CHAPTER - II
REVIEW OF LITERATURE ON SUPPLY CHAIN MANAGEMENT

Literature and contemporary studies on supply chain management and logistics management in Fertilizer Marketing Systems have been limited. The Industry has been active only during the past two decades. The major policies and operations had been in the area of developing adequate production capacity as a part of import substitution and to generate base level demand for fertilizer products and improved cultivation practices.

The supply chain management and logistics management in Fertilizer Marketing Systems had been largely confined to distribution activities i.e. outbound logistics as the part of inbound logistics is limited. Fertilizer marketing had been more on the lines of Public Distribution System (PDS) and had little consumer orientation. The literatures available are therefore not on supply chain management and logistics management in Fertilizer Marketing Systems. In the recent times, Academicians, Researchers and Management executives are focusing attention on the several aspects of the industry.

An elaborate review of the literature has been made with a view to analyze the nature and scope of several studies pioneered so far in the fields of fertilizers supply chain management and logistics management. The main objective of this review is to evaluate the current level of knowledge and to focus on the objectives of the present study i.e. a shift from known to unknown.

The thoughts and concepts of Academicians at Universities, including Fertilizer Marketing executives, Professionals at the Fertilizer Association of India (FAI) New-Delhi, Agricultural University, Management Schools (IIMs) The contents in their publications, have been critically reviewed. This overview brings out some of the highlights of the literature.

Relevant books, Newspapers, Magazines, Journals seminar reports. Case study materials containing key issues on several aspects of supply chain
management and logistics management in Fertilizer Marketing Systems such as primary and supportive activities of supply chain management and logistics management in Fertilizer Marketing System, distribution systems, inventory management, MIS, have been made. The highlights of the concepts discussed, the suggestions and recommendations made in the several literatures pertaining to supply chain management and logistics management in Fertilizer Marketing System etc. are summarized. The arrangement of the reviews / summaries are not in chronological order but placed according to the international and Indian perspectives.

2.1 REVIEW OF LITERATURE ON SUPPLY CHAIN MANAGEMENT: INTERNATIONAL PERSPECTIVE

The supply chain, also known as value chain is a concept from business management that was first described and popularized by Michael Porter in his book, Competitive Advantage: Creating and Sustaining Superior Performance. Porter, M. E. (1985).

Fig. 2.1 Michael Porter value chain

The definitions provided by various authors vary according to their area of focus and the industry they are trying to analyze. What can be seen from the bulk

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of the literature on supply chain management in the area of particularly agricultural products?

A broader definition is given by Raphael Kaplinsky and Mike Morris (2000)\(^6\). Which defines the value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use? The definition recognizes the flow of services as well as products in value chains.

According to a USAID brief (2008)\(^7\) The premise underlying both value chain and cluster approaches is that individual firms often face sector-level constraints that they cannot address alone. Therefore, any effort to increase competitiveness must do more than support individual firms, since inter-firm cooperation is important to achieving this goal. These two approaches have common intellectual roots in Harvard’s Michael Porter, who played a key role in developing both theories.

The differences between the approaches may be subtle. The value chain approach considers a broad market system and the development of products/services from input suppliers to end market buyers. Essentially, the value chain focuses on the flow of a developmental process. It differs from a supply chain in its emphasis on creating \textit{value} in each segment of the chain (2008)\(^8\).

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\(^7\) ‘United States Agency for International Development Value Chains and the cluster approach: best practices in transforming relationships to increase competitiveness and micro REPORT # 148, prepared by Chenomics International under contract to AMAP P.1’

\(^8\) ‘Value Chains and the cluster approach: best practices in transforming relationships to increase competitiveness and micro REPORT # 148, prepared by Chenomics International under contract to AMAP P.4’
According to Jon Hellin and Madelyn Meijer (2006)\(^9\) the most important step in doing a value chain analysis is mapping the market, “If we want to understand more about the rationale behind farmers’ decisions vis-à-vis the types of seeds that farmers purchase etc. then we also need to know about the extraneous factors that influence the way that the value chain works. This is where the market map comes in useful. The market map is a conceptual and practical tool that helps us identify policy issues that may be hindering or enhancing the functioning of the chain and also the institutions and organizations providing the services (e.g. market information, quality standards) that the different chain actors need in order to make better informed decisions”.

The term upgrading refers to improvements in one or more of four different areas, as defined by Kaplinsky and Morris (2000)\(^10\)

**Process Upgrading:** Increasing the efficiency of internal processes such that these are significantly better than their rivals, both within individual links in the chain and between links.

