meal. In Zambia Maize is the major important food grain, and comprises nearly 70 per cent of the market value of all agricultural goods. Subsidy policies have been oriented towards producers and urban consumers. Consumer subsidy as percentage of actual retail price varied from years to year, and peaked at 72 per cent in 1977. Fluctuation in incomes resulted in a large number of poor

consumers shifting towards maize, which was the only good at stable prices. In January 1989, government initiated food coupon system. Coupons were intended for all urban, but no rural households. Families with incomes from the informal sector were entitled to coupons, but dependents were limited to six. Initiation of food coupon system rendered a significant minority of vulnerable families unable to utilize the system.

2.5.3 Jamaica

Jamaica is a low-income nation which has attained great levels of human development. It robust health record and enhancement in nutritional standards during 1960 to 1985 received significant public support. After the economic recession of 1977, structural adjustment was introduced, and liberalization sped. Reduced food subsidy and social sector expenses were an element of adjustment in the 1980s. In 1984, general subsidies were done away with and substituted with a targeted food stamp and school-feeding scheme. Real value of food stamps eroded with time. High inflation in food prices resulted in significant rise in cost of commodities. With rise in prices of basic food items, quality declined. Targeting resulted in under coverage of eligible people. 'Poor' households were identified on the basis of a crude and simple survey and no attempt was made to verify reported incomes except observing 'quality of housing and consumer goods during a home visit.' Thus, the novel targeted coupon system left out majority of the poorest.

2.5.4 Tunisia

By 1980, Tunisia fell under the category of middle income countries and 'considered a model of successful development'. The period 1972-82 witnessed boom led by surge in foreign exchange, primarily from worker remittances, tourism and oil revenues. After 1983, a debt crisis arose. As a response, conventional stabilization and structural adjustment measures were initiated 1986 onwards, attempting a reduction in subsidies, including food subsidy. A system of generalized price subsidies on a range of basic food commodities was initiated in Tunisia. The system was universal and had no quantity restraints; benefits were apportioned to consumption. Reforms in Tunisia were different from other nations and sought to lessen food subsidy via a combination of self-targeting and introduction of quality distinction. Subsidy was

given only for inferior goods, therefore, only the poor consumed them. Food subsidies had an overall negative affect on nutrition.

2.5.5 Sri Lanka

Sri Lanka runs an effectual food rationing system, giving significant subsidy introduced in 1942 as a relief measure during times of war. In 1978, the policy shifted towards targeted rationing where households with a monthly income of less than Rs.300 were eligible for ration. Food stamps were adopted again. As value of food stamps was in nominal terms, real value of subsidy decreased with inflation. Prices of various food commodities went higher with removal of subsidies and devaluation. Emphasis from universal rationing to targeted, non-indexed food stamps negatively influenced consumption and nutrition among poor. The case of Sri Lanka reveals that food subsidy helped maintaining nutritional levels and reducing food subsidy in the late 1970s negatively affected nutrition.

2.6 THE PUBLIC DISTRIBUTION SYSTEM IN INDIA

Ghose (1990) revealed that introduction of PDS in India was a result of famines and food scarcities during British rule. In the Bengal famine of 1770, around 10 million people perished due to plundering by colonists of East India Company. Between 1860 and 1910, 20 major famines happened. The last famine in British India was the Bengal famine of 1943 which resulted in extreme food scarcity over the nation. After partition, 82 per cent of the erstwhile population remained in India, left with 75 per cent of cereal producing areas in undivided India. Majority of granaries of Punjab and Bengal lay in the newborn Pakistan.

Food Grains Policy Commission constituted in 1947 reassessed the policy of food grain of independent India. The commission suggested gradual abolition of control on food and rationing, and emphasized imports to generate a central buffer to cope with crop failure. The commission also stressed the need to achieve strategic growth in food grain production and developed a plan to increase at least 10 million tonnes per annum till self-sufficiency. Following the recommendations, government eliminated all control on food grains assumed after the Bengal famine and World War II. Food prices soared immediately and government took control again in September 1948. Food grains Procurement Commission of 1950 recommended rationing of food grains in all towns with populations over 50000, informal

rationing in small towns and regulated supply of food grains to rural areas. The commission favored government monopoly in food grain trade, but chose a middle path, equally opposing total governmental control and free reign of market forces. These developments led to creation of PDS in India. The Food grains Inquiry Committee formulated in 1957 mulled creation of food buffer stocks and suggested setting up of food grain stabilization organization to check procurement, logistics and distribution of food grain. Rationing lasted except for the period 1947-48 and during 1954-55. Imports under the US aided PL480 played a key role in Indian food economy from 1957 to 1977. Food Corporation of India was formed in 1965 with an aim of acquiring food grain from domestic sources and overseas, and maintaining them towards serving the PDS. The shift from statutory rationing to a defined public distribution system has been one of progression; from a single source in ration supplies to the dual role of catering to statutory rationing and to counter balance the open market forces.

Effects of PDS in India have been mixed. While its reach in Punjab and Bihar has been limited, Kerala and West Bengal depend on it largely. The essence is to strengthen the market, not complement it. For instance, food is undersupplied in backward areas due to weak trade channels. A market-based allocation would lead to an under supply. In majority of states, less than 22 paisa in each rupee spent went to poor. Despite the revamp, benefits to poor have not increased while subsidy has. PDS is unlikely to improve without radical reform. PDS can be viewed as anti-inflationary and anti-poverty measure. As anti-inflationary measure, it focuses on providing a set of essential inflation proof supplies to people, mitigating the effect of rising prices. Ensuring availability of essential consumption goods at stable, fair and affordable prices, the poor and vulnerable are protected from inflation.

2.7 ORGANIZATION AND WORKING OF PDS

The PDS in India is considered to be the among major policy instrument of the GOI as a safety net program having a crucial role of different state governments to provide not only sufficient and safe food to the poor population of their respective states but also to provide safety net to the poor against the spiraling rise in prices of essential commodities. Tamil Nadu is the first state in India implementing the universal coverage of PDS in the state to set as a role model of central government policy. More than 93 present of distribution channel is governed through cooperative societies in public partnership in the FPS network which is worthwhile for

objective implementation. Further, women SHGs also plays an important role in managing the distribution channel of cooperative to ensure safety, transparency, and accessibility and due to their managerial capabilities reduced the transaction cost in PDS which is again benefited for the BPL. Such role model channel of distribution must also be promoted to other states of country. From literature survey, It is observed that whole supply chain of PDS is to be reformed as there are several issues at distribution level like leakages, inferior quality of food grains, under weighing during distribution, non-availability of subsidized products as per time schedule and also non availability of products during certain periods due to operational and allocation problems, shortage of ration cards, fake cards, etc., which affect the efficiency whole system as managerial prospective. Different researchers suggest various measures to overcome this problem to ensure the availability of required food grains allocation by GOI as per need the FPS consumers as to increased business wages of the FPS owners to provide better services to the cardholders for customer satisfaction, to reduce number of customers to be handled by a FPS for better focus on target group to achieve competency in business, to update communication and information system at FPS level by maintaining and updating the Notice Boards at work places, to check the business practices of FPS through appointments of vigilance committees at different levels and providing more role to women SHGs through cooperative societies to strengthen the PDS which cannot be overlooked. Role of FPS owner is very import as he can be helpful for removing the problem of fake cards, making proper coordination from local administrative channels, supply departments authorities for better implementation of system as per local consumer need. Development of such universal System of distribution will help the poor to provide safety net against variation of market prices of essential commodities.

Till 1960's, PDS was largely dependent on import with almost no internal acquisition of food grain. The Green Revolution and resultant huge cultivation of wheat and rice in several regions of the country made internal food acquisition possible. Wheat acquisition largely happens in North India. In 1980s, only three states as Uttar Pradesh, Haryana, and Punjab accounted for over 98 per cent of the wheat stock of entire GOI. On another hand procurement of rice was relatively more even across the country; Punjab, Andhra Pradesh, and Tamil Nadu were the most important suppliers.

Distribution of food grains was rather uneven across the nation. Average distribution of food grains under PDS during the period 1983-88 was about 21.7 kg per capita per year. In Kerala, per capita distribution stood was highest and at almost three times of this figure while population in states likes Punjab, Uttar Pradesh, Bihar, Haryana, and Madhya Pradesh distribution ratio is very less in comparison of all India average. After Green revolution in country during 1992, total 21.7 million tonnes of grain was distributed under PDS which accounts for nearly 13 per cent of total production of food grains of this year and an average per capita distribution of approximately 25 kg per annum which is a remarkable growth on country agriculture business.

Singh (1972) clearly stated that the Central government has got sufficient powers in relation to the fixation of prices of essential communities under the Essential Commodities Act, 1955. He recommended the extension of fair price and state governments should take fresh measures to strengthen the PDS, for the protection of the vulnerable section of the community

Riessman (1988) argued that after independence; PDS that catered to the poor ought to have got higher priority. Actually, a substantive PDS for rural regions emerged almost two decades after the green revolution of the late 1960s. PDS significantly grew in rural regions in the 1980s due to excess wheat and rice production in areas benefitted by the green revolution. However, the PDS did not provide security to the poor. There were many areas in the India where there is no penetration of PDS. Regions where PDS was present witnessed purchases from PDS account for less than one fifth of food grain consumption of the peoples.

Nag (1988) asserted that PDS sought to make available some minimal quantity of food grain at a subsidized price to segments of the society with lower income, and maintain price stability. The past functioning of the PDS considering the aforementioned aims has been assessed. Further, corrective measures required for the system have been identified. Study objectives include review of performance and aims of PDS, estimation of demand and distribution of food grain in following two years for every state, estimation of gap between demand-supply in the previous period and following few years according to state, assessing significance of PDS in filling gaps, and suggesting a strategic formulation for allocation of food grain from the warehouses of FCI to the state government warehouses for distribution of food grains under PDS. The findings of the study were that PDS in India has been only moderately

successful. Its way of functioning was not found to be in sync with its goals. Wide difference was observed in consumption of wheat, cereal and rice among states and people with different income levels. The anticipated demand in all states was also observed to have increased during the forecast period. Population, income level of family or individual, cost of food grains, total number of members in family and cost of alternative to food were revealed to be major influencers of strategic requirement of food grain under PDS. The gap between demand and supply was found to be widening in majority of states. The government is confronted with the challenge of widening the scope of PDS. Food grain prices were found to be directly linked to the gap between demand and supply. This gap should be reduced to maintain stability in prices over long periods of time and across states. However, increasing the production of food grains seems to be the long term solution. Efforts need to be made so that even poor can have access to food grains via PDS, and they don't resort to buying grains from open market.

Bapna (1990) examined features of PDS. In 1964-65, two institutions were established- the Food Corporation of India (responsible for acquisition, storing and transportation of food grain), and the Agricultural Prices Commission (now Commission on Agricultural Costs and Prices) for advising the government on the policies regarding pricing of agricultural goods. Since the mid 1960's, strategic objectives behind the policy of PDS are mainly as (a) To survive during period of emergency/scarcity; (b) To supply food grains at reasonable subsidized rates to the poor ; and (c) guarantee minimum support prices to farmers for their production. Over time, these goals became mutually conflicting at times.

Suryanarayana (1991) asserted that of the several antipoverty schemes in India, some could be used with modifications as safety nets in the transitory phase. Beneficiary schemes such as PDS could be implemented towards this end. PDS in its present form is a centralized system on a large scale having less organized distribution management especially in rural and tribal regions. A combination of PDS and activities camp to feed population at different level was needed to address the issue of malnutrition.

Gopalan (1992) observed that a rational food policy for India should aim at the twin objectives of increase in production and equitable distribution, in conformity with the recommended National Minimum Nutritional Standard. He also stated that the per capita regional production of food grains and calorie intake are highly co-related.

Sen (1992) addressed that urban regions accounts for only about 20 per cent of population in India which consumed about 68 per cent of food grain distributed through PDS, while about 32 per cent for food grains are distributed in rural areas where 77 per cent of the population accounting and majority of them are living under BPL.

Kabra & Ittyerah (1992) observed various facets of Indian PDS while considering the nation's political economy and food system. He assessed utilization of trade capital and its relation with various processes of state and role of different counter parts in context of continuing agricultural reforms, and development and functioning of food policies of GOI in different aspects, including those arising from inter-state multiplicity. The study showed that self sufficiency in agricultural cultivation and growth remained incomplete in spite of large scale involvements resulting in huge production. He used an unexplored approach to understand its functioning and implications of the macro-level restrictions while underscoring the elements which determined access of the system to poor sections. They illustrated how the objectives of maintaining nutritional levels and stability of prices could be met. Issues that the present policy addresses such as establishing fair price shops for the poor and subsidy provided have been examined in the study. A case study on unutilized primary and secondary resources has been presented which highlighted organizational and administrative issues. On the basis of an attentive analysis of realities, hypothesis, various operative issues and policy and administrative replacements, the interaction of different characteristics of socioeconomic actuality in context of an important and present form of state involvement in the Indian economy of food grains has been highlighted.

Gopalan (1992) assessed PDS from a historical perspective in the state of Kerala considering the demographic and socioeconomic features impacting the entire policy of PDS in India, and observed the functioning of civil supplies department in the state of Kerala. The study aimed at estimating the influence of the supplies department on internal availability of food grains and costing of necessary commodities in the state of Kerala. Steps towards the improvement of state PDS were also suggested.

Venugopal (1992) opined that food security implied access of food grain to every member in every house, especially those in rural areas. It is ironic that though the country produces sufficient food grain, the entire populace doesn't have access to it.

Nilkanth and Kapter (1994) suggested that consumer cooperatives should strengthen consumerism and extent protection to their consumers without entirely depending upon the government for consumer protection.

Foster (1995) saw PDS as basically a social welfare and antipoverty program led by the Government of India. The Indian PDS, with a network of over 4,00,000 Fair Price Shops (FPS), is probably the biggest distribution channel of its kind in the entire world. The system's success is dependent on its capacity to translate macro level self sufficiency to the micro level, by making sure availability of food grains to poor households.

Meyer (1995) stated in his article, 'Open Economy in Consumer Co-operatives' that the development of consumer co-operatives in Japan, Sweden, Thailand, England and Singapore are along with other supermarkets in the private sector because these countries have always been free market economies. He opined that the small consumer co-operative stores working in India function with the financial help of states and so they cannot follow the principles of co-operation. The existence of these co-operatives will be a problem unless they grow or amalgamate with the leading consumer stores in the neighborhood. Suryanarayanm (1994) evaluated the trends in PDS off-take, consumption of food grains and variance in the degree of calorie intake in Kerala during some selected period. He found that inadequate access and inferior quality of the rice distributed through the PDS are the two major reasons for the inadequate utilization of the system.

Vidyasagar (1996) analyzed how PDS ensured food security in the state of Rajasthan by examining its spread, efficacy and effectiveness in targeting the tribal and rural poor population. Surveys on household's consumption of four districts having distinguished typologies of the PDS- agro climatic environment interface were carried out. The study found that the policy of food security gave price advantages by reinforcing the market infrastructure.

Tuma (1998) opined that PDS was a result of social responsibility of GOI for the growth of the country agricultural sector wherein which management of food grains played a vital role. However, several shortcomings of the system were also revealed. Despite increased average access, widespread under nutrition still prevailed.

Ravichandran and Padmanaban (1998) studied that PDS was implemented to end customer through distribution channel of FPS, ration shops and co-operative societies. Co-

operatives societies were the pillars of the distribution channels of PDS and help to decrease costing of essential goods distributed under PDS. The major objectives of such societies are: exclusion of mediators, checking malpractices such as adulteration and maintaining purity, maintenance of quality and quantity. It was observed that in Tamil Nadu, about four thousands primary co-operatives are working to cater PDS in the state at primary level. The major objectives of these societies are to maintained timely supply of food commodities to the consumer with proper quality and quantity for value for money.

Pagan & Ullah (1999) observed that there is a significant relation between per-capita production of food grains and per-capita calorie intake of food grains, but the influence of income on this factor is found to be significant. He believes that a huge number of our population has insufficient income to consume food grains at levels mentioned for getting sufficient calorie. Therefore, he suggested that the present Public distribution system has to be revised so as to ensure the supply of food grains to all.

Mooij (1999) argued that even after almost sixty years since its inception, the PDS was still a debate and policy matter. It has been interpreted and viewed by various actors in various ways, and in different contexts, due to which opposing measures and practices also have been introduced. For example, while the system has been portrayed as ineffectual and costly, it has also been seen as a net of safety that protects the poor in tough times.. Since 1991, PDS prices have risen on numerous occasions to cut down government subsidies. Also, several state politicians proposed expansion of the PDS and assigned huge sums of money for it. These are some examples of the many problems associated with the current PDS.

Dev & Suryanarayana (1999) observed the development of PDS policies as well as the organizational structure and operational facets of PDS such as procurement, warehousing and distribution of important cereals. The functioning of PDS was assessed on end customer image and perception as basis. Public participation in the system was also observed. The methodology used served as a system model for future research in the field. To study and determine the crucial objectives for the policy of PDS factual data was examined in context of district Konda of the Telungana region of Andhra Pradesh.

Swaminathan (2000) analysed PDS in context of current scenario of liberalization, structural adjustment and related weakening of welfare systems etc. The study established

poverty and food insecurity among the country population on a large scale, and claimed PDS a failure in various parts of the country. Objectives of the study included examining if decrease in food grains intake in rural India was in fact an algebraic artifact; understanding the nature of change in food compositions, and its implications on hunger. The study particularly stressed on substitution between major food grains and other local foods, and substitution among major food grains as rice and wheat.

Nair (2000) observed the influence of reduction in food subsidy and increased prices of food grain as part of reforms on food security. The survey was conducted in four villages in the state of Kerala under the GOI policy of reforms on subsidy. It was observed that per capita intake of food grains did not represents any major methodical differences across landholding categories of population. They seemed to increase with increased per capita expenditure. In rural areas having no production of rice, the dependence for the purchase of rice from local market is very high. The ration of PDS purchase increased with expenditure. It was found that PDS support the well off and not the poor. Important suggestions were observed as to improving the quality of PDS food grain, review of FPS brokerage to curb diversion of food grains in open market, and identifying the BPL population through appropriate authorities at village level which are actually needy for subsidized food and excluding the population which are not dependent on PDS subsidized goods or target the group as per need.

Bhargava (2001) analyzed that food prices increased at considerably lower rates in the 1970s and 1980s as compared to increase in per capita incomes. It is noteworthy that the increased access can't be the result of food policy alone.

Gohara (2001) explained that the Indian PDS came into existence because of the droughts and food scarcity during the British rule in India. Food Grains Procurement Commission 1950 recommended rationing in all towns having populations over fifty thousand, and casual rationing of food grains in all other small towns and regulated supply of food grain to rural and tribal areas. In response to these recommendations, the Government of India initiated a PDS in the nation.

Dre'ze (2001) revealed the shortcomings of the PDS and pointed out that the system functions in a very lethargic manner and the private sector takes the fruits of this weakness. This can be eradicated by proper reorganization of PDS through a thorough monitoring process.

Kannan & Narwade (2002) studied food security with respect to food availability and self sufficiency in agriculture production. It was revealed that through a pro-poor public policy regime, Kerala witnessed considerable food security. Kerala would have to decide to either continue with greater PDS coverage with subsidies, or limit PDS only to the poor.