**Product Upgrading:** Introducing new products or improving old products faster than rivals

**Functional Upgrading:** Increasing value added by changing the mix of activities conducted within the firm

**Chain (or Channel) Upgrading:** Moving to a new value chain, e.g., switching from the production of transistor radios to calculators, or moving to a new market channel.

An example of process upgrading might be an increase in productivity due to mechanization, such as increased agricultural output from irrigation. A well

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\(^9\) ‘Guidelines for Value Chain Analysis. p.422,’
known example of product upgrading, also from agriculture, is an improvement of
the product so that it complies with food safety standards. Functional upgrading
occurs when a firm takes on new functions, such as when an in-country
intermediary decides to become an exporter or when an MSE producer buys a
truck and begins brokering on behalf of other producers in a distant wholesale
market. Channel upgrading occurs when firms begin to sell in new end markets,
while inter-sectoral (inter-chain) upgrading occurs when firms move to a
completely different sub sector.

Supply chain management (SCM) is the management of a network of
interconnected businesses involved in the ultimate provision of product and
service packages required by end customers (Harland, 1996)\textsuperscript{11}. Supply chain
management spans all movement and storage of raw materials, work-in-process
inventory, and finished goods from point of origin to point of consumption.

Fig. 2.2 Supply Chain Management: Relationships\textsuperscript{12}

\textsuperscript{11} ‘Supply Chain Management, Purchasing and Supply Management, Logistics, Vertical Integration, Materials
Management. UK: Blackwell.’

\textsuperscript{12} ‘Supply Chain Management: Relationships, Chains and Networks British Journal of Management December 1996
Volume 7’
Organizations increasingly find that they must rely on effective supply chains, or networks, to compete in the global market and networked economy. In Peter Drucker's (1998) this concept of business relationships extends beyond traditional enterprise boundaries and seeks to organize entire business processes throughout a value chain of multiple companies.

During the past decades, globalization, outsourcing and information technology have enabled many organizations, such as Dell and Hewlett Packard, to successfully operate solid collaborative supply networks in which each specialized business partner focuses on only a few key strategic activities (Scott, 1993). This inter-organizational supply network can be acknowledged as a new form of organization. However, with the complicated interactions among the players, the network structure fits neither "market" nor "hierarchy" categories (Powell, 1990). It is not clear what kind of performance impacts different supply network structures could have on firms, and little is known about the coordination conditions and trade-offs that may exist among the players. From a systems perspective, a complex network structure can be decomposed into individual component firms (Zhang and Dilts, 2004). Traditionally, companies in a supply network concentrate on the inputs and outputs of the processes, with little concern for the internal management working of other individual players. Therefore, the

14 'Baziopulousos, 2004 Mac Duffie and Helper, 1997; Monden, 1993; Womack and Jones, 1996; Gunasekaran, 1999  
Drucker, 1998; Tapscott, 1996; Dilts, 1999  
15 'Developments in Theories of Supply Chain Management: The Case of B2B Electronic Marketplace Adoption, The  
16 'An Easily Implemental Hierarchical Heuristic for a Two-Echelon Spare Parts Distribution System. IIE Transactions  
31, pp. 977–988.'
choice of an internal management control structure is known to impact local firm performance (Mintzberg, 1979)\textsuperscript{17}.

Supply chain management is the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole (Mentzer\textit{et al}, 2001)\textsuperscript{18}.

A customer focused definition is given by Hines (2004)\textsuperscript{19} "Supply chain strategies require a total systems view of the linkages in the chain that work together efficiently to create customer satisfaction at the end point of delivery to the consumer. As a consequence costs must be lowered throughout the chain by driving out unnecessary costs and focusing attention on adding value. Throughout efficiency must be increased, bottlenecks removed and performance measurement must focus on total systems efficiency and equitable reward distribution to those in the supply chain adding value. The supply chain system must be responsive to customer requirements."

Global supply chain forum - supply chain management is the integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders (Lambert, 2008)\textsuperscript{20}.

According to the Council of Supply Chain Management Professionals (CSCMP), supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics

\begin{itemize}
  \item \textsuperscript{20}‘Supply Chain Management: Processes, Partnerships, Performance, 3rd edition, 2008.’
\end{itemize}
management. It also includes the crucial components of 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. More recently, the loosely coupled, self-organizing network of businesses that cooperate to provide product and service offerings has been called the

A supply chain, as opposed to supply chain management, is a set of organizations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer. Managing a supply chain is 'supply chain management' (Mentzer et al., 2001)\textsuperscript{21}.