Bhatiya & Jean (2002) has pointed out in his study that consumer cooperatives had not been able to achieve their main objectives so far as the 'Price Setter' in the market by holding the price line. They had been suffering from many structural, operational and administrative weaknesses. Unattractive prices, inadequate stock of fast moving goods, poor salesmanship and absence effective sales promotion are some of the factors that contributed to their steep decline. There is a vast scope for the consumers' co- operatives, provided they are organized on sound lines and better economic footing with active assistance from the government.

Chan & Qi (2003) stated that essential commodities such as food grains and pulses supplied through the public distribution system are of low quality due to deterioration during storage and due to infestation. Careless handling, and outdated storage facilities are also other major causes for low quality.

Greene (2003) observed that a key difference between India and East Asian adjustment experience was decrease in food security sensed by majority of workers. There were strategies considered to decrease consumer subsidy on food grain through PDS. However, the subsidy was low by East Asian standards. In most states in India, the amount of subsidy provided through PDS stood at less than wages of one to two persons per day per family per month. As per his analysis to continue the subsidy on PDS to the economical weaker section of poor population must be continued to provide food security in country.

Bhalotra (2004) in his study` The Role of Consumer Co-operatives in Public Distribution System' found that the consumer co-operatives have a great role in the eradication of exploitation and adulteration .He strongly opined that consumer co-operative societies are able to provide remedies against higher pricing and other malpractices. They can provide commodities at fair prices maintaining purity, better quality, pure weight, etc.

Majumder & Narwade (2004) examined the degree to which PDS ensured access of important goods to poor people. Food poverty was considered basis for determining whether PDS helped the target citizens. Public Distribution System can be viewed as a social safety net

in the sense that total food grain available in the country doesn't necessary mean capability to procure cereals. Requirements and Production does not automatically guarantee each other. A presence of food doesn't make a person entitled to consume it. Buying capacity also does not ensure food security in the absence of an effective distribution system. Literature pertaining to the colonial rule in India establishes, "the major famines and scarcities occurred during a period when India was a food surplus country and was in fact exporting large quantities of food grains". Also, at least at the national level, famines in British India "were not precipitated by absolute shortages of food caused by uncontrollable vagaries of nature". An individual correlation between per capita distribution of food and requirement of a section of population in terms of food requirement has not been established. According to National Sample Survey Organization (NSSO], during 1972-73 and 1993-94, per capita requirement of food grains decreased from 15.3 kg. to 13.4 kg per month. During the period of 1993-94, a constant shortfall in cereals share from 73 per cent to 55 per cent at the all-India level observed.

Amit et al. (2005) explained in his study on `Impact of Targeted Public Distribution System among Rural Below Poverty Line Group, Kerala ' PDS as an instrument of the 'Food Management Policy' of the government under the Essential Commodities Act, specially to the weaker sections of the society. Well targeted and properly functioning PDS is an important constituent of the strategy for poverty alleviation.

Indrakant (2005) advocated use of food coupons once in two years to counter inefficiencies of the present PDS and examined if a sudden price rise of rice distributed through Indian PDS in Andhra Pradesh, negatively impacted child nutrition. Results brought the ability of the PDS to provide food security to poor households in doubt.

Priyesh et al. (2006) suggested in his thesis that it is not necessary to extent subsidization of food grains to all people and the government should revamp the traditional functions of our Public Distribution System. He also recommended that a government controlled system should be started to deal with frequent fluctuations in the price of essential commodities.

Carpenter & Moor (2006) stated in their study ' location of hyper store as per customer convenience, quality of store and SKU level of products in the store in the US grocery market industry' that the grocery industry is critically operated by price competitiveness, product

selection, assortment and the diplomacy of personnel. While determining the SKU level of the stores, hygiene atmosphere is the most important factor of consumer choice, regardless of the size and presentation. Again, price level and distance from the residence of buyers also are other determining drivers for the store choice.

Gentiline (2007) observed the importance of consumer co-operatives in the national economy and found that consumer co-operatives have emerged as very strong organizations in the distributive trade. Co-operative trade in India not only distributes essential commodities but also provides all other consumer goods at reasonable price.

Dhanasekara and Tamilmani (2007) observed that consumer cooperatives which have been doing yeoman service to the public by providing them quality consumer goods and services at competitive prices, are witnessing a difficult situation. The complexity of the situation has grown further at an alarming level especially in the post liberalized period, as it is marked by the arrival of new players and their strategies in the retail trade.

Swaminathan (2008) asserted that while making efforts towards "efficiency" through narrow targeting, families eligible to basic food security through PDS were excluded. In the present situation, the working of PDS is based on data in the record and poor families having no BPL certification or Antyodaya card is effectively excluded from the consumer channel of PDS. In the state of Kerala alone during period of policy of universal PDS about 70 percent of families were not targeted under PDS. Large number of scheduled tribe's families excluded by the benefitted of PDS. As reports indicates that as an estimation families of schedule tribes about 90 percent Assam, 79 percent in Arunachal Pradesh and 68 percent in the state of Chhattisgarh were excluded from the system of PDS due to poor policy of targeting. Situation in North Eastern states were also critical. Andhra Pradesh, Gujarat, Orissa and Maharashtra were the only four states of the India where more than 50 percent of rural scheduled tribe families are targeted well and hold the benefits of PDS as BPL families.

Reardon & Gulati (2008) revealed that retailing environment grew considerably with emergence of big market players and larger store size. Food and beverages segment comprised over 70 percent of the retail pie. Food and grocery accounted for nearly 60 per cent. Organized retailing stood at less than 10 per cent of food retailing in India. Organized retailing in the food sector may grow to 15-20 per cent provided the current expansion trends remain.

Thulseedharan Nair (2008) described the PDS as a retailing network that entitles population of the country to specified quantities of selected cereals at a special subsidized price. The objectives of the Public Distribution System are maintaining stability of price in open market, rationing of food grains at the times of scarcity, social welfare of the BPL families, and keeping a check on illegal trade of food grains in open market.

Monapatra (2010) studied food retailing and indicated that an efficient system of marketing food items would aim at balancing conflicting interests such as consumers preferring to get their required quantities of food in pure quality at the least possible cost and middlemen aiming at realizing the maximum possible profits from the deal. Therefore, quality and price are the most important elements in the food retailing.

Nikola et al. (2010) explained in their article named `Practical Utopians; Rockdale Consumer Cooperatives in Australia and New Zealand' that Rockdale consumer cooperatives have played an integral role in the lives of many people in Australia and New Zealand in mining areas, rural regions and in metropolitan and suburban areas. In the years prior to Second World War, both the countries showed waves of interest in consumer cooperatives. In the post second world war period the survival of many of these cooperatives was not secure. As a result in the rise of chain supermarkets and shopping centers many of these cooperatives became incompetent and fell in to permanent decline.

Pal (2011) assessed the PDS and employment generation and poverty mitigation programs and concluded that such schemes contributed towards price control and poverty reduction. Public expenditure (subsidy) forms an important element of the PDS. The system is seen as a safety net that protects the interest of BPL families poor from price fluctuations in open market at short intervals which induced negative effects of economic reforms. It remains to be seen to what extent this perception is correct.

Nagavarapu & Sekhri (2011) carried out a study, to evaluate the working of civil supplies department in the state of Kerala which is responsible for monitoring on PDS in the state. The focus of the study was to evaluate the activities of the corporation and ascertained its role in PDS, Kerala. It revealed that while the corporation played a key role in the Kerala PDS, consumer satisfaction remained low. Ninety two per cent of the customers interviewed felt that supply corporation was successful in providing commodities at low prices.

Farahnaz et al. (2011) suggested that with the increase in education and civilized urbanization, huge populations transfer from lower social-economic classifications to higher socio –economic classifications. The consuming class predominantly comprises socio-economic classifications A&B and represents around 105 million people in 22 million families of urban population in India.

Prakash (2011) studied the Indian PDS as a safety net that comprised Food Corporation of India (FCI) warehouses and fair price shops (FPS), and protected the poor.. The study revealed many shortcomings like inefficiency, poor quality of goods, insufficient grains, malpractices in weighing and measuring, mismatch between supply and demand, long waiting times, rampant corruption, rude behavior of shopkeepers and poor service delivery. The study is sought to understand the structure, execution and monitoring of PDS supply chain procedures. Such an understanding would help in restructuring the PDS process, and initiating IT based interventions, ensuring flow of food items and similar goods, and making policy suggestions. The methodology used was a combination of literature review, analysis of documents such as government gazettes, interviews with policy makers in the government, officials of FCI, fair price shop owners, private retailers and survey of end users through a schedule. A hybrid approach was suggested to retain the present PDS supply chain while at the same time introducing appropriate process redesigns, initiating ICT based interventions and engagement of private players in service delivery. High leakages in PDS also raised questions. "If one has to pour more grains under NFSA in this TPDS, it is important to fix it first or better still- finds an alternative mechanism that can help the poor more and plug these large leakages".

Kumara and Mohant (2012) argued that the Indian public distribution system as a system built by the government to ascertain food security and other essential supplies to the rural poor was unsuccessful in protecting interests of the poor. This failure can be attributed to a corrupt system. The present study concentrates on the level of this corruption at the micro level, the implications it has, and gives directions towards restoration. Consumer clubs have been formed in rural schools to reinforce PDS and provide food security. Corruption is rampant in PDS in rural India. A few reasons are political influence behind appointments and fewer margins to traders. Consumer clubs suffer from lack of finances. These clubs can significantly participate in informing rural customers about PDS and ascertaining their welfare and food

security. Karami et al. (2012) stated that the poor also bought food grain from the open market, and efforts were required to stabilize consumption levels of the poor.

Mahajan (2012) observed that at regional level some features like religion and caste influence the concept of food security. Hence it become necessary to take consideration of such influences on regional basis as such events critically affects the SC of PDS to ensure food security among population especially for part of BPL families as effect will be more on such sector. On the basis of analysis of regional variation of socio economic features polices must be flexible enough to face regional variation especially within the rural to provide food for all against a 'one size fits all' general policy of the central government. Study also indicates that socio-economic features and different camps of social assistance had various impacts on calorie gap depending on one's nutritional status. Most of the literature on food security missed this straightforward relationship and becomes a strategic question for policy makers to be considered for fare implication of policy. The results of the factual studies for rural India analyzed and it has been observed the factors having influence on poverty and responsible for same are not necessarily affect on the calorie gap although poverty and food security are somehow interlinked. Factual studies also indicated that food security programs like Manrega (Food against work) and PDS have limited success in eroding food security. On the basis of such facts it becomes a question of critical rethink of the strategies for effective targeting of the food insecure population for poverty alleviation. On the basis of various discussion and conferences at the level of GOI and different researches (GOI, 2010; Mehrotra and Mandar, 2009) it has been resulted that on the basis of a suitable poverty line hunger can not be completely removed in the country.

Kumara and Mohant (2012) said that Indian PDS sought to make sure security of food and associated essential goods to the rural poor, but failed to do so. The failure can be attributed to a corrupt system. According to Kishore and Chakrabarti (2015) targeted public distribution system (TPDS) of India as world's largest food safety-net program having a reputation for poor targeting, rampant corruption and low impact. Five states of India modified TPDS by reducing targeting, lowering grain prices to Rs.1–3 per kg and tightening its administration. This paper assesses the impact of changes in the TPDS on household food consumption using data from a repeated cross-section of Indian households from five rounds of representative consumption surveys between 1993–1994 and 2009–2010. We use the Difference-in-Difference (DID)

method to identify the policy impact, first on consumption of food-grains, and second, on food expenditure. We find that modifications in TPDS led not only to an increase in the purchase of subsidized grains from fair-price shops, but also to diversification of the food basket of poor households. We also find evidence for reduction in the diversion of grains from TPDS to the open market in reform states. Finally, we present suggestive evidence that a food policy reform is likely to fail if price and targeting policy components are not accompanied by effective administrative measures to reduce corruption and improve the logistics of subsidized food distribution. These are important findings for India's own National Food Security Act (NFSA) and for other food safety-net programs throughout the developing world.

Arora (2013) argued that consumer cooperatives being value based enterprises with a unique blend of economic and social responsibilities is a preferred option in the supply of consumer goods at low prices without private interest. Consumer cooperatives are worldwide models for common stands against private exploitation.

Dreze and Sen (2013) found food price stability in India quite impressive. As an example, even during the 1987-88 droughts which resulted in significant decrease in food cultivation, fluctuation in prices of food grain upward by less than 10 per cent. This could be attributed to the supply of food grains through the PDS, as storage depots of FCI holds huge food grain stocks before the drought hit the country. PDS contributed towards increased physical and economic access to food also. Due to policy reforms of GOI there is an increase in per capita per day food grain availability from 1951 to 1980s as 400 grams to 450 grams.

Mishra (2013) observed several economic aspects of PDS of food grain in Orissa, including its logic and functioning, norms of buffer stock and responsibility of FCI, acquisition problems, etc., required in formulation of appropriate strategy of functioning of PDS. He presented a major description of different steps taken in the state of Orissa for equitable supply of cereals from the period of the Second World War to the 1980s. Key problems identified in the study included insufficient food grain supply, irregular distribution of food grains among various income groups, fluctuation in prices of food grains and irregular operations of FPS in tribal and rural areas, among others. The study suggested enabling the poor to buy the food grain supplied via PDS, universal coverage, reinforcing FCI, establishing Civil Supplies monitoring agencies in the state, raising farmer's price, strengthening regulations for effectual

acquisition, plugging gaps along borders to stop illegal trading of rice etc. The study further revealed that lower income groups consumed less rice as compared to higher income groups.

Tiwari (2013) argued that distribution of goods and services was of great significance in improving living standards of people,. Retail trade and PDS are vital factors which should not be neglected in the best interests of society. The current PDS does not possess efficacy, coverage and capability to fulfill the needs of the public at fair prices – elements essential for a public distribution system.

Sinha (2013) has given in his articles 'Co-operative Reliable and Socially Motivated Machinery for Handling Distributive Trade' that cooperation has the responsibility to make PDS successful, especially in the present situation. Co-operative societies have a great responsibility in protecting consumers and safeguarding the interests of producers. He suggested the government to try to get more and more involvement of cooperation in the Public distribution System.

Banerjee et al. (2014) studied nearly every facet of food grain acquisition and distribution in PDS. They asserted that inherent inefficiency and irregularity hindered in gaining food security while greater coverage of the scheme affected budget. Bangladesh in contrast, runs a food grain distribution system that is highly poor oriented.

Banerjee (2014) asserted that insufficient domestic food grain production in the past, food grain imports from other countries (prior to the green revolution), low purchasing power, geographical discontinuity and variability in supply and demand of food grains in the country warranted extra efforts by the central and state governments to establish a food security net. Studies reveal that merely 56 per cent to 58.5 per cent of total food subsidy (i.e. Centre and State) reaches PDS consumers (Planning Commission 2002-07).

Chauhan *et al. (*2014) proposed a similar approach in LBSNAA, Mussorrie. Studies have given evidence that conditional cash transfer schemes have been successful globally. Examples are Brazil (Higgins, 2012), Mexico (Rawlings and Rubio, 2005; Behrman and Hoddinott, 2005), among others. The income policy (direct cash transfers) is believed to be able to plug leakage of grain by linking cash transfer to UID under Aadhaar, decrease efficiency losses through less trade/market distorting and reducing 'rent seeking' by intermediaries in the grain-chain.

Gandhi and Zhou (2014) said that China and India, with their large populace (37% of the world total), witnessed high economic growth rates of 7 to 12% in the last two decades which resulted in considerable changes in food buying and consumption patterns They examined change in demand of food in the two nations and implications for food security scheme. Data from consumer surveys by the Government of India covering nearly 100,000 households were used. Similar data were used for China. Results indicated that food demand underwent, and would undergo, significant change.

Sinha (2014) developed a structure to increase the agriculture production in India with the use of nanotechnology. To develop a methodology using techniques of nanotechnology some primary factors are identified which have direct primary impact on food security in country as type of soil, chemistry of water, agricultural productivity, and quality of food in warehousing and distribution network. The structure is designed in two stages: (i) correlation of nanotechnology with entire agriculture supply chain and (ii) from the different critical factors affecting to determine food security. With the help of literature review already published and primary data from different sources, a model was developed on the basis of research by the use of nanotechnology to the agricultural and food related areas and determination of food security is developed through a specific designed database. The developed model describes identification and sequences of various factors to be consider as per priority for the applications nanotechnology to increase self-sufficiency in food security. If we compare this latest growing field of technology with other technology of green revolutions and biotechnology uses in agriculture field, nanotechnology seems to be a greater and rapid effect of on all component of the agricultural supply chain having synchronous with social, environmental, lawful, and ethical implications. In the present technology based scenario it's becomes need of the society to buildup capacity for the development of an nanotechnology based infrastructure in agriculture value chain for agriculture growth in India to achieve food security for society.

Gulati and Sainin (2015) said that PDS has been a important policy frame work of the GOI in providing food security to its citizens, particularly the vulnerable. The recent National Food Security Act (NFSA), 2013, also depends on it to deliver more grain at largely subsidized prices to nearly 67 percent of the populace. However, the current PDS is inefficient and has

leaks resulting in huge amounts of grain (40 to 50 percent) pilfered and redirected to open market. The study revealed that at an all-India level, 46.7 % of the total lifted food grain under PDS did not reach poor beneficiaries in 2011-12 and diverted to open market for black marketing. Bihar, UP, MP, West Bengal and Maharashtra are the major states having 60% of the total country poor population where leakage of food grains was more and accounted to be about 50% of the leakage of total allotted food grain leakage in the year 2011-12).

Singh et al. (2015) asserted that the PDS had since been criticized for inefficiency, poor quality of grain, lack of transparency and coverage, and leaks causing considerable loss to the nation. A chief reason behind the leakages does the price differential exist between market prices of grain and the rates at which grains were sold through PDS. The paper proposes a novel approach towards PDS considering technology and process change to address the problematic issues in the system. It suggests changes in how grain is delivered to Fair Price Shops (FPS) and eligible individuals. The suggested model seeks to develop a system that aims at effective delivery of advantages to the needy, and without leaks. The paper further considers that it is more important to provide the needy with nutritious meals at reasonable prices. To this end, the study suggests that PDS deliver greater number of nutritious foods to the poor of the nation. PDS could also be used as instrument to control food prices. Gulati and Jain (2011) provided evidence for a common "V-factor" taken from principal components of a panel of Indian output per capita series disaggregated by state and sector, that appears to capture well a systematic and pervasive shift in growth rates during the 1980s. V-factor is more relevant to the history of Indian policy reform than previous studies, such as those by Rodrik and Subramanian (2005), that have dated the turnaround to the beginning of the 1980s or even earlier. Their results emphasized trade liberalization and asserted that state capability to avail of the opportunities provided by policy reforms was enhanced through education and transport links, and impeded by size of the agricultural sector. It could not be established that public sector output or development spending affected a turnaround. However, there was some evidence that suggested that sectors with significant government intervention (most notably in registered manufacturing) participated less in the turnaround.

Masiero (2015) try to develop a relation between e-governance and use of its applications in food security for policy formulation prospective. Although in India, by the use of modern e-governance application competencies are achieved at various level but in value

chain of food security penetration of modern IT tools is negligible. Researcher tries to develop a model based on PDS supply chain strategy in the state of Kerala, where the entire supply chain of PDS has been digitalized and make a check on diversion of food grains from FPS however, some issues of targeting correct beneficiary and partial coverage are still remaining. By the success of Kerala model of e-governance in PDS supply chain, many other state governments are also analyzing the concept of IT in PDS for their social safety nets. With the use of e-governance core issues of the various problems can be identified easily to build up a coherent strategy strategic planning for the same.

According to Wilson (2015) Trinidad and Tobago is contributing to climate change by maintaining a model for food security that is based on corporate controls over food and agriculture. With policy documents, media sources, and ethnographic data, he argue that Trinidad and Tobago's food system is connected to national and transnational markets that firmly affix the country's food system to the fossil fuel economy. Three examples are provided. The first is the adoption of the World Bank's 'value chain' model for agriculture, which favors larger, economically (rather than ecologically) efficient farmers. The second is the recent state-led campaign to 'put T&T on your table', which overlooks the political prioritization of industrial food imports exemplified by current policies to eliminate VAT (Value Added Tax) on industrial food imports. The final example is the November 2013 Memorandum of Understanding between Trinidad and Tobago and Guyana, under which Guyanese lands are being converted for the industrial production of corn, soya, and other crops for final processing and consumption in Trinidad and Tobago. While such policies are justified under the label of national and regional food security, he argue that they perpetuate a Caribbean-style corporate food regime that counteracts more climate-sensitive efforts to create sustainable producer and consumer networks. There is also an increasing trend in consumption of other food items like fruits, vegetables and animal products etc. is observed among various consumers and the intake of other food grains requirements are reducing. Both in rural and urban areas the demand of these food grains supplements increases, In India as people preferred vegetarian diets, hence consumption of dairy products increases with a high rapid growth while consumption of other products meat, vegetables and eggs is also growing rapidly.

Kaul (2015) targeted public distribution system (TPDS) of India as world's largest food safety-net program which has a reputation for poor targeting, rampant corruption and low

impact. Five states of India modified TPDS by reducing targeting, lowering grain prices to Rs.1–3 per kg and tightening its administration. This paper assesses the impact of changes in the TPDS on household food consumption using data from a repeated cross-section of Indian households from five rounds of representative consumption surveys between 1993–1994 and 2009–2010. We use the Difference-in-Difference (DID) method to identify the policy impact, first on consumption of food-grains, and second, on food expenditure. We find that modifications in TPDS led not only to an increase in the purchase of subsidized grains from fair-price shops, but also to diversification of the food basket of poor households. We also find evidence for reduction in the diversion of grains from TPDS to the open market in reform states. Finally, we present suggestive evidence that a food policy reform is likely to fail if price and targeting policy components are not accompanied by effective administrative measures to reduce corruption and improve the logistics of subsidized food distribution. These are important findings for India's own National Food Security Act (NFSA) and for other food safety-net programs throughout the developing world.

2.8 CONCLUSION

There is no doubt and it is a matter of proud that India is the leading producers of rice, wheat, fresh fruits and vegetables in the world. But it is very painful to realize that most of the agricultural production doesn't reach the end consumer and a result of which about 21% of our population is malnourished. One of the main causes for this is the inefficient supply chain management in the agricultural business and majority of the SC is in the hand of semi-organized sector and there is a need of the sector to develop strategic implementation to get more organized in a professional approach. It is the time to focus on the gaps in the supply chain management and bridge them by means of improving the infrastructure and logistics facilities. In the years to come, the channel partners in agribusiness will have to strategically improve their presence in the market and improve efficiency to meet increasingly high quality, consistency, and safety standards to meet the international standards and food laws to cater the demands of export markets. These challenges will require remarkable changes in the SC design and operation of the entire business at micro level that will help the food from the 'farm to fork.' This will consequently raise new possibilities at managerial level for meeting the specific demands for various possible users as food processing units, feed companies, exporters, retail chains, and finally end consumers. Government policies and rule regulation also plays a

strategic role having a significant effect on food supply channels as food is an essential item and every citizen is a consumer and some of them are also producers. Agribusiness required a need to develop a wide and thorough SC perspective having a focus on building skills and knowledge required for meeting the challenges of modern food supply chain management to fulfill the need of food security in India and to make India the food basket of the world.

2.9 GAPS IDENTIFIED FROM LITERATURE

PDS is identified to be the main safety net policy of GOI to secure the poor population of country through food security (Mooij. 1994). The question of interest is: to what extent is PDS serving the objective expected from it? And at what cost? Most of the studies on the PDS in India have major focus on the issues bearing on regional variation in the supply of food grain through PDS, urban bias in PDS (Dutta & Ramaswami, 2001), targeting of PDS (Jha, 1991), the growing cost of food subsidy in PDS etc. There are studies measuring the welfare gain from PDS (Parikh, 1994). Most of the studies in area of PDS deal with welfare of society. Some studies focus on nutritional level of the targeted population. But no study examined and recommended policy solution for efficiency and effectiveness of distribution to achieve objectives of PDS. Use of technology based scheme will help in improving and examining the different aspects related to PDS as well as better coordination and communication between different channels of the policy.

Also from the analysis of Evaluation Reports of Planning Commission on Food Distribution it has been observed that there are leakages in whole Supply Chain Network of PDS and there is abundant scope to reform the network in order to minimize the leakages to make the policy more effective.

On the basis of the literature review Table 2.4 & 2.5 summarizes the significant contribution of the research and gap identified. Table 2.4 is based on findings of individual researchers while table 2.5 presents findings of reports undertaken by different governmental agencies. Innovations and studies are critical requirements of the market for better implementation and timely evaluation and reform of the policies.

Table 2.4: Table of Gaps Identified from Literature Review

S. No.	Title	Author	Journal/Year	Objective	Result/findings	Gaps
1	Public Distribution System, Food Subsidy and Production Incentives	George, P.S.	Economic and Political Weekly 1996	To reviews aspects of operation of PDS	To achieve objective of PDS specific group of vulnerable segments of the population is to be targeted.	Need to study how targeted segment is to be defined & mechanism to serve the Target Group.
2	The Indian Public Distribution System as Provider of Food security: Evidence from child Anthropometry in Andhra Pradesh	Tarozzi, A.	Priceton and SSRC follows conference 2002	To Study the effect of upward trends in retail price of Rice distributed under PDS on Child weight.	Instant downfall in amount of subsidy offered under PDS had detectable negative effect on children weight.	Need to examine the scope, philosophy and usage of PDS & to measure effectiveness of PDS.

3	The Management of Public Distribution system in India- A dynamic Perspective (The Case of Tamil Nadu)	Jacob, F. P.	System Dynamic Conference 1992	To evaluate the entire working of policy intervention in PDS to ensure the achievement of objective of PDS.	Based on agriculture sector, market structure and support services, The system dynamic model of PDS can be improved.	The study is confined to the state of Tamil Nadu only. It is likely to be enlarging as a national growth model for PDS.
4	Food Security and the Targeted PublicDistribution System in India	Kattumuri, R.	Asia Research Centre Working Paper 38/2011	To evaluate the TPDS of India to ensure the food security for the poor people of India in light of global food hunger index.	The need to improve implementation of TPDS is acknowledge. On the basis is of intervention of Technology in policy, operation of strategy will improve having better monitoring as well as communication and co-ordination between different channels of the system.	The study is confined to the policies and system of PDS but how system can be improved having better distribution network in not touched or How the whole supply chain system of PDS can be strengthen to meet out the objectives.

5	The Percolation of Public Expenditure: Food Subsidies and the Poor in India and the Philippines	Jha, S. and Ramaswami, B.	India Policy Forum 2011	To measures the percolation of food subsidy expenditures to the population under poverty line in India and the Philippines.	The major finding is that neither country scores well on the percolation index. Participation rates are low and households, whether poor or not, do not receive most of the expenditures of the food subsidy	The study is confined to the expenditure of both countries on food subsidy but Targeting effectiveness of policies of both countries are not focused.
6	Consumer Subsidies in India: Is Targeting Effective?	Jha, S.	Wiley on line library Development and Change/2008	To analyse the effectiveness of self-targeting in the PDS in India.	To study the effectiveness of implicit targeting of the s distribution of essential goods, at subsidized price it required to target the non-targeted population to be benefited as a part of the subsidized product due to wrong targeting of population.	The study is confined only to the population targeting for PDS benefits, other issues like distribution channel, policy strategy and implementation are not touched.

7	Food for Education Improves Girls' Education:The Pakistan Girls' Education Programme	Touseef, A., Rashida, A., Francisco, E., Aulo, G. and Ute M.	World Food Programme 2007	To study the effect of Food for Education (FFE) programmes in Pakistan on Girls education.	As a results Food for Education programme (FFE) in Pakistan for the welfare of girls education and under the project meals and snakes are provided in schools with a facility to take food at home As a result of implementation of scheme there is positive effect on girls education and productivity at national level.	The study is confined only to the effect of PDS in Food For Education programmes in Pakistan only. The effectiveness of PDS on other area of targeting is not measured.
8	Role and Effectiveness of Public Distribution System in Assuring Food Security in India: An Appraisal	Ray, S. and Ray, A.I.	Journal of Economics and Sustainable Development Vol.2, No.4/ 2011	To identify the population which in under food insecurity in India and To study the availability, procurement, storage, and distribution of food	The population targeted under PDS has led to the large-scale exclusion of competent person living below poverty line. Visibility of FPS is poor. Economic viability of theses shops must be re-evaluated for better targeting of the policy	The study is confined to leakages & diversion of items distributed through PDS. Measure to make better supply chain management of the policy is not considered.

				grain to analyse the effectiveness of PDS in the country.		
9	The case of food subsidies in India	Bhalotra, B.	World Institute for Development of Economic Research/2002	To analyse the effects of the food subsidy offered under PDS on child malnutrition in India.	Expenditure on Food subsidy y has a significant impact on health of children, either measured as height or weight. PDS has a significantly positive effect on nutrition values of childhood although the size of this effect is small.	The discussion is focused only on impact of food subsidy through PDS on child health. No other issues related to efficiency of PDS are considered.
10	The Public Distribution System in India: Counting the poor from making the poor count.	Tritah, A.	World Bank Economic Development Research Group/2003	The major objective behind research is to map the effect of food subsidies on food security and poverty in India.	Major finding of research are that while the PDS has a poor r visibility in the society and targeting the poor is very low and out of reach for the population in rural and tribal areas. Due to this error role of	The research is mainly focused on a new poverty measure, integrating the food content of poverty lines and shows that relative to this poverty line PDS has benefited the poor, but focus on improving the

					subsidy utilization is not strategically and targeted population is not benefited as per policy intervention.	distribution channel of PDS is missing to enhance the productivity of PDS.
11	The Public Distribution Systems of Food grains and Implications for Food Security: Comparison of the Experiences of India and China.	Zhou, Z.Y. and Wan, G.	World Institute for Development of Economic research Paper No.98/2006	A comparative study of the distribution network of subsidized food grains in India and China to identified outcomes and experiences that are valuable for the implementation in policy reforms.	To evaluate the experiences of the two countries to address r that when a country's income level improves, PDS operations need to be modified to make it more flexible and better targeted. Pilot programmes to reduce PDS operation or to switch to direct income transfers could be considered in regions or states where conditions permit.	The research is mainly focused on the comparison of the benefits of the distribution network of both the countries but focus on the policy management of both countries are missing especially how cost effective measures can countract with poverty.

Table 2.5 Key Finding from Government Reports

S. no.	Source	Topic	Key findings of the Reports
1	Planning Commission (1985)	Evaluation Report on Essential Supplies Programme	The beneficiaries and the fair price shopkeepers faced four major difficulties, like irregular availability of the commodities, inadequate supplies, and poor quality and under-weigh supplies.
2	Planning Commission (2005)	Performance Evaluation of Targeted Public Distribution System	Analysis of the system of PDS found that approximately 58 present of the subsidized food grains issued from the central government are diverted in the way and do not reach the BPL families because of identification errors, non transparent operation and unethical practices in the implementation of TPDS. There is a lack of coordination between the various channel partners of the policy (such as the government officers, FCI, the wholesale dealers and FPS) to divert a large part of the subsidized grains from the supply chain of PDS.
3	Department of Food and Public Distribution	Annual Report (2010-11)	To minimise leakages in PDS distribution channels piloting of new technologies for tracking movement of vehicles transporting TPDS commodities.
4	Planning Commission (2001)	Excess Food Stocks, PDS and Procurement Policy	In order to ensure better targeting of the food subsidy major reforms are required in the pattern of marketing of food grains in the country. The concept of having fair price shops over the length and breadth of the country needs to be re-examined.

5	Planning Commission (2004)	A Study on the Effectiveness of Public Distribution System in Rural Tamilnadu.	The role of FPS cannot be restricted with the distribution of rationed articles alone, both in the context of viability of the FPS business as well as safeguarding the poor against spiralling rice of essential commodities. Hence, FPS should also concentrate on non-subsidized goods in order to be be competitive enough in attracting the consumers.

2.10 RESEARCH QUESTION

Over the period of time, the functioning of the PDS in India has suffered due to insufficient management and lack of proper targeting of BPL families to manage the concept of food security (Srinivas & Thaha, 2004). The misuse of resources and improper management of the PDS was universal and become well known among societies (Radhakrishna, 1997). The need to improve better implementation of PDS is generally acknowledged. Due to these gaps it has become clear that there is an abundant scope for research in this field and especially to study the whole supply chain management system of the PDS to make the scheme more effective & efficient to fulfill the objective. This research aims to fill this gap.

The major objective of the research is to find out how scheme of PDS serves the poor people of country to fulfill their requirement of nutritious food for their daily requirement in an effective and efficient way. The major objective of research is examined the scope, philosophy, usage of PDS and supply chain strategy while identifying various barriers and enablers in achieving the objectives of PDS also suggest certain improvement to increase effectiveness and efficiency of PDS.

Chapter III

METHODOLOGY

3.1 INTRODUCTION

The theoretical framework of this research has been developed on the basis of literature reviews. The previous chapter of literature review deals with how the prior studies developed a relationship between SCM and PDS. This chapter addresses the methodology adopted to fulfill the objective of the study. It provides an explanation of the objectives that have been set for the study, hypotheses that were formulated, details regarding the size and other properties of the sample, different variables to be examined, selection of proper measurement tools and finally the guidelines or parameters for the collection of data and data analysis.

3.2 SIGNIFICANCE OF THE STUDY

The design of research used during this study is mainly descriptive in nature, but exploratory in some aspects. To assess the effectiveness of PDS all aspects and issues related to SCM of PDS system are considered to fulfill the objective of the study. The main issues are discussed extensively; the basic steps to analyze the SCM have been taken from textbooks, research literature, and expert's opinion, further to apply it to the system of PDS in our country to analyze the objective of the study.

3.3 OBJECTIVE AND HYPOTHESIS

In the first phase, a complete outline of the study related to objectives was planned to identify the objectives of research work finally on that basis objective of the study were set through expert opinions and literature reviews. The literature related to the present study was reviewed to locate and identify current topics and major issues related to the present study. Literature was collected from various academic courses, journals of related academic areas, textbooks, news articles, and magazines, GOI annual reports from government websites, doctoral dissertations, and conference credible recourses.

The followings are the objectives of the study in context of PDS system in our country:

Objective 1: To examine the scope, philosophy and usage of PDS.

Objective 2: To study supply chain strategy and system of PDS.

Objective 3: To identify various barriers and enablers in achieving the objectives of PDS.

Objective 4: To suggest a certain improvement to increase effectiveness and efficiency of PDS.

To fulfill the objectives of the study hypothesis have been framed to achieve objectives.

The study will be guided by following Hypotheses:

H1: Customer satisfaction is related to SKU level in PDS.

H2: Customer satisfaction is related to location of PDS Shops in PDS.

H3: Customer satisfaction is related to flexibility in change of customer requirement as per need in PDS.

H4: Customer satisfaction is related to return policy of goods in PDS.

H5: Customer satisfaction is related to availability of subsidized products in PDS shops in PDS.

H6: Customer satisfaction is related to Direct Cash Subsidy in Bank Account in PDS.

H7: Customer satisfaction is related to On Timely Delivery of Products in PDS.

H8: Customer satisfaction is related to information regarding products in PDS.

3.4 USE OF SYSTEM DYNAMICS FOR PDS SUPPLY CHAIN

3.4.1 System Dynamics - An Introduction

System dynamics (SD) is a multidimensional strategic methodology used for the identification and analysis of multidimensional problems for understanding and modeling of the nonlinear behavior of complex systems and to understand the complexity of the physical and social system. The behavior of the complex system is studied using stocks and flows, internal feedback loops and time delays to designed models of complex systems to make a further strategy for management perspective and change in the system. The core of the strategy for system modeling is in the structure of the system in the shape of stocks and of flows. In order to designed system using the methodology of SD, feedback loops are the basis to better understand and explain system behavior. During early 1950s system dynamics, the methodology is developed by Jay W. Forrester initially for managers of corporate sectors for better improvement and understanding of the industrial and managerial process in their organization system. Basically, modeling of any strategy or policy through system dynamics is

based on feedback system theory. From last more than fifty years system dynamics modeling are widely accepted across the world by various public and private sectors for the analysis and designing of policies. On all social, ecological, managerial system problems techniques through modeling of system dynamics approach are widely accepted. System dynamics models has been widely used worldwide for different perspective such as to analyze the dynamic and prospective correlation of economy and the energy, for modeling of the international petroleum trade above a interval of thirty decades, to develop strategic models for dynamics of worldwide economic growth, to capture the environmental consequences of international trade, for modeling of supply-chain management strategy of different physical and social systems, to analyze various strategic policies for the development and growth of different nation-building, to provide various strategic models for software development, and also development of techniques through system modeling for examination of t the intricacies of the air force command and control systems.

System dynamics is a technique to understand a problem and solution through modeling. The complexity of real-world problems is identified in system dynamics models through the analysis of the problem by feedback of various variables related to the problem. The first step in system dynamics modeling is to generate or collect all necessary information that we can collect regarding a system through feedback. The collected database through the inside of a system itself is a valuable source of rich information regarding the different important sectors of a system and source of information about the strategic policies already being implemented and used presently in decision making in the system. The methodology for system dynamics modeling of the system used this information to process and translates these elements to generate the model for the system. Empirical investigation is also used to find and developed the dynamic relationships between individual sectors in the complete system to better comprehending the dynamics of a system. Through formal and informal modeling and analysis by system dynamics many feedback structures related to different sectors like defense, public health, welfare reforms, food grain and education programs get necessary and successful information for policymaking. Figure 3.1 shows the flow diagram of system dynamics methodology.