In the 21st century, changes in the business environment have contributed to the development of supply chain networks. First, as an outcome of globalization and the proliferation of multinational companies, joint ventures, strategic alliances and business partnerships, significant success factors were identified, complementing the earlier "Just-In-Time", "Lean Manufacturing" and "Agile Manufacturing" practices. Second, technological changes, particularly the dramatic fall in information communication costs, which are a significant component of transaction costs, have led to changes in coordination among the members of the supply chain network (Coase, 1998)\textsuperscript{22}.

Many researchers have recognized these kinds of supply network structures as a new organization form, using terms such as "Keiretsu", "Extended Enterprise", "Virtual Corporation", "Global Production Network", and "Next Generation Manufacturing System". In general, such a structure can be defined as "a group of semi-independent organizations, each with their capabilities, which


\textsuperscript{22} Alliance advantage: The art of creating value through partnering. Cambridge, MA: Harvard Business School Press.
collaborate in ever-changing constellations to serve one or more markets in order to achieve some business goal specific to that collaboration” (Ackerman’s, 2001).  

Three major movements can be observed in the evolution of supply chain management studies: Creation, Integration, and Globalization (Movahedi et al., 2009),

a) Creation

The term supply chain management was first coined by a U.S. industry consultant in the early 1980s. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to the Japanese practice of management.

b) Integration

This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems in the 1960s and developed through the 1990s by the introduction of Enterprise Resource Planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of internet-based collaborative systems. This era of supply chain


evolution is characterized by both increasing value-adding and cost reductions through integration.

In fact a supply chain can be classified as a Stage 1, 2 or 3 networks. In stage 1 type supply chain, various systems such as Make, Storage, Distribution, Material control, etc are not linked and are independent of each other. In a stage 2 supply chain, these are integrated under one plan and are ERP enabled. A stage 3 supply chain is one in which vertical integration with the suppliers in upstream direction and customers in downstream direction are achieved. An example of this kind of supply chain is Tesco.

c) Globalization

The third movement of supply chain management development, the globalization era can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains over national boundaries and into other continents. Although the use of global sources in the supply chain of organizations can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, value-adding, and reducing costs through global sourcing.

The geographic placement of production facilities, stocking points, and sourcing points is the natural first step in creating a supply chain. The location of facilities involves a commitment of resources to a long-term plan. Once the size, number, and location of these are determined, so are the possible paths by which the product flows through to the final customer. These decisions are of great significance to a firm since they represent the basic strategy for accessing customer markets, and will have a considerable impact on revenue, cost, and level
of service. These decisions should be determined by an optimization routine that considers production costs, taxes, duties and duty drawback, tariffs, local content, distribution costs, production limitations, etc.

Breitman and Lucas (1987)²⁵ attempt to provide a framework for a comprehensive model of a production-distribution system, "PLANETS", that is used to decide what products to produce, where and how to produce it, which markets to pursue and what resources to use. Parts of this ambitious project were successfully implemented at General Motors.

Cohen and Lee (1985)²⁶ developed a conceptual framework for manufacturing strategy analysis, where they describe a series of stochastic sub-models, that considers annualized product flows from raw material vendors via intermediate plants and distribution echelons to the final customers. They use heuristic methods to link and optimize these sub-models. They later give an integrated and readable exposition of their models and methods in Cohen and Lee (1988)²⁷.

Cohen and Lee (1989)²⁸ present a normative model for resource deployment in a global manufacturing and distribution network. Global after-tax profit (profit-local taxes) is maximized through the design of facility network and control of material flows within the network. The cost structure consists of variable and fixed costs for material procurement, production, distribution and

transportation. They validate the model by applying it to analyze the global manufacturing strategies of a personal computer manufacturer.

Arntzen, Brown, Harrison, and Trafton (1995)\textsuperscript{29} provide the most comprehensive deterministic model for supply chain management. The objective function minimizes a combination of cost and time elements. Examples of cost elements include purchasing, manufacturing, pipeline inventory, transportation costs between various sites, duties, and taxes. Time elements include manufacturing lead times and transit times. Unique to this model was the explicit consideration of duty and their recovery as the product flowed through different countries. Implementation of this model at the Digital Equipment Corporation has produced spectacular results - savings in the order of $100 million dollars.