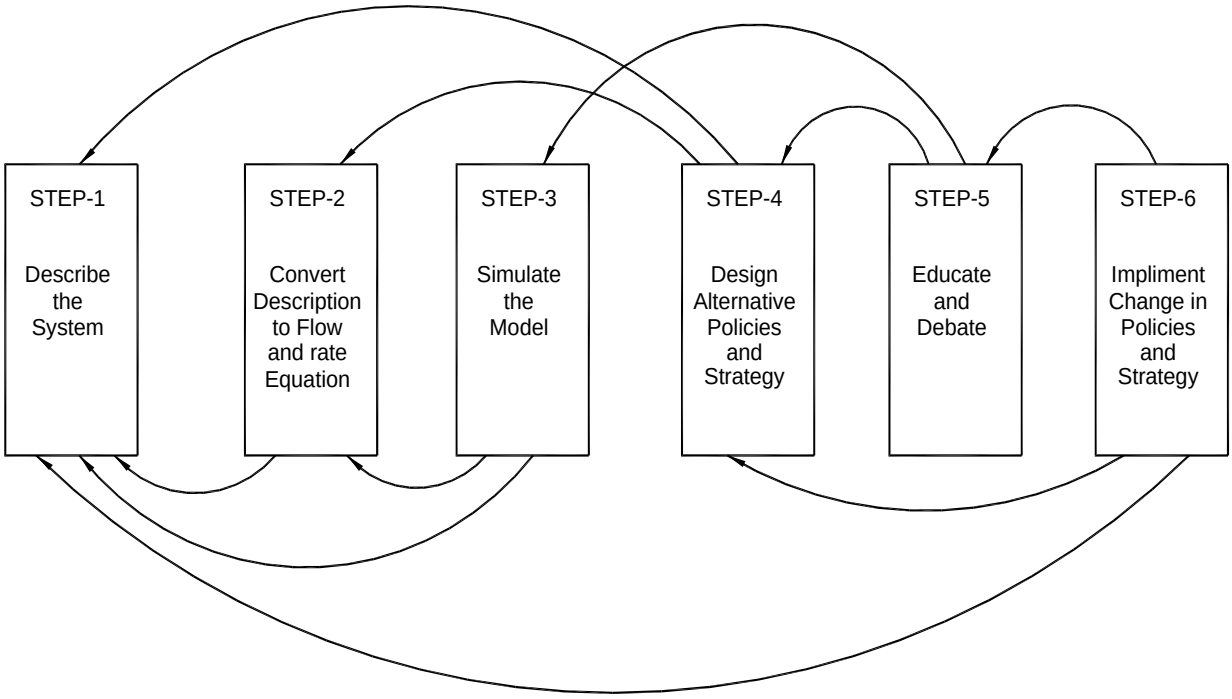


Fig. 3.1 : Flow Diagram of SD Methodology

3.4.2 System dynamics approach

The system dynamics models are problem oriented and for each question, the model will be different. As per theory developed by Forrester's stepwise approach to developing a system involves:

- The system dynamics approach starts by defining problems in question dynamically, by means of graphs over time to proceeds further to modeling stages in order to build up strength in the model and implications of system policies having self-confidence.
- To develop a system dynamics approach endogenous change in the system modeling is fundamental which dictates all required facts of model formulation. Like displacing pendulum exogenous interruption from the settled and peaceful position of the system are seen at most as triggers of system behavior and the reasons for such behavior already exists within the structure of the system itself.

- The concept of feedback thinking is the core and vital basis of system dynamics approach. On the basis of thinking of all aspects of the actual system diagrams in the form of loops of information or feedback, loops are basic tools required for conceptualizing the structure of the system which are a complex structure.
- Stocks (levels) along with the flows (rates) of a system model are essential and basic components of system structure. Proper reorganization of each and every independent stocks or accumulation (levels) and their circulation as inflows and outflows (rates) in the system model are basic requirements for a perfect system modeling approach.
- Based on above next step is the formulation of a behavioral system model which is capable of again representing itself the dynamic problem of interest for understanding the complex issues and the complicated problem-based issues. The models are generally expressed in the form of nonlinear mathematical equations based on a computer simulation technique but is sometimes left unquantified as a diagram apprehending the stock and flow/causal feedback structure of the system.
- On the basis of resulting model find out the new understandings from the model and applicable to same for policy formulation.
- Implementation of change to system problem resulting from model-established consequences and understandings from the model itself.

3.4.3 System Dynamics in Management

SD is used widely by various private and public organizations throughout the globe where management is facing high-stakes decisions making problems and observing that their outcomes are affected by some major forces from years or for better future planning. System dynamics models help such organizations to better weigh the different major forces which are affecting organizational growth. SD models are general as per requirement or need of the customer for the particular problem facing by customer and SD model works closely with the customer to determine about the key action and outcome variables to be considered for planning to make a perfect useful model which considers all of the important variables but leaves out the extraneous ones. SD models not only provide checking of different current and possible decision options but also of unusual one which is required for worth considering. Hariharan et al. (2002) developed a model based on analytic hierarchy process to measure the

global performance of intensive care units and apply the same model to measure service for the improvement of quality.

In management education system dynamics can play an important role when the method of teaching by case study methods will be fully replaced by system dynamics techniques of modeling to educate managers. Since the beginning of the Harvard Business School around 1910, teaching by the methods of case studies is pioneered in management education and this approach of teaching is widely adopted and commonly used around the world for management education. On the basis of organizing information from the actual managerial feedback, system dynamics approach can also start in the same way as a case study analysis. However information used in case study methods are mainly in a descriptive manner that cannot reliably link with the dynamic complexity involved in the system while modeling through system dynamics can better organize and utilized the descriptive information having more uniqueness about the whole process developed on the basis of conceptual knowledge of experienced managers of the system through feedback. Dey and Ogunlana (2002) developed decision support system model for project management perspective in order to make the right decision at the right time for the success of a project as per objectives. On the basis of physical system theory (PST) models, Sushil (1994) developed various SD models to solve various large scale problems related to different sectors. Srivastava and Sushil (2014) developed SD model for automation to interpret various events and action in any system for effective strategy execution.

3.4.4 System Dynamics Approach to Food Security Studies

To reduce hunger or to ensure food security all around the world by providing availability, accessibility and the stability of sufficient food to each and every living person around the globe is a major problem having strategic attention for the administration and the scientific community especially in developing nations like India. Here we concern to the scientific community as they play a dominant and critical role for understanding the strategically implementation of policies and providing platforms for execution of food security policies in developing nations. The overall structure of food security is very crucial and the process of decision-making is very analytical due to the interaction of different critical multidimensional process related to food security. System of food security are generally complex due to various factors, like lack of modern tools or methodologies which are helpful for making long-term policies related to distribution of food grain in the country, failure of role

of different agencies in playing appropriate responsibilities in the system consequently working under various unwanted pressure and impacts, the deficiency of a holistic system model approach to facilitate intervention and understanding of the proper system modeling (Saeed, 1994), the high fatality between various circumstances in a nation including the political, interaction of social and economic factors, and environmental development, functionality of the food economy and general practices associated with the health sector.

In order to achieve the objective of food security all around the world, almost all nations especially delegates of developing countries are working to form a common strategy to generate proper strategy related to issue of food security in consideration of their national and regional variables, and public policies targeted to improve the food security on the basis of three major objectives as to ensure sufficient growth of food production, to ensure proper security in the constant flow of supply and to ensure a safeguard for availability of food for all especially for those who are in need.

In view of these problems, it becomes necessarily to develop a methodology which is capable of providing an understanding of the view of the system and its policies having capabilities of decision making to provide a proper modeling of a system to achieve the objective of food security. The system dynamics approach of simulation and modeling can be helpful to develop a tool for identification of causal association and critical variables for providing a better methodology to ensure food security. There is a need for modeling with system dynamics formulation so that policy makers make proper decisions supported by analysis of key components of food security such as adequate availability of food, proper and safe accessibility of food resources and stability of network for food distribution channel in a nation with proper planning having integrated appropriate strategy to ensure food security.

As per theory of system dynamics, SD is a multidisciplinary strategic methodology to provide a simulation model which allows identifying, to comprehend, and to use the relationship between performance and structure in almost all complex dynamic problem orientated systems. In respect of the application of the concept of the behavior of the complex system of insecurity of the national food can only be attained through the coverage of the complete system rather than an isolated individual component of the system. As per (colin 1997) it is important to consider that the approach of system dynamics modeling is not entirely holistic, as it is required to be essential to use some elements from reductionism in order to narrate the behavior of the most of the major parts of the system.

Most of the developed models for the accessibility of food security are based on correlations coefficients to determine relationships between various factors affecting food security, but the models as suggested by the approach using methodology of system dynamics is based on methodology that helps to understand present behavior of various factors of problem and its impact on different variables, furthermore, the major concern of modeling is to evaluate the policies and their long-term effect on model. Different types of models can be designed as per need based on user requirement and internal structure of the system which can also be helpful to examine the relationship between the entire structure of the system and the performance of the model. Such types of models are very popular and pronounced mostly as white boxes as they are very transparent for policy analysis. For better understanding the phenomenon of food security through the approach of system dynamics modeling finds its primary uses in those circumstances in which human complicated and crucial decisions frequently guided by the logic are called for and where efforts are made to stabilize the systems end up regularly in a real destabilization of it (Sterman, 2000). Complex system modeling through SD modeling process can build both understandings of sophistication required to find effective policies as well as the confidence to work that understanding to take action appropriately. The simulation of dynamic systems models is far clear when different assumptions are taking into consideration on the fact that how they interact with each other. It will also allow determining the critical variables that influence the complete phenomenon, how they accept their behavior over time as well as induced changes, supporting the development scenarios that are more probable.

Based on the methodology of system dynamics various models have been developed throughout the developing countries on food security in order to be able to comprehend the interaction of numerous factors influencing food security and the way to carry out the optimization of social, economic, demographic, industrial and agricultural systems amongst others. Such models are more transparent for the evaluation of policy more effectively for policy makers to make more outstanding performance-based contributions and solution to the study of the phenomenon of food security.

Based on methodology of system dynamics through modeling of various models on food supply chain Bach and Saeed (1992) studies various possible effective solutions to provide self-sufficiency on food distribution network and production to procurement in Vietnam to evaluate the effects of policies of an agricultural resource system to maintain self-sufficiency

in food sector in a centrally planned strategic manner of economy. To achieve the task experiments are conducted based on system dynamics approach of modeling of the entire food production and management system having concerning the relation of agricultural property management and soil ecology which serves as a basis for this strategic modeling approach. On the basis of modeling to improve production level as short-run policies seem to be harmful in order to maintain self-sufficiency in food grains production and for long terms planning of future. It was also found on the basis of modeling that to achieve a sustainable policy for food production must include proper timely improvement and conservation of soil management, and control on nation population for better management. In a centrally planned economy, it is found to feasible in nature for the sake of country but may be challenging to implement such a policy agenda in a market system.

A model based on approach of system dynamics modeling practices was developed by Bala (1999) to study the food grain procurement and storage and further distribution to people of Bangladesh by their government as per of their needs and import of food grains to fulfill country requirement as Bangladesh is a food deficit country and its major requirement are fulfill by import and aid from other nations. Based on casual loop model to study the various factor affecting food security, develops an alternate model for food storage management for policy makers to consider. Sharma et al. (2006) developed a fuzzy goal programming (FGP) based model in order to increase production, income, and employment in the rural sector to improve the rural development.

Gohara (2001) also developed a model based on modeling of system dynamic theory to estimation the future production capacity of food grains throughout the world based on analysis of supply and demand of food products throughout the world. Similarly based on the approach of modeling through system dynamics Meadows (1976) developed an SD model on the basis of studies based on supply and demand pattern of food grains in respect of changes in the demography of the country. Another model using SD methodology is also developed by Meadows, (1977) for the analysis of the critical food problem as a global point of view as seen from both growth-based models together with nongrowth models approach.

A model is developed by Quinn (2002) for food security using integrated system dynamics simulation approach through modeling that correlates agricultural production of food grains, consumption of food products as per dietary requirement of the population of the country and sustainable development in a complicated and crucial global arena order to study

the nation food security behavior in order to explain interactions between political, economic, and ecological systems. Sharma et al. (2007) developed a model based on FGP for allocation of minimum available land for different agricultural products in order to maximum production to achieve strategic goals.

Saeed et al. (1983) developed a system dynamic model to analysis the policy of Bangladesh government applied to the distribution of rice and foodgrains based on population and its growth of the entire country, participant of food producers, and the total availability of food at present in the country of Bangladesh. The model incorporates the mechanism of population growth, the capacity of production, and total country food consumption by residents. On the basis of SD modeling, analysis suggests that as there is a strong relationship based on feedback between availability of food grains and growth of country population so any policy formulation for increasing the supply of food products can not be considered independently without considering other factors of time.

Saeed (2000) developed a system dynamic model addressing the food security problem in Asia to analyze the performance related to the system structure of food management and evaluate the procedure of implementation by how the proposed policies in different parts of nations are implemented on the basis of proper correlation between the three major components required to achieve national food security in any part of globe as availability of proper food to all, accessibility to food supply and stability among the media production and the resources to achieve them.

Using methodology of system dynamics approach as a technique for modeling and analysis Georgiadis et al. (2005) developed an evaluation of supply chain management of food supply chain and analyses the system by using methodology of SD as a tool to undertake strategic issues of management of food supply chains and developed strategic guidelines for the methodology and present a system developed for the tactical modeling of single and multi-echelon of food supply chains. Based on the study of different models of food security it has been observed that these models make a more useful contribution to the study of the concept of food security as these models are strategically fares, transparent and appropriate for any strategic valuation for policy implementation for the administrative approach.

Total supply chain cost (TSCC) model of food supply chain for Indian food distribution context is evaluated by Sachan (2005). The objective of the study was to better understand the phenomena of different models of supply chain and the pre evaluation of the future outcome of

each model in different strategic scenarios as per various critical situations and to developed strategic policies implementation accordingly to minimize TSCC to achieve food security and to minimize the amount of subsidy. In order to develop the model for TSCC approach of strategic modeling through principal of system dynamics (SD) methodology is implemented on Indian food grain supply chain, which considers cost variable as of the dynamic interaction. The major objective behind the studies is to evaluate and minimize cost ratios in the various stages of supply chain model of food security. A total of nine scenarios are appraised for evaluation based on a collaborative supply chain predicted on the views that are optimistic, pessimistic and most likely which are the contract farming model and cooperative model. It was evaluated that TSCC model is beneficial for the whole society and also not only for the organizations working or willing to working into the food supply chain business but in addition to policy makers for economic consideration.

Ambekar (2015) develop a framework for mapping the Indian Public Distribution System (PDS) using multi-agent system (MAS). The entire PDS supply chain from purchase to the distribution is mapped in detail by integrating stages of PDS supply chain On the basis of literature related to PDS, food grain supply chain (FGSC) and MAS is reviewed and critically assessed. Based on this a framework is proposed which will help in improving the functioning of PDS. The major findings on the basis of the study found that PDS has many shortcomings arising from its complex structure and practices which are used to implement it. The study proposed that MAS to model it in which each entity will be modeled as an agent and propose two stages of the supply chain. First stage models the processes from procurement to storage of food grain and second stage model the distribution process

3.4.5 System Dynamics for PDS Supply Chain

The SD modeling of SC of PDS is done with following objectives:

(a) To minimize the time to deliver from state level warehouse to end customer using FPS.
(b) To minimize the cost of SC to improve efficiency.
(c) To adjust receiving rate according to customer demand with the objective of customer satisfaction.
(d) To identify the stage of SC where shortage / excess supply reduces efficiency or effectiveness or both.
(e) To propose inventory turn as a measure of performance of PDS supply chain.

System Dynamics model for PDS supply chain is developed at three different stages of supply chain.

1. Initial procurement level.
2. Warehousing at state government agency level.
3. Fair price shop level.

3.4.6 System Dynamics Model at Initial Procurement Level

Central agencies of GOI like Food Corporation of India are responsible for initial procurement of food grains. The procurement of the food grains depends upon agriculture output during a particular crop season. Therefore, initial procurement rate in the supply chain depends upon agriculture produce of the country. However, as contingency measure government sometimes may import food grains to provide necessary food security to the beneficiary. Depending on availability of stocks at central warehouse level stocks are maintained at regional warehouses of the central agencies. The regional warehouse then transfers stocks to state warehouse. Inventory turn which is a ratio of cost of annual goods sold and average inventory level is very important for performance of an efficient supply chain. Therefore, in initial procurement level of PDS supply chain in system dynamics model as shown in figure no. 3.2 inventory turn is considered to be performance criterion at both central warehouse and regional warehouse of the central agencies.

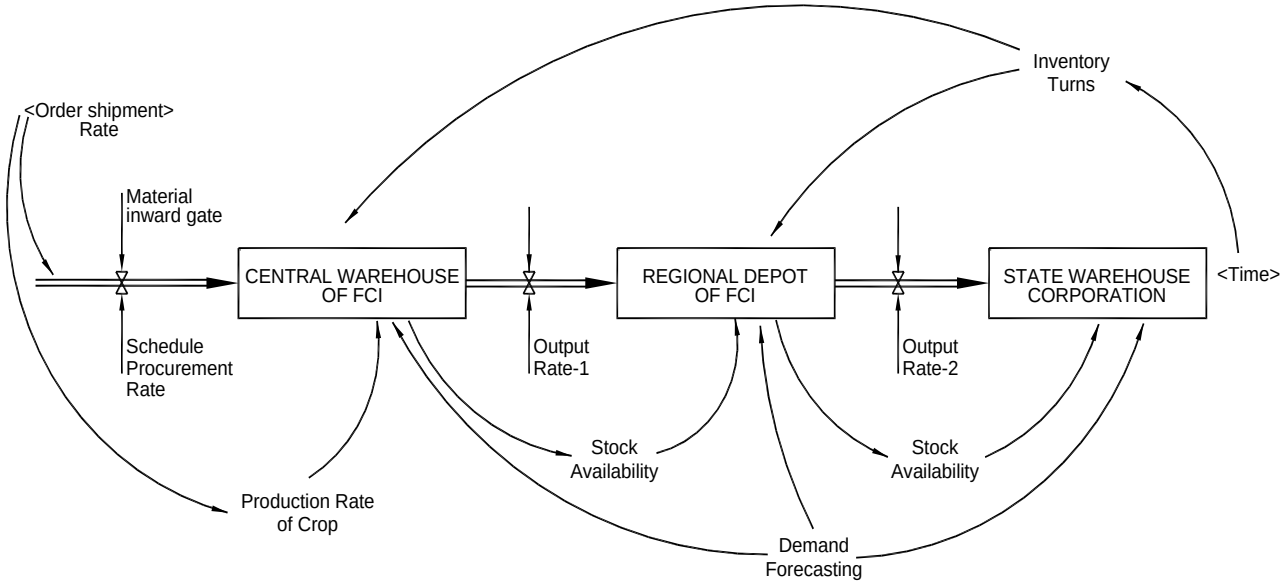


Fig. 3.2 : SD Model for Initial Procurement Level

3.4.7 System Dynamics Model for State Level

State level warehouse receives material from regional warehouses of the central agencies. Since at central level initial procurement rate depends on various external factors but in case of state warehouse the procurement is not been affected by external factors and therefore, a planned schedule of receiving the material is possible at this level. The inventory turn is again an important performance criterion for state warehouse. Inventory turn is helpful as it will help in reducing average inventory level in the state warehouse and this also means less cost of storage and indirectly this will result in reducing the wastages of food grain in storage. Therefore, at state level also focus on performance of supply chain which will help to make our supply chain more effective and responsive and flexible towards customer needs. The model presented in figure no. 3.3 describes the procurement and output of food grain from state level warehouse to fare price shop.