The thrust of the rough cut models is the development of inventory control policies, considering several levels or echelons together. These models have come to be known as "multi-level" or "multi-echelon" inventory control models. For a review the reader is directed to Volkmann et al. (1992)\textsuperscript{30}.

Multi-echelon inventory theory has been very successfully used in industry. Cohen et al. (1990)\textsuperscript{31} describe "OPTIMIZER", one of the most complex models to date to manage IBM's spare parts inventory. They develop efficient algorithms and sophisticated data structures to achieve large scale systems integration.


According to Lambert and Cooper (2008)\textsuperscript{32}, operating an integrated supply chain requires a continuous information flow. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes stated by Lambert are:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Supplier relationship management
- Product development and commercialization
- Returns management

Much has been written about demand management. Best-in-Class companies have similar characteristics, which include the following: a) Internal and external collaboration b) Lead time reduction initiatives c) Tighter feedback from customer and market demand d) Customer level forecasting

One could suggest other key critical supply business processes which combine these processes stated by Lambert such as:

- Customer service management
- Procurement
- Product development and commercialization
- Manufacturing flow management/support
- Physical distribution
- Outsourcing/partnerships

\textsuperscript{32} ‘Lambert, Douglas M.Supply Chain Management: Processes, Partnerships, Performance, 3rd edition, 2008’
Performance measurement

Experts found a strong relationship from the largest arcs of supplier and customer integration to market share and profitability. Taking advantage of supplier capabilities and emphasizing a long-term supply chain perspective in customer relationships can both be correlated with firm performance. As logistics competency becomes a more critical factor in creating and maintaining competitive advantage, logistics measurement becomes increasingly important because the difference between profitable and unprofitable operations becomes narrower. A.T. Kearney Consultants (1985)\(^{33}\) noted that firms engaging in comprehensive performance measurement realized improvements in overall productivity. According to experts, internal measures are generally collected and analyzed by the firm including:

- Cost
- Customer Service
- Productivity measures
- Asset measurement, and
- Quality.

External performance measurement is examined through customer perception measures and "best practice" benchmarking, and includes 1) customer perception measurement, and 2) best practice benchmarking. Currently there is a gap in the literature available on supply chain management studies: there is no theoretical support for explaining the existence and the boundaries of supply chain management. A few authors such as Alderson, et al. (2003)\(^{34}\),

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\(^{33}\) ‘Material Management By PawanArora Global India Publications, 01-Dec-2008 Page 72

\(^{34}\) ‘Inter-organizational theories behind Supply Chain Management – discussion and applications, In Seuring, Stefan et al. (eds.), Strategy and Organization in Supply Chains, PhysicaVerlag.’
Ketchen and Hult (2006) and Lavassani, et al. (2009)\textsuperscript{35} have tried to provide theoretical foundations for different areas related to supply chain by employing organizational theories. These theories include:

- Resource-Based View (RBV)
- Transaction Cost Analysis (TCA)
- Knowledge-Based View (KBV)
- Strategic Choice Theory (SCT)
- Agency Theory (AT)
- Institutional theory (InT)
- Systems Theory (ST)
- Network Perspective (NP)
- Materials Logistics Management (MLM)
- Just-in-Time (JIT)
- Material Requirements Planning (MRP)
- Theory of Constraints (TOC)
- Total Quality Management (TQM)
- Agile Manufacturing
- Time Based Competition (TBC)
- Quick Response Manufacturing (QRM)
- Customer Relationship Management (CRM)

The SCM components are the third element of the four-square circulation framework. The level of integration and management of a business process link is a function of the number and level, ranging from low to high, of components added to the link (Ellram and Cooper, 1990; Houlihan, 1985)\textsuperscript{36}. Consequently,


\textsuperscript{36} ‘Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy. The International Journal of Logistics Management, 4, 2, 13-24.'
adding more management components or increasing the level of each component can increase the level of integration of the business process link. The literature on business process re-engineering, buyer-supplier relationships, and SCM suggests various possible components that must receive managerial attention when managing supply relationships. Lambert and Cooper (2000)\textsuperscript{37} identified the following components:

- Planning and control
- Work structure
- Organization structure
- Product flow facility structure
- Information flow facility structure
- Management methods
- Power and leadership structure
- Risk and reward structure
- Culture and attitude

However, a more careful examination of the existing literature leads to a more comprehensive understanding of what should be the key critical supply chain components, the "branches" of the previous identified supply chain business processes, that is, what kind of relationship the components may have that are related to suppliers and customers.