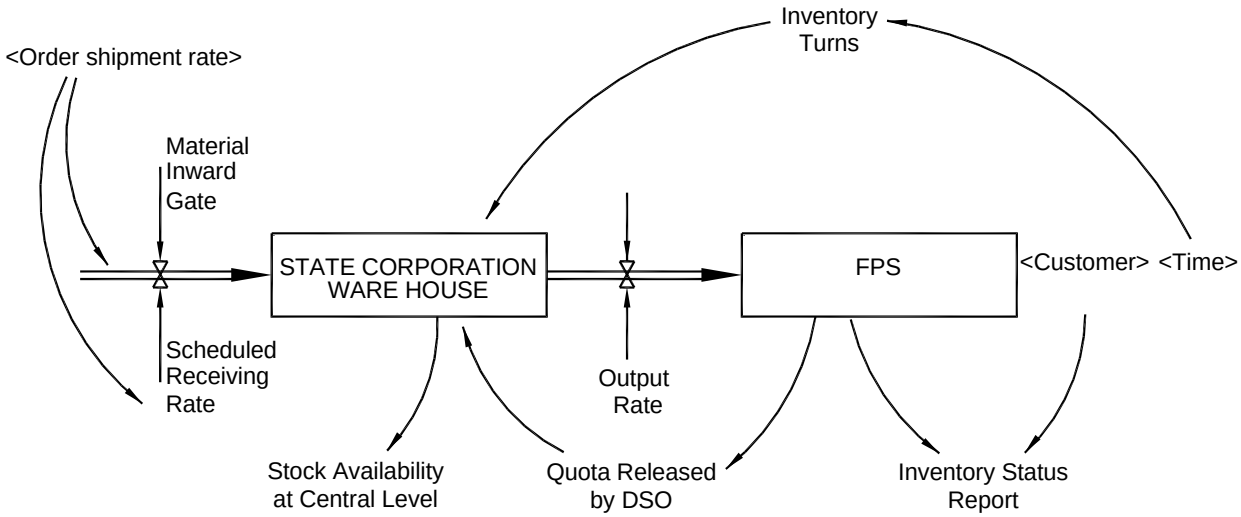


Fig. 3.3 : SD Model for State Level

3.4.8 System Dynamics Model for FPS level

The last level of supply chain is FPS. These FPSs are already highly efficient as the available data suggest that inventory turn at this level is more than 12. Therefore, inventory turn as such is not included to measure the performance of supply chain at this level. However, at FPS level the customer satisfaction is directly related to the availability of food grains and many a times customer faces the problem of stock out. Therefore, stock availability is considered to be an important criteria which is also shown in system dynamics model presented in figure no. 3.4. FPS are also directly dealing with end customers therefore, various marketing related aspects are also playing an important role for the customer satisfaction but those aspects are not included in model presented in figure no. 3.4 as the scope the study is limited to the supply chain perspective of the PDS.

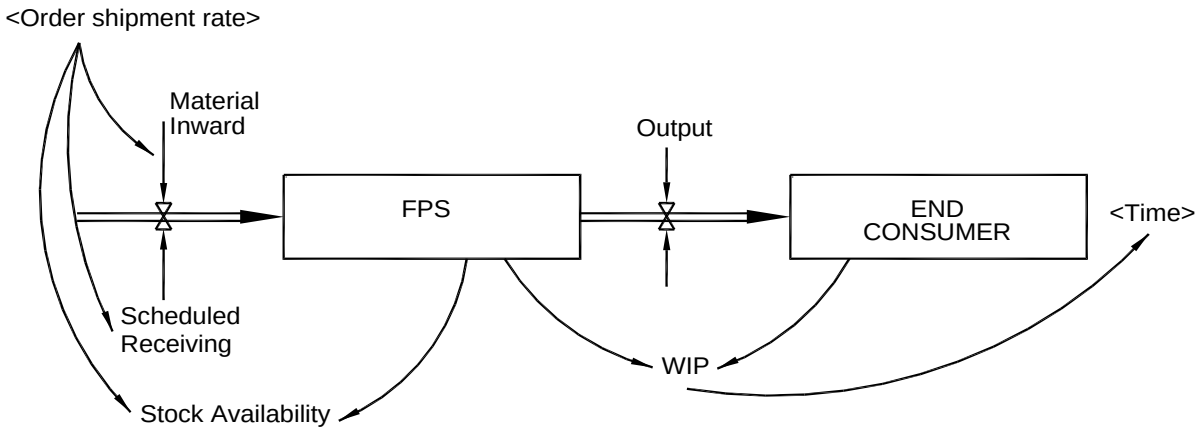


Fig. 3.4 : SD Model for FPS Level

3.5 QUESTIONNAIRE DESIGN

Based on objective and literature, an initial questionnaire was designed. This questionnaire has been divided into two sections: the first section was related to demographic data and respondent's personal details. These questions were on non-metric data. The second section was related to objectives. These questions are based on a five-point Likert scale.

3.6 SAMPLE

The study was conducted on a sample of 308 people. The convenient purposive sampling procedures are used to collect data from to plains of Uttrakhand state. Data was collected on the basis of the questionnaire related to customer satisfaction, direct cash subsidies, quality of products distributed, inbuilt subsidies, existing distribution network of PDS and. In addition, Inputs in the form of discussions/interviews with the other stakeholders of the supply chain network of PDS will also take for analysis. Apart from this, personal information was also collected on the basis of certain factors as name, age, gender, educational qualification, occupation, marital status, designation and work experience. The descriptive statistics of the demographic variables as gender and marital status, educational qualification, work experience has been shown as per in the form of tables.

3.7 DATA COLLECTION METHOD

The third phase of the study was data collection which is very important as results of entire research is based on data collection. Data for the study has been collected by administering measuring instruments by the field survey method. Questionnaire data was collected personally by the in-person survey. Since the objective of the study was to find out the SCM of PDS which affects the poor people of the country to achieve food security and most of the people targeting the PDS facilities are from villages of the country having less connectivity of modern online communication facilities, so complete data was collected by personally by field survey. A brief description of each test has been given as under:

3.7.1 Personal Information Sheet

The personal information sheet included a list of questions as Name, Age, Gender, Marital Status, Educational Qualification, and Income. The Personal information Sheet has been shown in Appendix A.

3.7.2 Objective Information Sheet

The objective of the study has been measured by 30-items scale which is self-administrated and developed by the researcher himself. The scale identifies 9 dimensions such as customer satisfaction (5), SKU LEVEL (9), changing requirements (3), return policy (2), direct subsidy (1), subsidized product (5), ontime delivery (4), store location (2) and Information (3) which constitute the concept of PDS. Participants were asked to answer on a five-point Likert-scale ranging from completely agree as 1 to completely disagree as 5. The objective information sheet has been shown in Appendix B.

3.7.3 Scope of Data Collection

At the beginning of the data collection, explanation regarding research, benefits and another related information regarding SCM, PDS and right to food security has been explained to each responder. All questions were open-ended and of easy understanding to collect information in prescribed format in details for further analysis and a questionnaire was developed in the Hindi language as most of the respondent are from villages having low education level and to a better understanding of the question to provide detailed information about each question.

3.8 DATA ANALYSIS PROCESS

The last stage of the present study was analyzing the data. Questionnaire responses are stored and can be retrieved from the database. They were recognized for the case of analysis using quantitative techniques. For descriptive analysis, results were demonstrated as the average number, percentage, ranking, and standard deviation included graphical reports in the form of charts, tables, and graphs. For hypothesis testing, data collected from field survey was analyzed using SPSS. Statistical research techniques were used for the validation of data, for e.g. reliability test, missing data, discriminate analysis. The quantitative data from the questionnaire was subjected to a number of statistical analyzes related to the research goals or objectives of the present study.

The major part of the study is pertinent to Pearson's Product Moment Correlation Method and ANOVA, T-Test, ISM, AHP etc. will be used for in-depth analysis. Quantitative data from the questionnaire was analyzed by using IBM's Statistical package for the Social Sciences (SPSS 21.0) and Analysis of Moment Structure (AMOS 21.0). Results obtained from data analyses were further analyzed as descriptive statistics and hypothesis testing. Conclusions were drawn on the basis of results.

Discriminate analysis has been used in the next step. The first section of the questionnaire assessed the respondent's personal information, i.e. age, gender, qualification, income, and other individual basic information of respondent. The second section of the questionnaire was based on the objective of the study has been measured by 30-items scale on which rating scales were based on a five-point Likert scale ranging from completely agree as 1 to completely disagree as 5.

3.9 CHAPTER SUMMARY

This chapter elaborated the approach of the study. It highlighted that this study is based on data collected through field data. The main element of the chapters were the objectives, the hypothesis, the planned hypothesis testing tools for accomplishing the objectives, the description of the target population and sample, the data collection, data analysis tools, and techniques. This chapter also summarized the demographic data of respondents in terms of age, gender, qualification, income.

RESULTS

This chapter presents the results obtained on the basis of the statistical analysis of the data collected from field survey for the verification of hypotheses and begins with the descriptive statistics of the variables along with Pearson Correlation and ANOVA.

4.1 DESCRIPTIVE STATISTICS OF THE VARIABLES

In order to summarize the data collected from the field, data is analyzed using descriptive statistics techniques to present data in a meaningful way or in some presentable form such as graphs or some other specified pattern. However, Descriptive statistics analysis do not allow to make conclusions regarding any hypotheses testing we have made for any research problem. The descriptive analysis simply describes data in a more meaningful presentation using a combination of tables, graphs and charts. Descriptive statistics of the variables determined in the study are presented in Table 4.1 which includes Sum, means and standard deviation.

Table 4.1: Descriptive Statistics of the Study Variables

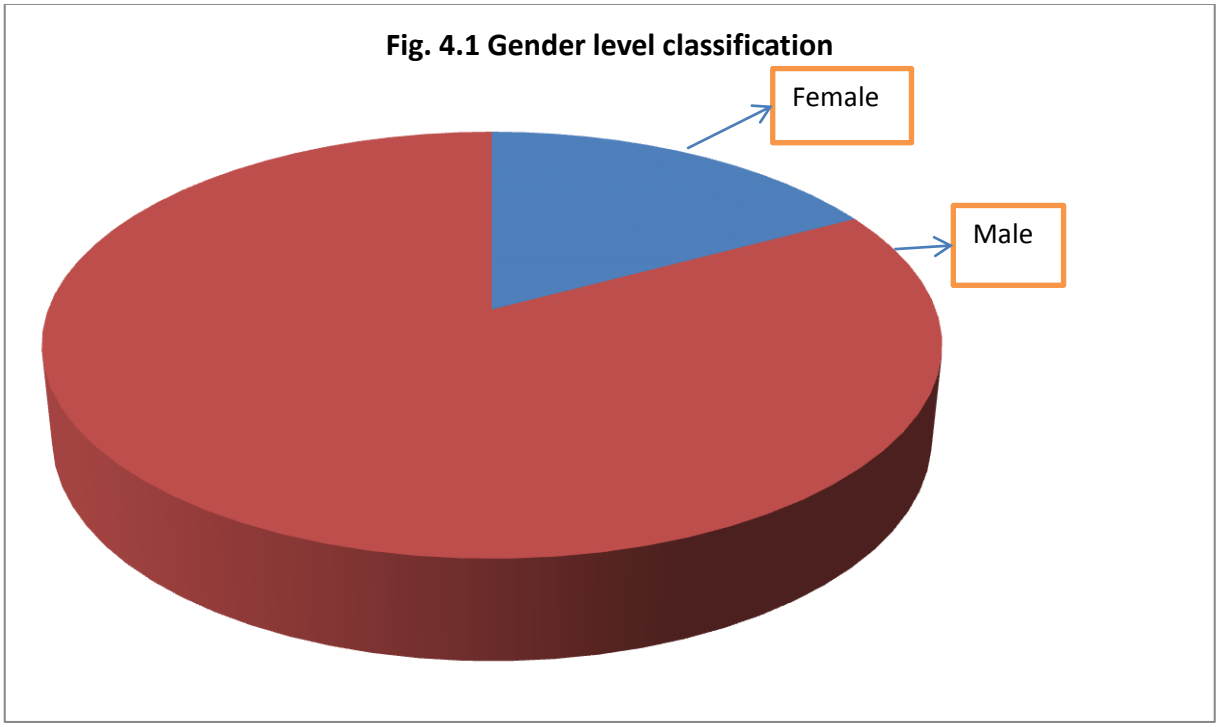
Major Issues	N	Mean	Std. Deviation
Customer Satisfaction	308	2.9037	0.45152
SKU LEVEL	308	3.8458	0.76129
Location of PDS Shop	308	2.0292	0.64756
Changing Requirements	308	4.0032	0.68724
Return Policy	308	4.0844	0.79454
Subsidized Product	308	1.9351	1.30484
Direct Subsidy in Account	308	2.8182	1.44138
On time Delivery	308	2.4026	0.53411
Information about Products	308	2.5130	0.88223

4.1.1 Gender wise Classification

On the basis of data collection based on the classification of the male and female respondent, Table 4.2 represents the valid gender wise classification of data which is also represented as in Figure 4.1 which indicates that the male respondents are more dominant as compared to female respondents.

Table 4.2: Gender wise classification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	53	17.2	17.2	17.2
	Male	255	82.8	82.8	100.0
	Total	308	100.0	100.0	

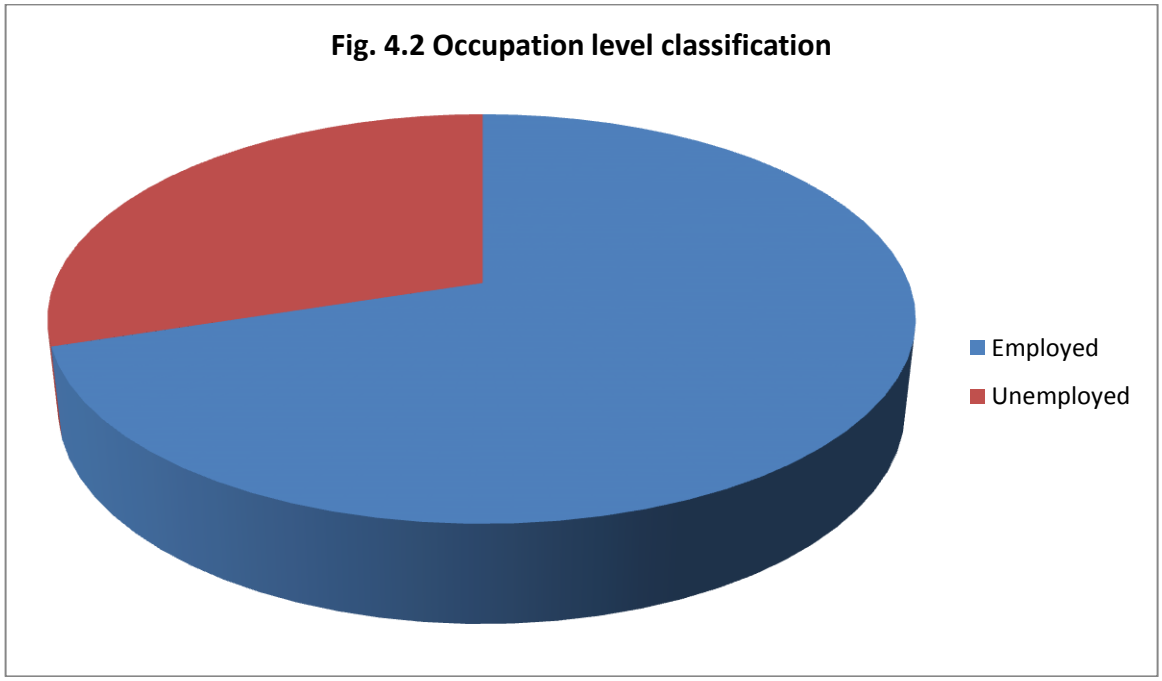


4.1.2 Occupation wise Classification

Data is also collected to represent the occupation status of the population to observe the occupation status of the respondent. On the basis of data analysis, Table 4.3 represents the occupational level classification of respondent which is also represented in Figure 4.2. Data represents that employed respondents frequency is high as compared to unemployed respondent's frequency.

Table 4.3

OCCUPATION DETAILS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	216	70.1	70.1	70.1
	Unemployed	92	29.9	29.9	100.0
	Total	308	100.0	100.0	

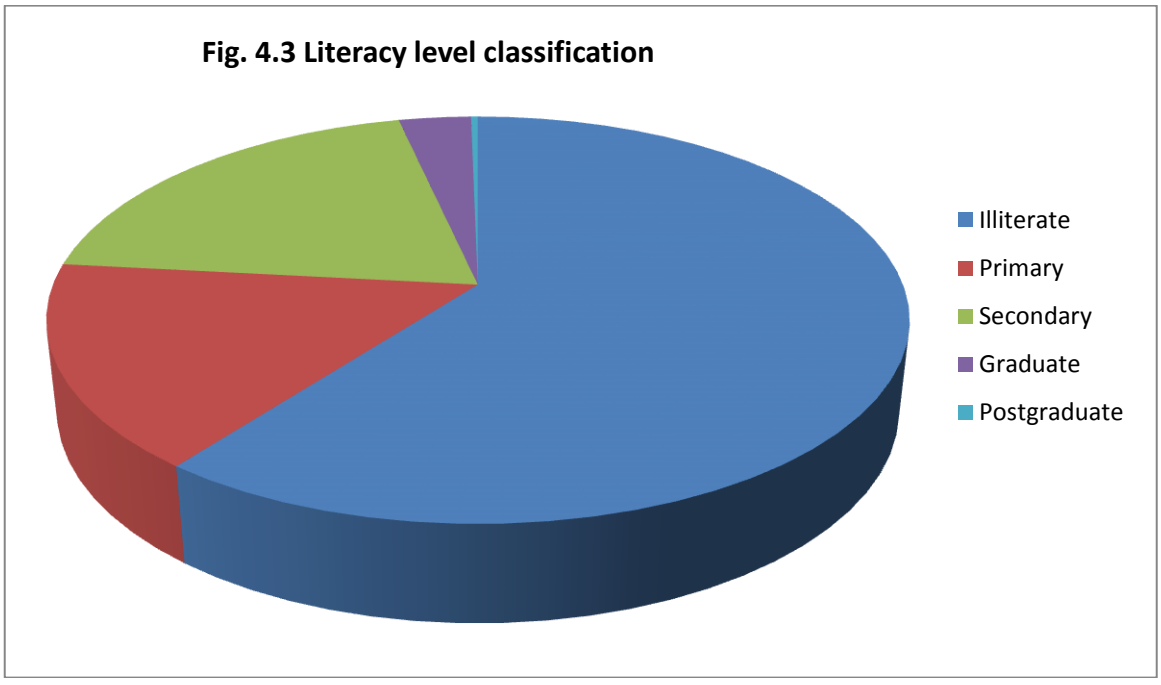


4.1.3 Literacy-wise Classification

Data is also collected to represent the education level of population to observe the classification of the population on the basis of education as literacy is a key factor for decision making regarding any factor. Education level status of the respondent are represented in Table 4.4 and also represented by Figure 4.3 which shows 60.4% are illiterate respondents, 16.2% respondents are completed their education and only 10% respondents completed their graduation level. As per our data analysis illiteracy rate is very high especially in a population of BPL which is a remarkable question for education policy implementation in the country.

Table 4.4 Education Details

EDUCATION DETAILS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Illiterate	186	60.4	60.4	60.4
	Primary	50	16.2	16.2	76.6
	Secondary	61	19.8	19.8	96.4
	Graduate	10	3.2	3.2	99.7
	Postgraduate	1	.3	.3	100.0
	Total	308	100.0	100.0	

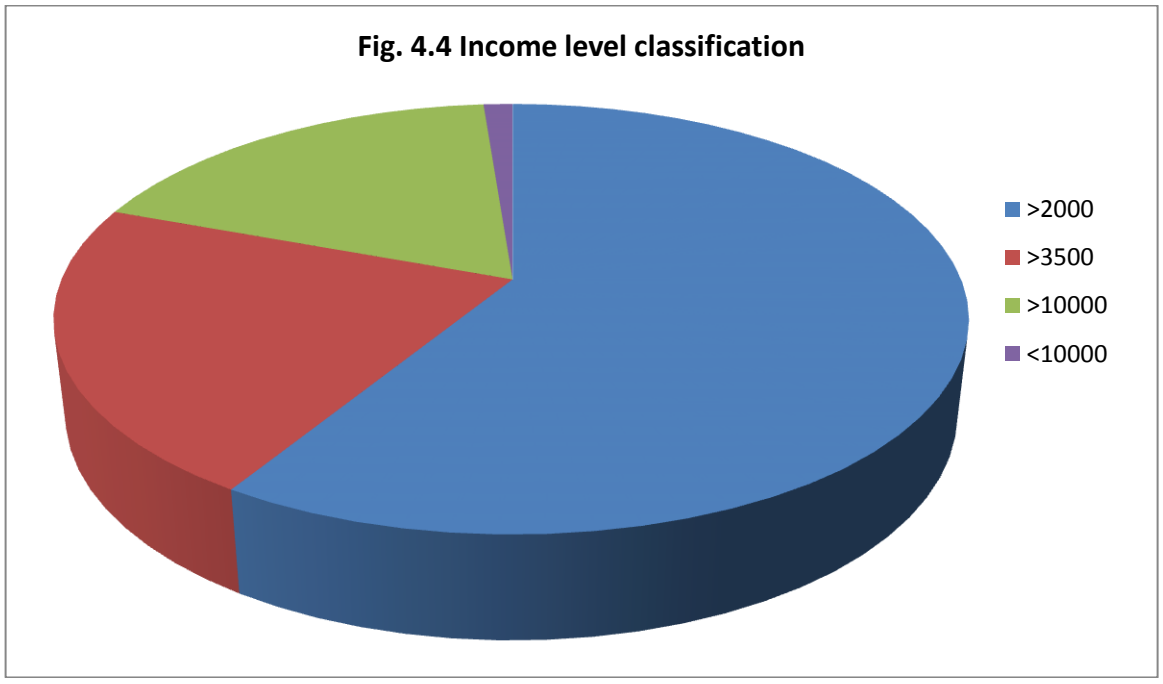


4.1.4 Income Level Classification

Data is also collected to represent the Income level of population to observe the classification of the population on the basis of income as income level is on of the key factor for the policy implementation of PDS in the country. Income level status of the respondent is represented in Table 4.5 and also represented by Figure 4.5 which shows a majority of the population is of BPL having income level less than Rs. 2000.00 per month and it becomes impossible for such families to survive without subsidized food for their daily dietary requirements.

Table 4.5 Income Level Details

INCOME LEVEL DETAILS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	>Rs. 2000	178	57.79	57.79	57.79
	>Rs. 3500	66	21.43	21.43	79.22
	>Rs. 10000	55	17.86	17.86	97.08
	<Rs. 10000	09	2.92	2.92	100
				.	
	Total	308	100.0	100.0	



4.2 INFERENTIAL STATISTICS TO THE VARIABLES

From descriptive statistics analysis, as discussed, we have information regarding our immediate group of data. For testing of our research statistical hypotheses, we used inferential statistics techniques to analyze research data. In quantitative research, research question or hypothesis are designed which are tested by significance testing through appropriate inferential statistics tests.

Based on data interpretation Table 4.6 represents Pearson Correlation between PDS dimensions and Customer satisfaction on an Overall Basis (N=308). From the analysis it is observed that SKU level showed a low correlation value with a dimension of customer satisfaction with the calculated r value as .06* (p< .o5 level). Changing requirements and on time delivery found to be correlated with customer satisfaction with the calculated r value as .16* and .14* (p< .05 level), respectively. Return policy has yielded low value as r = .06* (p<.05 level), followed by direct subsidy give same correlation value. The subsidized product also found weak correlation as r = .05*. Store location and information found the almost similar score.

Table 4.6: Pearson Correlation between PDS dimensions and Customer satisfaction

		Customer Satisfaction
Customer Satisfaction	Pearson Correlation	1
	Sig. (2-tailed)	
	N	308
SKU_LEVEL	Pearson Correlation	.115*
	Sig. (2-tailed)	.044
	N	308
Changing requirements	Pearson Correlation	.169**
	Sig. (2-tailed)	.003
	N	308
Return policy	Pearson Correlation	.065
	Sig. (2-tailed)	.255
	N	308

Direct subsidy	Pearson Correlation	-.060
	Sig. (2-tailed)	.291
	N	308
Subsidized product	Pearson Correlation	.058
	Sig. (2-tailed)	.314
	N	308
On time Delivery	Pearson Correlation	.148**
	Sig. (2-tailed)	.009
	N	308
Store location	Pearson Correlation	.269**
	Sig. (2-tailed)	.000
	N	308
Information	Pearson Correlation	.284**
	Sig. (2-tailed)	.000
	N	308

4.3 Hypothesis Testing

Field data is interpreted using ANOVA to test the various hypothesis of the study by taking consideration of Pearson Correlation between PDS dimensions and Customer satisfaction and significance level between customer satisfaction as the dependent variable and other dimensions of PDS as the independent variable. Results concluded on the basis of data processing are discussed as follows:

4.3.1 HypothesisH1: Customer satisfaction is related to SKU level in PDS.

On the basis of results on data interpretation, the correlation between Customer satisfaction and SKU Level is 0.115 with a significance of 0.044, which indicates a weak significance of the correlation between these two variables. Also the result of ANOVA table 4.7, taking satisfaction as dependent variable and SKU Level as independent variable has come out to be f (8,299)=1.172, (significance= 0.316) as significance is greater than 0.05 for 5% significance level, therefore, we conclude that SKU Level does not significantly affect

customer satisfaction in PDS. Hence, our Hypotheses H1 is rejected or we can say as per our studies in PDS customer satisfaction is not related to SKU level of FPS.

Table 4.7: Significance between Customer satisfaction and SKU level

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.903	8	0.238	1.172	0.316
Within Groups	60.684	299	0.203		
Total	62.587	307			

4.3.2 Hypothesis H2: Customer satisfaction is related to the location of PDS Shops in PDS

On the basis of results on data interpretation, the correlation between Customer satisfaction and Location of PDS Shop is 0.284 with a significance of 0.000, which indicates a good significance of the correlation between these two variables. Also the result of ANOVA table 4.8, taking satisfaction as dependent variable and Location of PDS Shop as independent variable has come out to be f(4,303)=8.622, (significance= 0.000) as significance is less than 0.05 for 5% significance level, therefore, we conclude that Location of PDS Shop significantly affects customer satisfaction in PDS. Hence, our Hypotheses H2 is accepted or as per results of data collected from field survey, it is observed that for PDS customer satisfaction is related to the location of FPS.

Table 4.8: Significance between Customer satisfaction and PDS shops

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6.396	4	1.599	8.622	.000
Within Groups	56.191	303	.185		
Total	62.587	307			

4.3.3. Hypothesis H3: Customer satisfaction is related to flexibility in change of customer requirement as per need in PDS

On the basis of data analysis, it is found that the correlation between Customer satisfaction and changing requirements of the customer is 0.169 with a significance of 0.003, which indicates a good significance of the correlation between these two variables. Also the result of ANOVA table 4.9, taking satisfaction as dependent variable and changing requirements of customer as independent variable has come out to be f(4,303)=2.831, (significance= 0..025) as significance is less than 0.05 for 5% significance level, therefore, we conclude that changing requirements of customer significantly affect customer satisfaction in PDS. Hence, our Hypotheses H3 is accepted so we can predict that in PDS customer satisfaction is related to flexibility is a change of customer requirement as per need.

Table 4.9: Significance between Customer satisfaction and change of requirement

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.255	4	0.564	2.831	0.025
Within Groups	60.332	303	0.199		
Total	62.587	307			

4.3.4 Hypothesis H4: Customer satisfaction is related to return policy of goods in PDS

As a result, of data analysis, it is observed that the correlation between Customer satisfaction and Return Policy is 0.265 with a significance of 0.255, which indicates a weak significance of the correlation between these two variables. Also the result of ANOVA table 4.10, taking satisfaction as dependent variable and Return Policy of customer as independent variable has come out to be f(3,304)=0.924, (significance= 0.430) as significance is greater than 0.05 for 5% significance level, therefore, we conclude that Return Policy significantly does not affect customer satisfaction in PDS. Hence, our Hypotheses H4 is rejected and it is concluded from the analysis that in PDS customer satisfaction is not related to the return of product policy.

Table 4.10: Significance between Customer satisfaction and return of policy

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.565	3	0.188	0.924	0.430
Within Groups	62.022	304	0.204		
Total	62.587	307			

4.3.5. Hypothesis H5: Customer satisfaction is related to the availability of subsidized products in PDS shops in PDS

On the basis of data analysis, it is observed that the correlation between Customer satisfaction and Subsidized Products is 0.058 with a significance of 0.341, which indicates a weak significance of the correlation between these two variables. Also the result of ANOVA table 4.11, taking satisfaction as dependent variable and Subsidized products of customer as independent variable has come out to be f(4,303)=1.106, (significance= 0.354) as significance is greater than 0.05 for 5% significance level, therefore, we conclude that Subsidized Products significantly does not affect customer satisfaction in PDS. Hence, our hypothesis is rejected and we conclude that in PDS customer satisfaction is not related to the availability of a variety of subsidized products in FPS.

Table 4.11: Significance between Customer satisfaction and availability of the subsidized product

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.900	4	0.225	1.106	0.354
Within Groups	61.687	303	0.204		
Total	62.587	307			

4.3.6. Hypothesis H6: Customer satisfaction is related to Direct Cash Subsidy in Bank Account in PDS

On the basis of data interpretation, it results that the correlation between Customer satisfaction and direct subsidy in the account is -0.060 with a significance of 0.291, which indicates a weak significance of the correlation between these two variables. Also the result of ANOVA table 4.12, taking satisfaction as dependent variable and Direct subsidy in account as independent variable has come out to be f(4,303)=0.292, (significance= 0.883) as significance is greater than 0.05 for 5% significance level, therefore, we conclude that Direct subsidy in account significantly does not affect customer satisfaction in PDS. Hence, our Hypotheses H6 is rejected so it can be seen that in PDS customer is not satisfied with direct cash transfer of subsidy in their bank accounts.

Table 4.12: Significance between Customer satisfaction and direct cash subsidy in a bank account

	Sum of Squares	df	Mean Square	F
Between Groups	0.241	4	0.060	0.292
Within Groups	62.346	303	0.200	
Total	62.587	307		

4.3.7. Hypothesis H7 Customer satisfaction is related to On Timely Delivery of Products in PDS

As per the analysis of data, it has been observed that the correlation between Customer satisfaction and On Time Delivery is 0.148 with a significance of 0.009, which indicates a good significance of the correlation between these two variables. Also the result of ANOVA table 4.13, taking satisfaction as the dependent variable and On Time Delivery as an independent variable has come out to be f(6,301)=3.371, (significance= 0.001) as significance is less than 0.05 for 5% significance level, therefore, we conclude that On Time Delivery significantly affect customer satisfaction in PDS. Hence, our Hypotheses H7 is accepted so it is clearly identified that in PDS customer satisfaction is strongly related to on time delivery of subsidized products from FPS.

Table4.13: Significance between Customer satisfaction and on-time delivery

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	4.333	6	0.722	3.731	.001
Within Groups	58.254	301	0.194		
Total	62.587	307			

4.3.8. Hypothesis H8: Customer satisfaction is related to information regarding Products in PDS

As per results of data analysis using statistical tools it is observed that the correlation between Customer satisfaction and Product Information is 0.269 with a significance of 0.000, which indicates a good significance of the correlation between these two variables. Also the result of ANOVA table 4.14, taking satisfaction as the dependent variable and Product Information as an independent variable has come out to be f(4,303)=7.194, (significance= 0.000) as significance is less than 0.05 for 5% significance level, therefore, we conclude that Product Information significantly affects customer satisfaction in PDS. Hence, our Hypotheses

H8 is accepted so it is observed that in PDS customer satisfaction is related to information regarding products availability is FPS.

Table4.14: Significance between Customer satisfaction and information about products

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.428	4	1.357	7.194	.000
Within Groups	57.159	303	0.189		
Total	62.587	307			

4.4 RESULTS OF HYPOTHESIS TESTING

On the basis of statistical analysis of the data collected through field survey, data is processed for the verification of hypotheses. As a result, of study, some hypotheses are accepted while some are rejected. A consolidated result of hypothesis testing is described in Table- 4.15

Table 4.15 Summary of Hypothesis Testing

Hypothesis	**Results**
H1 Customer satisfaction is related to SKU level in PDS.	Rejected
H2 Customer satisfaction is related to the location of PDS Shops in PDS.	Accepted
H3 Customer satisfaction is related to flexibility in a change of customer requirement as per need in PDS.	Accepted
H4 Customer satisfaction is related to return policy of goods in PDS.	Rejected
H5 Customer satisfaction is related to the availability of subsidized products in PDS shops in PDS.	Rejected
H6 Customer satisfaction is related to Direct Cash Subsidy in Bank Account in PDS.	Rejected
H7 Customer satisfaction is related to On Timely Delivery of Products in PDS.	Accepted
H8 Customer satisfaction is related to information regarding products in PDS.	Accepted

Chapter V

DISCUSSION

This chapter contains the details discussion on the interpretation of the data on the basis of statistical tools as discussed in the previous chapter. Interpretations of the results are discussed briefly on the basis of hypothesis testing. On the basis of data collection from the field survey through questionnaire has been analyzed in the previous chapter and on the basis of results in this chapter we discuss the outcomes of analysis briefly to study the objectives of the research.

5.1 INTRODUCTION

One of the most important and necessary step taken by Government of India (GOI) is the implementation of Public Distribution System (PDS) to ensure food security through the public distribution of specified quantities of selected commodities at an affordable subsidized price to the economically weaker section of the population living below poverty line. For the effectiveness of any distribution system as well as policy role of SCM has become very important and effectiveness of a proper supply chain management system to manage the food distribution network to achieve food security is a major challenge. The major objective of our study is the study of supply chain management of the policy of distribution of food grains through PDS. Through PDS government of India is distributing a huge quantity of subsidized food grains to poor people of the country with the huge burden on Indian economy as the subsidy. One of major channel partners of whole SCM of PDS is the customers or poor people of the country who are benefited by PDS by purchasing food grains through ration shops of PDS. For the success of any distribution channel satisfaction of customer availing, the facilities of distribution channel play an important role. Here in our study during data collection through the questionnaire, we ask different questioned to customers which are related to their satisfaction level with reference to the distribution of food through PDS to achieve the objective of the study. Gertsen and Zolner(2014) analyze that for better understanding and enhancing organizational identification must require a proper attention to all socio-cultural contexts and

background of all population having an association with that contexts. Krishna et al. (2011) describe that culture is one of the critical phenomena for customer satisfaction besides culture age, gender, education and income are other parameters which affects customer satisfaction. Gupta(2007) analyze the behavior of senior citizen during shopping for psychographic perspective and describes their experience satisfaction level while shopping. The data relating to socioeconomic features such as gender, income, occupation, education etc. for the families availing the facilities of Public Distribution System also examined and findings from socioeconomic features which are discussed in Section 5.2 of the current chapter while Findings of the other part of questionnaire regarding other parameters of customer satisfaction are discussed in section 5.3 of chapter.

5.2 SOCIO-ECONOMIC FEATURES

The data collected by the main field survey based on sample size of 308 are presented below.

5.2.1 Gender Level Classification

The major objective of this investigation is to recognize the comparative function of male and female in buying the commodities from the PDS. The proven fact is 17.2% that female members mostly influence the purchasing behavior of the family. The present study found that more than 82 percent of the respondents were male (Table 4.2).

5.2.2 Education Level Classification

Education is one of the major social factors for any society which plays a key role in molding the behavior of the respondents. On the basis of the present study, it has been observed that majority of the respondents about 60% in all the sample districts were illiterate which is really questionable as by various welfare schemes removal of illiteracy is also among one of the major priority of GOI. While respondents with primary level education was found to be about 16% and secondary level about 20% and only very few about 4 % respondents were graduate or above (Table 4.3) so it has been observed that the even after so much efforts of GOI literacy rate with no formal education were high among weaker section of the people in country. Mahajan (2013) emphasis on the role of education in the development of any country as education is as important as food, shelter and house to survive for a human being.

5.2.3 Occupation Level Classification

Occupation is also an important factor, which plays a dominant role to describe the purchasing behavior of an individual and helpful in establishing the relationship with the market. In the present study, it was observed from data analysis that about 70% of the respondents are employed (Table 4.4) which describes that the employment has been maintaining the key relationship with PDS.

5.2.4 Income Level Classification

Like occupation income level is also an important factor to decide the purchasing behavior of a family or an individual and establishes a strong relationship with the market. From the present study, it was observed out of the different income level groups, the majority of the respondents are in income group below Rs. 2000 per month (Table 4.5) which is extremely low and it becomes necessary for such segment of the population to avail PDS facility to fulfill their requirement of food grains at a subsidized price. This represents that the income level has been among key factor to make a strong relationship with PDS and also fulfill the objective of GOI of the launching of TPDS.

5.3 CUSTOMER SATISFACTION FEATURES

Customer satisfaction fundamentally is a term of marketing or product management to measure how a particular product or products or services supplied by an organization meets the customer expectation. Customer satisfaction can also be measured as percentage or number of total customers having buying experience with an organization regarding the products or services provided by that particular organization above a specified satisfaction goals. In a study of about 200 managers of senior marketing members, it was found that 71% of the responded observed that customer satisfaction metric is very useful for operational point of view in managing and monitoring their businesses (Kucukosmanoglu et al., 2010). For a competitive marketplace where businesses role of the customer is a major factor to compete, customer satisfaction seems to be a key element factor of business strategy. Krishna et al. (2011) suggest that in order to achieve maximum customer satisfaction in present comparative business scenario there must be a trust, loyalty, and understanding in all kind of service industry. Gupta and Sharma (2009) analyze that for marketing prospective service quality must always be unique as service are intangible in nature and important for customer loyalty. Therefore, it becomes essential for the organization as a part of effective businesses strategy to effectively

manage customer satisfaction as a key element. For research or survey point of view on a five-point scale if satisfaction level as '5' for an individual respondent is likely to become a satisfactory customer and when a product satisfied a customer as per his expectation while buying then he must recommend the same to the society.

For the success of supply chain of any distribution network or industry satisfaction of customer or channel partners is a key parameter. Service and service qualities are the major parameters to feel the customer satisfaction for any business organization Gupta (2007). The data collected on the basis of the questionnaire has been analyzed and the results are discussed here to achieve the objectives of the present research study. The data relating to the household consumption of beneficiary, purchase pattern of food grains under PDS from the fair price shops, the proximity of the PDS shops with the beneficiaries, prices of food grains available from the fair price shops under PDS, distribution of food grains as per changing requirement of beneficiaries, more government interference in PDS, SKU level of PDS shops, behavior of the staff in the Fair Price Shops and other factors related to customer satisfaction were analyzed and discussed.