Bower sox and Closs states that the emphasis on cooperation represents the synergism leading to the highest level of joint achievement\textsuperscript{38}. A primary level channel participant is a business that is willing to participate in the inventory

\textsuperscript{37} ‘Supply Chain Management: More Than a New Name for Logistics. The International Journal of Logistics Management Vol 8, Iss 1, pp 1–14’

ownership responsibility or assume other aspects of financial risk, thus including primary level components\textsuperscript{39}. A secondary level participant (specialized) is a business that participates in channel relationships by performing essential services for primary participants, including secondary level components, which support primary participants. Third level channel participants and components that support the primary level channel participants and are the fundamental branches of the secondary level components may also be included.

Consequently, Lambert and Cooper's framework of supply chain components does not lead to any conclusion about what are the primary or secondary (specialized) level supply chain component. That is, what supply chain components should be viewed as primary or secondary, how should these components be structured in order to have a more comprehensive supply chain structure, and how to examine the supply chain as an integrative one.

Reverse supply chain Reverse logistics is the process of managing the return of goods. Reverse logistics is also referred to as "Aftermarket Customer Services". In other words, any time money is taken from a company's warranty reserve or service logistics budget one can speak of a reverse logistics operation\textsuperscript{40}.

In order to become a single point of contact for clients, logistics companies may pursue acquisitions or alliances, which, however, pose the challenge of integration of diverse cultures. Attracting, recruiting, training, motivating and retaining management talent are also a great challenge that logistics managers need to take on (Lieb and Butner, 2007)\textsuperscript{41}.

\textsuperscript{39} ‘Supply Chain Logistics Management McGraw-Hill/Irwin, 3 Mar 2009 – 480 p. 93
\textsuperscript{40} ‘Reverse logistics: quantitative models for closed-loop supply chains Springer, 2004 - Business & Economics’
\textsuperscript{41} ‘Supply Chain Forum An International Journal Vol. 8 - N°1 – 2007’
2.2 REVIEW OF LITERATURE ON SUPPLY CHAIN MANAGEMENT: INDIA PERSPECTIVE

A survey of North American LSPs (Bagchi and Mitra, 2006)\(^{42}\) found that logistics managers perceived internationalization of operations, industry focus or specialization, investment in information systems, availability of skilled logistics professionals, integration of supply chains, customer focus and breadth of service offerings as the most important factors for success as a LSP. However, the survey identified significant gaps between expectations and actual achievements of LSPs with respect to internationalization of operations, skilled logistics professionals and integration of supply chains, which should be seriously looked into by managers. The survey also established relationships among a set of performance metrics and key success factors to identify significant predictor and criterion variables. One of the most important observations was that collaborative relationships with clients and investments in assets are necessary but not sufficient conditions for success in logistics. The findings of the survey may provide a useful guideline to logistics managers for allocation of scarce resources.

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2.3 REVIEW OF LITERATURE ON LOGISTICS MANAGEMENT:
INTERNATIONAL PERSPECTIVE

Donald J.43 has brought out the importance of logistics in marketing management both from the point of serving consumers and organizational efficiencies. The objective of logistics is to deliver finished products in correct quantities, when required, in the right form, to the location needed at the lowest cost. It is through the logistics that the products flow in to the vast network of distribution channels and finally the ultimate consumers. The goal of logistical performance is to achieve a predetermined level of production-marketing support at the lowest possible aggregate cost.

2.4 REVIEW OF LITERATURE ON LOGISTICS MANAGEMENT:
INDIA PERSPECTIVE:

Shanthi Narayan (1984) has brought out the need for adopting a systems approach in fertilizer distribution; Fertilizer is a significant and basic input for the growth of Indian agriculture. The challenges to cope with distribution of fertilizers from present level of 12.2 million Tons to nearly 20 million tons per annum by the turn of the century large scale stream lining of the current system and the infrastructure, are brought out. Development of logistic support for distribution of fertilizers was undertaken by GOI as a conscious effort to give a fillip to the growth of the industry. The paper analyze the-inter model mix of fertilizer

movement by rail and road during the past two decades and brings out the steep fall in the proportion of fertilizer moved by rail during this period.