5.3.1 Customer Satisfaction as SKU Level in PDS Shops

On the basis of analysis of data in the previous chapter as per table 4.7, the correlation between Customer satisfaction and SKU level indicates a weak significance of the correlation between these two variables. Also the result of ANOVA, taking satisfaction as the dependent variable and SKU Level as independent variable significance is found to be greater than 0.05 for 5% significance level; therefore, we conclude that SKU level does not significantly affect customer satisfaction in PDS. Hence, our Hypotheses H1 Customer satisfaction is related to SKU level in PDS is found to be rejected.

It is well true that present time is of modern and organized retailing. A properly managed and organized retail chain with strong supply chain management always satisfied customers. An organized modern retail hypermarket like reliance fresh, big bazaar, easy day replaces old Kirana shops. Customers are more satisfied with such types of stores with their layouts, SKU level, and discount schemes. But in the present study, our focus is on customers who are availing the facility of PDS. PDS shops are government run chain of shops developed by the government of India under an economic policy of ensuring the delivery of essential food grains items at affordable prices to the economically weaker section of country people. As per

result of data collection from field survey data, it is clearly observed that literacy rate of poor person availing the facility is very low and also most of the people are from very low-income group having monthly income less than Rs. 2000 per month and for such people SKU level of shops does not matter and their priority is to take food grains from PDS shops to fulfill their need irrespective of modern features of retailing available in the shop. Hence, for a PDS customer SKU level in PDS shop does not matter at all.

5.3.2 Customer Satisfaction as Location of PDS Shops

On the basis of analysis of data in the previous chapter as per table 4.8 indicated correlations between customer satisfaction and location of PDS shops indicates a good significance of the correlation between these two variables. Also the result of ANOVA, taking satisfaction as dependent variable and location of PDS shop as independent variable significance is less than 0.05 for 5% significance level; therefore, we conclude that Location of PDS shop significantly affects customer satisfaction in PDS. Hence, our Hypotheses H2Customer satisfaction is related to the location of PDS Shops in PDS is found to be accepted.

Satisfaction is contented feeling of a customer after comparing performance (results) to his anticipation related to the aspects that are offered by the shopkeeper. Customer satisfaction is also measured by measuring the location of PDS shops in PDS. In satisfaction variable, the strongest indicator during measurement is satisfaction related to the location of PDS shops in PDS. On the basis of data analysis as per table 4.8 which implies that PDS shop location for customers during shopping is an important indicator to measure customer satisfaction. Customers who have found a convenient location for purchasing they are more satisfied. On the basis of the result of present research, it shows that PDS shop's location is of more important to meet the expectation of the customers. Also as per government of India policy of distribution of food under PDS welfare schemes all PDS shops must be in close vicinity of PDS beneficiaries as to avail the facility more easily with transparency. This research is in accordance with Mahendran (2013) study that customer satisfaction is more effective when PDS is ensuring availability, affordability, and accessibility of PDS shop.

5.3.3 Customer Satisfaction as Flexibility in Requirement in PDS Shops

On the basis of analysis of data in the previous chapter as per table 4.9 indicated that the correlation between Customer satisfaction and changing requirements of customer indicates a

good significance of the correlation between these two variables. Also the result of ANOVA, taking satisfaction as the dependent variable and changing requirements of the customer as independent variable significance is less than 0.05 for 5% significance level; therefore, we conclude that changing requirements of customer significantly affect customer satisfaction in PDS. Hence, our Hypotheses H3 Customer satisfaction is related to flexibility in the change of customer requirement as per need in PDS is found to be accepted**.**

Customer satisfaction is positively related to changing requirements of the customer in order to determine how to maximize their customer base, market share, customer revenue, loyalty, profits, and survival (Ram et. al.2009). Although exemplary businesses always focus on the satisfaction level of their customer and his/her feedback regarding distribution network system. They always work to make their customers delightful and satisfied and see customer satisfaction as the key parameter to profit and growth to business survival. Customer satisfaction directly, in turn, hinges on the quality and has a remarkable effect of their expectation and experiences on the services and goods they receive. Sushil (2001) describes the concept of flexibility as freedom of choice which changes as per requirements. Achieving high levels of customer satisfaction in PDS, It requires that PDS continually monitor and examine the feedback through experiences, opinions, and suggestions of their beneficiaries who are also potential customers of PDS network. Understanding customer needs to meet customers' expectation is an ongoing part of the effectiveness of any distribution network like PDS. Customer satisfaction depends on both their treatment by the service provider and fulfills of his expectations during the buying process. On the basis of choices, customers decide and determine regarding available goods and services and shape how they are helpful to meet his expectation. The previous research also suggests that on the basis of customer satisfaction principles, a model can be performed having considerable potential to transform vulnerable PDS system which serves beneficiary to achieve objective behind PDS. The logic of these results suggests that PDS should first understand the effective customer service strategies. These actions aim to contribute to a specified and different relationship between the customer satisfaction and changing requirements need of PDS (Ray, 2011). Depending on situation customer satisfaction can differ for any product or service based on his/her experience, a purchase decision, a store, a salesperson, service provider, or an attribute or any of these. Influenced by any individual expectation regarding any product or service, Customer satisfaction is a highly personalized assessment of an individual. Research identifies different

parameters that are directly related to customer requirement as per need in PDS and its relationship with customer satisfaction. Jalan & Murgai (2006) assert that in order to satisfy a customer and for an effective PDS, the system must meet key customer need to deliver service excellence for the effectiveness of system and customer satisfaction. An array is identified by research that changing perceptions of customers needs in PDS factors that are important for customers which includes timeliness and convenience, availability, reliability and dependability, responsiveness, personal attention, competence and professionalism, empathy, assurance, and tangibles such as equipment and physical facilities and the behavior and appearance of the personnel. It has been also identified from research that these characteristics also apply to customer satisfaction with changing requirements of customers.

5.3.4 Customer Satisfaction as Return Policy in PDS Shops

Since the correlation between Customer satisfaction and Return Policy as per an analysis of data in the previous chapter from table 4.10 indicates a weak significance of the correlation between these two variables. Also the result of ANOVA, taking satisfaction as a dependent variable and Return Policy of the customer as independent variable significance is greater than 0.05 for 5% significance level; therefore, we conclude that Return Policy significantly does not affect customer satisfaction in PDS. Hence, our Hypotheses H4 Customer satisfaction is related to return policy of goods in PDS is found to be rejected.

As per Consumer Rights Act or Sale of Goods Act applicable in our country each and every customer have a statutory right to return something and get his money back or change the product if the product is not up to the mark of quality. Also big hyper stores, retail chains, online marketing services, private retail shops provide good return policies on their products as per their sales and marketing strategy. Also, all around globe customer satisfaction is also directly related to the return policy of the product while they purchase products. For total customer satisfaction, free returns of products become one of the major tools of service provided by most of the retailers and big firms include this factor in their supply chain process. But in the case of distribution of food grains through PDS which is also one of the largest distribution networks of the globe it is not true. Findings indicated that in every state across the country under PDS policy of GOI different commodities distributed through a network of PDS shops also known as fair price shops (FPS) include staple food grains, such as rice, wheat, sugar, and kerosene oil and these stores focus on practicing good customer service specifically

to fulfill food grains requirement of economically weaker section of country. Under the policy of PDS returns of goods is largely untouched area as a return of goods represents a general sign of failure on the demand side of the supply chain. However, to ensure customer satisfaction, it is a necessary part of the supply chain. Therefore, this research considered returns from the point of view of an end consumer. The current study suggests that returns of goods under PDS are not a great way to ensure customer satisfaction. As per policy of GOI regarding PDS shops, policies are so structured and managed to provide better interactions with customers and distribution processes is designed to provide better meet and exceed customer expectations. On average PDS shops, retail returns of food grains are around only 2-3 percent of total sales (Douthit et al, 2011) which is very low as compared to the large volume of sales of food grains every year. Distribution through PDS is not handling returns in a right way that's why there may be a considerable chance that there will be a negative perception of the consumer of PDS in favor of FPS retailer. Also, from the analysis of data we found that majority of PDS customers are from weaker section of country population having less literacy ratio and low-income group and need and greed of such section of population is to get subsidized food to fulfill their dietary basic needs so they are not too much worry about quality of material supplied as they don't have another choice to buy subsidized food grains from other place and also they don't have enough money to wait for quality food. Hence, it is observed that PDS customer doesn't much care for return policy of goods supplied from PDS shops.

5.3.5 Customer Satisfaction as Availability of Subsidized Products in PDS Shops

Findings from data analysis as per table 4.11 of the previous chapter, Customer satisfaction, and Subsidized Products indicate a weak significance of the correlation between these two variables. Also the result of ANOVA, taking satisfaction as the dependent variable and subsidized products of the customer as independent variable significance is greater than 0.05 for 5% significance level; therefore, we conclude that Subsidized Products significantly does not affect customer satisfaction in PDS. Hence, our Hypotheses H5 Customer satisfaction is related to the availability of subsidized products in PDS shops in PDS is found to be rejected.

The findings indicate that subsidized products in PDS shops significantly do not affect customer satisfaction of PDS customer. A subsidized product in PDS acts as a further brake on economies; tend to benefit the few at the expense of the many. The study identified that because of an effective mechanism of distribution of food under PDS in country poverty is

reduced somehow in rural areas and PDS customer at the time of purchasing from PDS shops focus only their need not greed. The overall results on the base of the analysis indicate that in parts of rural and slum parts of urban areas BPL families are satisfied with PDS shops as to fulfill their dietary requirements. As these families have limited amount of rupees just to live so they don't care about various products at a subsidized value in PDS shops as they have limited money to expand on such needs. This analysis reflects that in order to make the PDS more effective and viable, the availability of subsidized food grains as per changing requirement of the customer is an important factor of PDS customer rather than more and more subsidized product with good SKU level of PDS shops like other private ration shops or food retail chains.

5.3.6 Customer Satisfaction as Direct Cash Subsidy in Bank Account

Since the correlation between Customer satisfaction and direct subsidy indicates a weak significance of the correlation between these two variables (Table 4.12). Also the result of ANOVA, taking satisfaction as the dependent variable and Direct subsidy in the account as independent variable significance is greater than 0.05 for 5% significance level, therefore, we conclude that Direct subsidy in account significantly does not affect customer satisfaction in PDS. Hence, our Hypotheses H5 Customer satisfaction is related to Direct Cash Subsidy in Bank Account in PDS is found to be rejected.

A lot of discussions are going on across the country among different NGO's, finance people, policy makers and other welfare agencies on the issue of direct cash subsidy of food grains in place of distribution of food grains under PDS to implement the scheme more effectively and to stop leakages in the system. The government of India is also working on the proposed project for direct disbursement of food subsidies in the account of the beneficiary as cash transfer, instead of the distribution of food grains under the PDS. Some of the state governments also proposed some draft proposal to the central government on this issue and central government is working on the project with the concerned ministries as the ministry of finance and planning commission, food and consumer affairs ministry to secure the customer protection.

As a view of policy makers and economist, PDS is an inefficient mode of transfer of subsidies to poor people of the country due to huge leakages into the black market, and huge expenditure in transferring subsidies in the form of food grains under PDS. As per their arguments by the switch to food grains with direct cash transfers would reduce corruption and

leakages in the system. By cash transfers of money directly into bank accounts of identified beneficiary, it would enable the beneficiary to buy better quality food of their choice from the open market and not be restricted to items sold in the PDS, which are often inferior in quality and limited in range.

The findings come out from our studies indicate that Customer of PDS is strongly opposed direct cash subsidy in the bank account in place of subsidized products in PDS shops. Poor families also have a fear in mind that it is quite possible for people to spend cash transfers not on food grains but on other non-food items, which would create a problem especially for ladies of the family to fulfill the requirement of food to survive. Different research confirms that culturally decisions relating to cash in households made by male members while decisions relating to food are made by women in almost all cultures, and therefore, cash transfer in place of food grains from PDS shop is more likely to secure their food requirement to survive. This movement of government is also opposed by most food rights campaigners. They say that our protest is not against transfer of cash to people but our protest is against the transfer of cash in place of food grains which is our basic need. They also argue that irregularities are empirically found to be high in existing other cash transfer schemes like Cash transfers of old-age pensions. Pandya et al. (2012) studied the huge progress of internet among people in India but having limited use for business users. Peoples are also worries about current banking infrastructure system in the country as PDS shops exist almost in every village within the close vicinity of the beneficiary and easily accessible while average distance to the nearest bank branch is between 6.5km to 10km. which is longer in remote regions. On the basis of swot analyzes of the electronic supermarket (Pandya and Arenyeka-Diamond, 2002) analyze that although by the use of e-governance strength of business increases but there are also strength and weaknesses of implementation of a system to achieve competitively strengthens in business. Finally, it is an observed that it is a mistake to view PDS only as the burden of subsidy to the country and to transfer subsidies to poor households by cash to reduce subsidy amount. The cost of PDS needs to be measured against the objective of PDS and its goal. Therefore, our hypothesis is strongly rejected by PDS customers.

5.3.7 Customer Satisfaction as on Time Delivery of Products from PDS Shops

Since the correlation between Customer satisfaction and on Time Delivery indicates a good significance of the correlation between these two variables (Table 4.13). Also the result of

ANOVA, taking satisfaction as the dependent variable and On Time Delivery as independent variable significance is less than 0.05 for 5% significance level; therefore, we conclude that on Time Delivery significantly affect customer satisfaction in PDS. Hence, our Hypotheses H7 Customer satisfaction is related to On Timely Delivery of Products in PDS is found to be accepted.

The effectiveness of any distribution channel or processes can be measured by how to deliver that product or service to a customer to the satisfied need of the customer by delivering the service as per his requirement. As a business ethics, the satisfied customer always returns to buy more and always share their experiences regarding his satisfaction with other people or society and always ready to pay a premium to a trust as an associate for the privilege of doing business. From research studies, it is well true that the cost of keeping a satisfied and loyal customer is only one tenth of developing a new customer. Therefore, as the globe continues to speed up it becomes essential to retain or win a customer by his satisfaction for any organization or distribution channel. As the complexities of the modern life of people around the globe increase and customer have different option to select, the expectation of products or services to be delivered on or before the agreed time increases. No customers like to wait for any delay of services as per committed time and have no or little patience for supply channel. The role of SCM is very important is very for a distribution channel for on time efficient and cost effective delivery of products. With the help of proper SCM using modern IT-based tools, big hypermarkets, stores are providing on time promised deliveries of products to the customer as per their need. Online marketing companies also used advanced IT-based tools of SCM to delight their customers to deliver on time services of products. Here in the present research, our focus is on world largest public distribution channel responsible for the distribution of food grains as a welfare scheme for the poor people of the country on subsidized price to fulfill their daily need of food to survive. It is well aware that on-time requirement of food is essential for a human being especially for the economically weaker section of people whose survival is fully dependent on the distribution of subsidized product from government PDS shops. If there is a delay in supply of monthly need for food grains from PDS shops then it becomes very difficult for such community to purchase food from the open market due to the price difference. However in the policy of PDS government allocates food grains as per customer need but due to poor infrastructure and poor management of supply chain, many times problem arises. Therefore, it is first need of PDS customer to get a supply of food grains distribution from PDS

shops in time. Childers(2007) also emphasized that the customer satisfaction and timely delivery of products through PDS shops make customers more loyal this welfare scheme of government of India. Davis (1994) also describes that customer beliefs about timely delivery of product make customers more reliable on PDS shop. Therefore, PDS shops must prefer timely delivery of products for customer satisfaction and to attain competitive advantage and sustainable growth of PDS shops. Subramanian et al. (2014) described customer satisfaction while purchasing as responsiveness and reliability of quality service and on time delivery of products make the customer more delightful and drives them to re-purchase. Therefore, our hypothesis is strongly accepted by PDS customer.

5.3.8 Customer Satisfaction as Information Regarding Products in PDS Shops

Since the correlation between Customer satisfaction and Product Information indicates a good significance of the correlation between these two variables (Table 4.15). Also the result of ANOVA, taking satisfaction as the dependent variable and Product Information as independent variable significance is found to be less than 0.05 for 5% significance level, therefore, we conclude that Product Information significantly affects customer satisfaction in PDS. Hence, our Hypotheses H8 Customer satisfaction is related to information regarding products in PDS is found to be accepted.

It is the first priority of the government of India for the universal coverage of PDS by providing the availability, affordability, and accessibility of enough food grains to poor population of the country. To make the system more effective and viable, the satisfaction level of poor people regarding PDS is an important factor. Information regarding availability of products in fair price shops, the cost of products available and timings of product distribution through PDS shops are very important for PDS customers. Shah and Bhat (2008) analyze that role of sale person for an organization growth is important especially his behavior towards prospective customers, his product information in the store and sharing of information with others. The state government also fixed parameters for PDS shop owners to provide timely information regarding these parameters to PDS customer. Display notice boards and information relating to product availability, pricing, stocks and distribution timings are mandatory to display in PDS shops. Also, governments are working on IT based solutions to provide advance information for the availability of stocks in PDS shops through SMS and modern way of information communication. Implementation of a strong information system is

also a measure of performance (Sharma and Bhagwat, 2006) for an organization for oval hall growth. By the use of IT based solution innovation in business strategy (Pandya and Anand, 2008) can be achieved more effectively. The positive attitude of FPS owners towards the local PDS consumers affect the customer behaviors in the forms of repurchase rate from these shops and becomes a channel of advertisement as word of mouth about the functioning and satisfaction of PDS shops. Similarly due to improper information regarding availability of stocks there may be a chance of switching of customer from the PDS shop to other oneand switching cost including waste of time, lack of certainty in finding information about the new PDS stores in obtaining these products and waste of time are contributing variables to customer loyalty to the PDS stores that are same.. These findings are similar to research findings of (Zhang et al., 2008) that customers of PDS shops do the more control and bargaining power than consumers of any other supply channel because of their low-income status and less qualified customers as they want the greater availability of advice about services and products. Information regarding services, availability, system and quality always affects to change the satisfaction level of a customer and succeeding decisions during future repeat buying (DeLone and McLean, 2003). When the use of information system is voluntary, a causal relationship between satisfaction of customer and this constructs and exist. The effect of information quality on the satisfaction level of consumer advised that quality is always a measure of information system outputs which includes information accuracy, relevance, timeliness, aggregation and format (Ahituv, 1980). Which is an important factor having an effect on the effectiveness of satisfaction level using sensible thought? Information sharing about Product also helps a consumer to define the usefulness of the available product which helps in making a decision to evaluate the product as per their consumption level. Appropriate information regarding products availability, quality has a strong impact on customers of PDS as this FPS channel is the only source of getting subsidized products so that perceives a great risk to their thoughts regarding availability of their daily consumption of food and probably on the basis of information sharing helps consumers overcome these fears and form a more strong and favorable opinion about PDS shops.

5.4 CHAPTER SUMMARY

In order to achieve the objectives of the present study, data collected from the field survey is processed and results so obtained from data processing are used to test the hypothesis

framed to accomplish the objective of the present study and discussed briefly in the present chapter.

On the basis of literature review for the present studies it has been observed that PDS is among one of the most important policies of GOI used as safety net for the poor population of India to fulfill their basic dietary needs to survive and is of strategic importance as GOI expends billions of rupees every year as food subsidy to provide food to all. From the analysis of socio economic data collected from field survey, it has been observed that there are still majority of poor population living in villages of country which don't have enough income to survive and literacy rate is also very poor in such populations living below poverty line which is again a remarkable question for GOI as for the growth of any nation basic education is must for all. Getting food grains distributed through PDS is of strategic importance for such population for their survival. The philosophy of GOI behind the policy of PDS is to provide food grains to people of country living below poverty line to ensure food security in country. From data analysis and testing of hypotheses, some of our hypotheses are strongly accepted by PDS customers when we measured customer satisfaction as fixed variable and location of PDS shops, flexibility in change of requirement, on time delivery of products and information about products as variables. It has been observed all these variables are related to SC of policy of PDS. In order to achieve the objective of food security in country there is an amended scope to revive entire SCM of PDS to achieve objective of PDS. As India is country having majority of population living below BPL having no or insufficient supply of food to eat, hence policy of PDS is the only channel to fulfill the requirement of dietary needs of population living below poverty line. So it becomes need of the country to modify the entire supply chain of PDS in strategic manner as to achieve the strategic competitiveness of the distribution system.

It has been analyzed from analysis of data and testing of hypotheses that major need of the customers under PDS is to deliver the sufficient quantity of food grains as per their requirement at the time of their need from FPS situated at appropriate reachable location having proper information about services they delivered. As most of the families availing the facility of PDS are from BPL level and quantity of subsidized food distributed through PDS is only the way to fulfill majority of their daily dietary plan so it becomes necessary for them to avail the facility of PDS with in time, with proper information of delivery time as occupation of the most of the person are based on daily wages so it becomes also a problem for them to query about availability of products in PDS shops again and again. From literature review it has been

observed by various researchers and government reports that there are several barriers and enablers in achieving the objective of PDS policy as a huge quantity of PDS products are diverted from the right track of distribution and there are also problem of targeting correct population to avail the facility so there is a abounded scope of development of entire PDS policy in context of SCM so that right food can be distributed to right person at a right time. GOI also trying to modified entire policy based on information technology such as digitization of ration cards, direct transfer of amount of food subsidy to beneficiary account, biometric based distribution pattern to target right beneficiary etc. but it is again a question to observed that which segment of population we are targeting and whether they are enough educated to adopt new technology based reforms. As a analysis of data collection it has been observed that targeted population is not much interested in direct transfer of cash subsidy in their bank accounts as due to lack of proper education people have a fear in mind that by transfer of direct cash subsidy in their account whether they will be able to purchase food grains from FPS or not or their money will be diverted to fulfill other needs of family members. From data analysis it has been also observed by hypotheses testing that people availing the facility of PDS are not much interested in better SKU level of PDS shops, availability of more and more subsidized products and policy of return of good delivered through PDS shops. It may be due to fact that targeted population under PDS are BPL families having very low income group and they don't have sufficient money to buy more and more products and to fulfill basic dietary need is the only priority of them. Although people required good quality food and various study indicated the supply of inferior food grains through PDS shops and people complaints about them but in spite of all people are not much interested in return policy as their financial level is so poor so that they can't refuse to food gains available if PDS shops as it is of their first priority due to subsidized price. Hence in these contexts the entire SC of PDS must be redesigned as to provide sufficient and safe affordable food to all at all times to fulfill the objective behind concept of food security in entire country.

Chapter VI

CONCLUSION, IMPLICATIONS, LIMITATIONS AND FUTURE SCOPE

6.0 INTRODUCTION

The present research discussed the basic idea behind starting of public distribution system (PDS) by GOI. Over a period of time from the time of independence of country till date the scope of PDS has always been a matter of discussion. But most of the studies were carried out with a different approach to poverty elimination, food security, and nutrition values provided to the targeted population. Most of the times PDS is seen as the welfare program for the citizens of the country. But in a competitive environment where various other activities are to be supported with limited resources available to the states, it becomes very important to look for efficiency and effectiveness of a program like PDS. The present study is an attempt to use the principals of supply chain management (SCM) for making PDS more effective and efficient. However, it is also true that scheme like PDS is still not able to provide desired security cover to all the population living at the bottom of the pyramid. Therefore, NGOs like AkshayPatra type of food security program are offered which apply all modern concepts of SCM to ensure efficiency and effectiveness. The present study propose that use of SCM principals will help PDS to be more efficient and effective and, therefore, large population can be benefited with fewer recourses.

6.1 IMPLICATIONS FOR ACADEMICS

The proposed study is one of the few studies were done to explore managerial aspects in PDS. The present study proposed a supply chain model for PDS which can further be explored by various advanced research tool. As SCM researchers are always interested in minimizing the cost of logistics which includes transport, handling, storage and warehousing. As a rough estimate up to 20 percent of the food, grains are lost because of poor infrastructure of storages and transportation arrangements in our country (Ahluwalia, 1993). As an academician, this present research opens a vista of many further research opportunities to reduce wastage so that PDS supply chain can be more productive. Further, the supply chain of PDS follows a hub and spoke model where a fair price shop owner who

is at the end of the spoke is connected to the state government warehouses who is considered to be a hub. Now it will be interesting for an academician to model supply chain of PDS using alternative distribution models and simulation of those models will help to decide the usefulness of alternative supply chain strategies for PDS.

The present study discussed the important dimensions of customer satisfaction in PDS. However, the other studies so far did not consider PDS beneficiary from the point of view of customer satisfaction. Most of the available studies have used terms like "target group" for the population under PDS cover. Adding the dimension of customer satisfaction in PDS will help policy makers, decision makers to apply the concept of marketing and supply chain management to help the beneficiary in a more professional way. The various variables which are identified for the current research to measure customer satisfaction are related to numbers of SKUs at the fair price shop level, the location of the FPS itself, flexibility in the supply chain of products as per changing requirement. Further customer satisfaction also measure against some of the unique characteristics of PDS like direct subsidy in the form of direct cash transfer to the bank account of the beneficiary, amount of subsidy versus quality of products, trade of between on time delivery and return policy and availability of more subsidized products under PDS. As a Supply chain professional the performance of a PDS supply chain can be measured using SCOR and balanced score card model also, so the academician can also used the present study for advance research in PDS for supply chain prospective.

The present study has very important implication for academicians that it opens scope of concepts like third party logistics (3PL) and fourth party logistics (4PL) in PDS supply chain.A 3PL is considered to be helping the original supply chain to concentrate on the core competencies, if 3PL is involved in PDS supply chain it can performed roles of transportation of material from storage points of the central agencies to the storage points of state government agencies and from godowns of state agencies to the FPS locations. 3PL can also be used to provide warehousing facilities at different stages of supply chain of PDS. Academicians can also explore using various advance modeling tools and techniques to minimize the cost of distribution. In the entire process of PDS supply chain central, state, district level authorities can concentrate more focus on fundamental issues of PDS to increase the level of customer satisfaction. Academicians can also come up with propositions of reverse logistics, by the use of 4PL in PDS supply chain. This will help to monitor the inventory levels in entire supply chain and proper distribution of food grains in different areas.

For academician another important contribution of the present study is the use of concept of flexibility in the supply chain. Flexibility is an important concept present competitive environment. Though the basic objective of PDS supply chain is not to make profit but to work as a welfare mechanism to provide food security to the population of bottom of pyramid. But also it is very important to understand that in India large number of public sector enterprises started from the concept of welfare of providing employment and development to the rural areas of the country but over a period of time the idea changed towards profit making organizations having comparisons with other large multinational companies (MNC). Therefore, similar conditions may also exist with PDS. Presently it is a welfare activity but over a period of time PDS supply chain may have to compete with other low cost strategies of corporate targeting bottom of the pyramid market with more customized solutions. Here comes a very important implication of study for academician where they can use concept like flexibility and co creation for the PDS supply chain.

6.2 MANAGERIAL IMPLICATIONS

The present study is more important from the practical point of view and this has a very important managerial implementation which will affect 40% of the population of the country .The effective implementation of government policies is always a challenge for the government. Therefore despite large number of such welfare scheme, the benefit of those schemes is not reaching to the target population. In India one of the former Prime Minister Mr. Rajiv Gandhi himself admitted that out of hundred paise released from the central treasury only fifteen paise reaches in the hands of final beneficiary (Jain, 1988). This indicates extremely poor supply chain performance, but at the same time from the practical point of view it indicates issues like corruption,pilferage, poor efficiency and excess burden on exchequer for providing benefit to the country men. Therefore, present study helps us in understanding factors which can directly be taken care to improve the performance of PDS and therefore the society at large. The research suggests that in case of PDS number of SKUs does not effect customer satisfaction therefore professionals managing the supply chain of PDS should not think about increasing the product mix of PDS supply chain. This also strengthens that a PDS supply chain is necessary for providing limited number of products to the customers.

From the practical point of view location of fair price shop is directly affecting the customer satisfaction. It is recommended that location of FPS should be chosen according to the convenience of the targeted population. During the study with interaction of respondents

and with personal observation of researcher it was found that FPS of not located at convenient places and it was observed that convenience is an important factor even though the product is of essential nature. Therefore managers of the PDS supply chain can use principal like centre of gravity methods for deciding the best location of the FPS. Many a time, it was also observed that customers move from one area to another area but for getting the food grains the family is attach with old FPS of previous area. Because off lack of convenience it is difficult for a person to get these kind of changes in ration card easily and this affects the satisfaction level.

Further, customer satisfaction is also related with flexibility. PDS supply chain should be flexible to accommodate the changing requirements as per need of the customer. Normally a ration card holder has fixed quota of different types of food grains to be procured from FPS but under the system of flexibility the customer will have option to use that quota as per his/her choice. If lets say that a ration card holder has a monthly quota of 4kg of rice and 2kg of wheat then under the system of flexibility he will have a 6kg of food grain which he can divide as per family choice every month. The research says that this flexibility will help in getting more customer satisfaction.

As far as reverse logistic is considered don't feel that returnability plays any important role in PDS supply chain therefore from the customer perspective development of reverse logistic supply chain is not required.

Interestingly customers in beneficiary group of PDS rejected the idea of subsidized products in FPS. This is supported by many other researchers who coined terms like poor penalty, etc.In case of PDS also now customer wants good quality products and may be those products are not to be subsidized at current PDS level. As a informed customer they are more rational and required products which can exactly fulfill the needs of the customer like providing enough nutritious values and overall physical and mental development through there food grains. ,many studies are available where it was pointed out that the subsidized food offered through PDS lacks in providing complete nutritious which are required for balance physical development. These studies have given sufficient data of those children living below poverty line and completely dependent on PDS for their food needs. Therefore, it is important for managerial prospective to focus on quality of the food through PDS.

The customers of PDS want timely information and exact schedule of distribution of the products under PDS. Customer need to wait long hours in front of FPS to get their

turnfor getting the material. This can be eliminated, minimize by using some IT tools which does not require any type of internet connection, data uses etc. the basic mobile phone service provider using message services can get the information about availability and opening schedule for distribution . When a poor person is waiting in front of a FPS for food grains he/she is putting this time out of the total productive time available to him so it is interesting anomaly on one side we are providing subsidized food to BPL families and on the other hand they lose their productiveness (hours of wage earning). So in order to serve the customer in PDS it is important to use modern tools of ICT for uplifting the customer satisfaction.

6.3 LIMITATIONS

Every study faces many constraints. These constraints are more while study is conducted for award of Ph.D. degree. This study also faced similar constraints. Limitations of time and monitory resources are one reason to limit the scope of data collection. In case of availability of these resources, scope of the present study would be enhanced. Further this is one of the starting study of SCM in PDS so this study does not enjoy availability of large literature base of the subject area. The other limitation is unavailability of software's like VENSIM which are directly useful for simulating SD models. This could have facilitated the researcher to go for simulation of SD models. The future studies can be done by removing these constraints and increasing the scope of present research.

6.4 SCOPE FOR FUTURE RESEARCH

The present study is one of the few attempts to see the usefulness of SCM principal in PDS. However this research provides some very interesting finding related to customer satisfaction in PDS supply chain but this research opens many dimensions for future research.Given a time and resources we will like to do this research with larger sample coverage of many important states of India. The other scope which brings that there are certain enablers and barriers for implementing SCM principals in PDS supply chain. Modeling these enablers and barriers will help researchers to understand the impact of different factors to PDS supply chain as well as management people can use this research for making many practical decisions. The present work can extended to include cases of sugar, kerosene oil in same PDS supply chain, as the current research only focus on food grain supply chain. Researchers can use advance modeling techniques like the model presented by system dynamics to simulate the behavior of PDS supply chain. The SD model can be simulated using software's like MATLAB or any other customized simulation

platforms. As a future scope of the research work, it is also proposed to do a scale development exercise for determining the performance of PDS supply chain.

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दिनांक : .....

Annexure-A

स्थान :

भाग 'क'

1. नाम ..... 2. उम्र .....

3. लिंग पुरूष /महिला

4. आय : 1. प्रतिमाह 2000 रूप से भी कम 2. प्रतिमाह 3500 से कम
3. प्रतिमाह 10,000 से कम 4. प्रतिमाह 10,000 से अधिक

5. शिक्षा : 1. अशिक्षित 2. प्राथमिक पास (PRIMARY)
3. माध्यमिक पास (SECONDARY) 4. स्नातक (GRADUATE)
5. स्नातकोत्तर (POST GRADUATE)

6. रोजगार की स्थिति : 1 बेरोजगार 2. कार्यरत

7. परिवार में लोगों की संख्या : .....

8. धर्म : .....

9. मकान : 1. कच्चा 2. पक्का 3. किराए का मकान 4. खुद का मकान

भाग 'ख'

Tick mark (✓)

1.	क्या आप पी0डी0एस0 सुविधाएं प्राप्त करते हैं?	कभी नही	शायद कभी	अक्सर	बहुत बार	नियमित
2.	आपके मासिक किराने/अनाज की कितनी आवश्यकता पी0डी0एस0 से पूरी हो जाती है?	बिल्कुल नहीं	बहुत कम	कम	लगभग सम्पूर्ण	सम्पूर्ण
3.	पी0डी0एस0 की सुविधा का लाभ उठाना सुविधाजनक है।	पूरी तरह से सहमत	सहमत	न तो सहमत न ही असहमत	असहमत	पूरी तरह से असहम
4.	पी0डी0एस0 की सुविधा पास में ही उपलब्ध है।					
5.	पी0डी0एस0 मेरी मांग के अनुसार विभिन्न स्तर की मांग प्रदान करने में सक्षम है।					
6.	पी0डी0एस0 मांग के अनुसार विभिन्न प्रकार की वस्तुऐं प्रदान करने में सक्षम है।					
7.	पी0डी0एस0 की सुविधा आवश्यकताओं में परिवर्तन के अनुसार बदलने में समर्थ है। /बदल जाती है।					
8.	पी0डी0एस0 की सुविधा बाजार में किसी भी अन्य खुदरा व्यापारिक प्रतिष्ठान के समान ही संतुष्टि का एक ही स्तर प्रदान करती है।					
9.	पी0डी0एस0 की सुविधा समाज के आर्थिक रूप से कमजोर वर्गों के लिए अधिक उपयोगी है।					
10.	पी0डी0एस0 की सुविधा समाज के सभी वर्गों के लिए समान रूप से उपयोगी है।					
11.	पी0डी0एस0 की दुकाने सुविधाजनक स्थानों पर स्थित है।					
12.	पी0डी0एस0 द्वारा खरीदारी करने पर ग्राहक को एक सुखद अनुभव होता है।					
13.	पी0डी0एस0 की दुकानों पर अनेक प्रकार के उत्पाद उपलब्ध होते है।					
14.	उत्पादों की उपलब्धता के बारे में पूर्ण जानकारी पी0डी0एस0 दुकानों में सही रूप में उपलब्ध रहती है।					
15.	पी0डी0एस0 प्रणाली में सभी उत्पादों की कीमते अपेक्षाकृत कम होती है।					

16.	पी0डी0एस0 प्रणाली की सुविधा उत्पादों की आसान वापसी की सुविधा प्रदान करती है।					
17.	पी0डी0एस0 अंतिम उपयोगकर्ताओं तक उत्पादों की आसान वितरण प्रणाली अपनाते है।					
18.	पी0डी0एस0 की सुविधा में सरकार के अत्यधिक हस्तक्षेप से पी0डी0एस0 सुविधा की कार्यप्रणाली कम हो जाती है।					
19.	पी0डी0एस0 सुविधा को सफल बनाने के लिए लोग स्वयं आगें नहीं आते।					
20.	सूचना प्रौद्योगिकी का उपयोग पी0डी0एस0 की सफलता के लिए महत्वपूर्ण है।					
21.	क्या आप ग्राहक के रूप में रियायती दर पर उत्पादों में रूचि रखते है।					
22.	एक ग्राहक के रूप में अपने खाते में सीधी रियायत में रूचि रखते है।					
23.	एक ग्राहक के रूप में पी0डी0एस0 के तहत आप अच्छी गुणवत्ता वाले उत्पादों के स्थान पर कम लागत वाले प्रभावी उत्पादों की उम्मीद रखते हैं।					
24.	पी0डी0एस0 की दुकानों के मालिक समय पर उत्पाद वितरित करते है।					
25.	पी0डी0एस0 की दुकानों के मालिक समय पर उत्पाद ले आते है।					
26.	पी0डी0एस0 अपने उद्देश्यों को प्राप्त कर रहा है।					
27.	पी0डी0एस0 दुकानों पर उत्पादों के आगमन की जानकारी प्राप्त हो जाती है।					
28.	पी0डी0एस0 की दुकान के मालिक के व्यवहार अन्य खुदरा विक्रेताओं के समान है।					
29.	क्या पी0डी0एस0 को अधिक प्रभावित बनाने हेतु पैट्रोलियम पदार्थो की भांति स्वतन्त्र वितरण प्रणाली का रूप दिया जाये।					
30.	पी0डी0एस0 दुकानों से समान लेना एक जटिल प्रक्रिया है।					

भाग 'ग'

पी0डी0एस0 से जुड़ी निम्नलिखित चुनौतियों को प्राथमिकता अनुसार क्रम में लगाए -

1. उत्पाद की गुणवत्ता कम होना
2. उत्पाद की उपलब्धता कम होना
3. दुकानदार का खराब व्यवहार
4. उत्पाद के विषय में सूचनाओं का अभाव
5. पी0डी0एस0 की सुविधा आसानी से उपलब्ध न होना
6. कीमत में बहुत अंतर न होना
7. अनुचित कीमत लेना
8. आधुनिकीकरण का निम्न स्तर होना
9. स्टॉक का अतिशीघ्र समाप्त होना
10. प्रस्तुतिकरण का निम्न स्तर
11. निर्धारित समय का पालन न करना।
12. उत्पाद का सही रख-रखाव/प्रदर्शन न हो।
13. अन्य .....

Annexure-B

PUBLICATION FROM THE PRESENT RESEARCH

1. Singhal, P. (2015). A Study of Scope, Philosophy and Usage of Public Distribution System to Achieve Food Security. *International Journal of Engineering Technology, Management and Applied Sciences,* 3, pp. 72-76**.**
2. Singhal,P., Agarwal, R., & Sharma, V. (2016). Significance of Supply Chain Management in Public distribution System. *Journal* of Supply *chain management System*, 5(1), pp. 27-32.