To generate awareness, the government may organize seminars, workshops, exhibitions and meetings to bring in representatives of logistics users, service providers and government under one roof, and also sponsor courses in leading Indian institutes to attract talent. Growth of the logistics industry in India will not only contribute to the GDP, but also generate employment (Mitra, 2006)\textsuperscript{44}.

The globalization, the free market and the competition has required that the customer gets the right material, at the right time, at the right point and in the right condition… at the lowest cost. Logistics plays an important role in this condition. But in Marketing of fertilizers, particularly the logistics part did not improve as much as needed. Shortages of fertilizers followed by gluts, non-availability of the right type of fertilizers at the right places have been the common phenomenon of the Indian Fertilizer Marketing system. Such an inconsistent situation in the fertilizer availability and inefficient public Distribution System.(FAI Annual review 92-93)\textsuperscript{45}.

A study conducted by H.K.LakshmanRao at Madras Fertilizers Ltd. (1985-86)\textsuperscript{46}. (PDS) in fertilizer adversely affected an orderly development of consumption. Small to Medium sized holdings farmers were unable to adopt a consistent approach with regard to usage of fertilizer products due to uncertainty of the availability of the products of their choice.

The Sivaraman committee, appointed by Government of India (GOI)\textsuperscript{47} for studying the marketing aspects reported in the mid 70s that the marketing and

\textsuperscript{44} ‘A survey of Indian third-party logistics service providers. IIMB Management Review, 18 (2), 159-174.’
\textsuperscript{45} ‘FAI Annual reviews 1992-93 Page 86.’
\textsuperscript{46} ‘A study conducted by H.K.LakshmanRao at Madras Fertilizers Ltd. (1985-86).’
\textsuperscript{47} ‘Report of the high powered committee of GOI.’
distribution of fertilizers were not up to the expectations and the cooperatives which play a major role in the distribution lacked marketing approach.

The institutions providing the infra-structural support to the fertilizer marketing system; warehousing Corporations, system and communication system have not equipped their facilities to meet the growing needs of the industry. In this context, an analysis of consumption of fertilizers is considered important.

The consumption of fertilizers in India has been highly skewed. Only 2% of the districts contribute to 85% of the total consumption and major portion of the consumption is from irrigated crops. Paddy and wheat alone account for 68% of the total consumption of nitrogen, 66% of Phosphate and 66% of Potash. These crops are under irrigated conditions. A vast range of other crops receive only marginal quantum of fertilizers.

At the micro level there is significant variation in the utilization of fertilizers among farmers of the same area. According to a study undertaken by National Council of Economic Research (NCER) during 1989-90⁴⁸, even in Punjab the top user of fertilizers, 8% of the farmers, which accounted for 24% of the cultivated area, no fertilizer was used.

The high rates of crisscross movement, existence of oversupply in some consumption areas and scarcity in some others have been the common features of the industry. The estimates of requirement developed by the state Dept. of agriculture on which GOI has been making allocations have been unscientific.

A study undertaken by LakshmanRao H.K (1985)⁴⁹ at Madras Fertilizers Ltd a fertilizer manufacturing unit revealed that the per hectare consumption of fertilizers is highly correlated to the prosperity of the village. In a group of 27

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⁴⁹ ‘Study undertaken by LakshmanRao H.K. at Madras Fertilizers Ltd.’
villages adopted by Madras Fertilizers in northern Karnataka, the agricultural productivity went up by 233% in a four year period of the adoption. This was due to increased fertilizer consumption, scientific method of cultivation, among other factors. The entire village was transformed and the economy greatly improved. Agriculture productivity can create such dramatic changes in the economy. The study conducted before and after the adoption of the group of villages revealed the immense untapped potential. The group of villages showed demand for a variety of consumer products and consumer durable at the end of the adopted period. The study included control villages of the neighborhood for evaluation of the impact of the program. The study brought out that the farmers are willing to change and adopt better method of cultivation if they are properly guided and agricultural input are ensured. An effective marketing management system in the fertilizer industry is needed to tap the vast hidden potential for fertilizer consumption.

The study conducted by Madras Fertilizers Ltd, in 1985-86 to identify the key factors affecting fertilizer consumption, covering 750 farmers and 100 retail outlets in the southern states revealed the following factors in the order of importance:

1. Adequate and timely availability
2. Weather conditions.
3. Prices of produce
4. Prices of fertilizer products.
5. Credit availability.

Marketing of fertilizers, particularly the logistics part did not improve as much as needed. Shortages of fertilizers followed by gluts, non-availability of the right type of fertilizers at the right places have been the common phenomenon of the Indian Fertilizer Marketing system. Such an inconsistent situation in the
fertilizer availability and inefficient public Distribution System (PDS) in fertilizer adversely affected an orderly development of consumption.

Saleem Ahmed, Chowdhury and others (1992) have made an in depth analysis of several aspects of Fertilizer demand projections and also the agricultural productions based on time series data on past consumption trends of fertilizer consumption and food production estimates for south eastern countries. They contend that time series analysis is best suited for short term forecasting in fertilizers. According to them "To meet the year 2000 projected agricultural production targets would grow by 45% in case of India, and would double in respect of Bangladesh & Nepal and would grow about 77% in case of Pakistan."

Based on their regression model the consumption in India would reach a level of 18.7 Million tons for N & P. The regression coefficient is 22.1 for the factors considered; agricultural productivity and fertilizer used kg/ha square being 0.883. Improving the logistical support for stimulating the consumption growth rate has been suggested. Increasing per hectare consumption level is also considered as an important aspect.

Rama Swamy (1985) covers major fertilizer marketing functions. It describes the process of fertilizer marketing in India as existed prior to 80s. It has brought out the Strengths, Weakness, Opportunities and the Threats (SWOT) of the fertilizer marketing system. It also brings out the need and feasibility of containing the marketing costs in the fertilizer industry. The importance of logistics management in improving the service levels and minimizing the costs has been brought out. The linkages between fertilizer consumption and food production in India has been brought out with comprehensive statistical data

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51 'Ramasamy V.S. (1985). A study of the marketing of fertilizers in India. Published by the Author'
Gupta (1984)\textsuperscript{52} has made a detailed study of the problems and issues relating to marketing of fertilizers. According to his analysis, the cooperatives cover 97\% of the six lakh villages and the membership accounts for 45\% of the rural population. He contends that even though in absolute terms the quantum of fertilizers marketed by the cooperatives has increased, their share has come down from 70 to 45\% partly because of internal problems and partly external. The need to step up the share of cooperatives to 55\% has been emphasized.

Cooperatives have to face the challenges of the emerging marketing environment and to establish as an efficient fertilizer marketing agency. For meeting this challenge the cooperatives should be free to make decisions on stocking, transportation, and consumer services. The strengths and weaknesses of the cooperative system have been brought out.

Vittal (1984)\textsuperscript{53} has brought out the strategies of cost reduction in logistics of fertilizer distribution in a lucid way. He contends that production and distribution of fertilizers in the most efficient manner is an issue of prime national importance. While evolving strategies for cost reduction, the skewed distribution of fertilizers (which has led to skewed consumption) has to be taken into consideration. The suggestions made include product exchange, rationalizations of Marketing zones, application of linear programming for product mix, rail-road mix etc; long term structural changes to remove the skewness in consumption, reduction of the cost of bagging, bulk movements, warehousing, operating capital dealer network. Taxes and levies are application of quantitative techniques in logistics. An effective marketing measure and the important role the policy has played in stimulating the consumption have been emphasized.

\textsuperscript{52} ‘Gupta, Problems and prospects of strengthening cooperatives marketing of fertilizers. FAI annual seminar 1984.’

\textsuperscript{53} ‘FAI seminar 1984 Paper presented.’
Pratap Narayan\textsuperscript{54} study has covered; a brief history of fertilizer pricing in India, subsidy, pricing versus consumption, and the retention price scheme (RPS) and dual pricing. The study analyses trends in fertilizer pricing in India during the past decade and the role it has played in achieving the twin objectives of accelerating the growth of the fertilizer industry on the one hand and serving the poor consumer through facilitating increase in agriculture productivity on the other hand. The RPS has provided an excellent combination of both rigidness and resilience necessary for development of the industry.

The railways would be required to regain their position in the fertilizer transportation in view of their inherent cost and energy efficiency. Next to transportation by water, the rail movement gives the efficiency in terms of energy conservation. The railways should adopt a marketing approach in order to compete with the road in terms of cost and facilities and customer service.

Chauhan. S (1984)\textsuperscript{55} Mechanizations of terminal operations is considered as an urgent need. The aspect of containerization is also broadly discussed. The proportion of train load movements to the overall has to be gradually built up. This would require development of full-rake handling capacities both at terminal and destination points. Nodal points to be identified based on the consumption pattern of fertilizers; facilities such as railway siding, unloading, storage accommodation and the facility for secondary movement should be enhanced.

Karunakaran (1992)\textsuperscript{56} has brought that the Indian Fertilizer marketing Scenario is undergoing a dramatic change and the old ways of promotion and

\textsuperscript{54} ‘Pratap Narayan - Dynamics of Price and Subsidies in fertilizers, FAI Seminar1984’
\textsuperscript{55} ‘Chauhan - Promotional Strategy for stimulating fertilizer use - FAI Seminar1984.’
\textsuperscript{56} ‘Towards Individualized Marketing of Fertilizers - Fertilizer marketing News,Aug. 1992. Published by FAI, New Delhi’
marketing are no longer effective and valid. Segmentation and focused marketing is the only way to improve the productivity in fertilizer marketing. The target groups must be isolated and the technique of niche marketing applied. In the context of hyper activity and imbalance in the fertilizer marketing, the only way to retain the market and win a lasting customer confidence is to resort to individualized marketing. FertilizerMarketers, in order to meet the realities of today, must jettison the traditional mass marketing system and adopt direct personalized marketing based on a clear situation analysis and data base and dialogue with farmers. Intensive farmer contact program (IFCP) carried by some manufacturers must become widespread.

Venkateswaran (1993)\(^ {57}\) deals with the importance of logistics in marketing management. Logistics is the term used in the military operations denotes the activity of moving the soldiers, their arms and ammunitions from their base station to the strategic points. The logistics support during a war is undoubtedly as important as waging the war itself.

Logistics functions forms the spine of manufacturing and marketing organization. Logistics may be defined as the activity of the movement of goods from manufacturer/supplier to their final customer. Logistics provides the most important link between the manufacturer and the customer. The quality of marketing largely depends on how best the products made available to the final consumer. A comprehensive definition of logistics comes from Shapiro and Heskett.\(^ {58}\) The process of strategically managing the movement of supplies, between enterprise facilities, and to customers. He classifies the “Integrated Logistics" tasks into two broad categories, namely, Logistical Operations, consisting of physical distribution, material management and internal inventory

\(^{57}\) 'Marketing of Logistics. Published in the book Marketing of Services concepts and applications by School of Management Studies, Indira Gandhi NationalOpen University (IGNOU), 1993.'

\(^{58}\) 'Logistical Management - Published by MacGrawhill Publishing House, New Delhi.'
transfer and Logistical Co-ordination consisting of product market forecasting, order processing, operation planning and procurement or materials requirement planning. Shapiro and Heskett define the central task of logistical management as “ensuring time, place and quantity utility.

The logistics incorporate a whole set of components such as transportation, Warehousing, Distribution channel, whole seller and retailer and also communications and control.

For the fertilizer industry the transportation mode mix includes Rail and Road, the inland water transportation has not been adequately developed. The economics of transportation by road is determined by a large number of external factors such as:

- Control on full movement of products by the state by the various forms,
- Check posts, etc.
- Condition of roads
- Facilities for communication
- Fuel efficient vehicles
- Information on the market

The January 1992 issue of Fertilizer news" covers highlights of the annual seminar on (Dec.'91)\(^5\) "Optimizing Fertilizer Production, Distribution and usage. The editorial of the issue has observed.” Fertilizer has played a key role in our march towards achieving self-sufficiency in food grains production. While the industry has achieved a great deal, the future is far more challenging than it was in the past. A one million incremental increase in nutrients per annum is required in the 90s, to feed the growing population. The need of the hour is to act fast and remove all bottle-necks, in the way of rapid increase in domestic production and

\(^5\) ‘Report of The HiPowered Committee on Fertilizer Consumer Prices under the Chairmanship of Dr.G.V.K.Rao. Published by FAI, New Delhi.’
consumption. It is imperative to adopt a pragmatic approach so that the industry's health and growth are assured. The seminar provided a forum to assess and reemphasizes the need for effective marketing and focusing on the logistics.” Among the key aspects of the conclusion are

- Rail transportation would continue to be the prominent mode of transportation of fertilizers. Challenges of fertilizer.
- Systematic approach is essential for the fertilizer distribution at the national level retail network is groaning under an increasing load. Retail outlets are not adequately motivated to meet the challenges of the logistics.
- Cooperatives have played an important role in the past. There is an urgent need to remove the bottlenecks to make the channel stronger.

Sexana (1994)60 has made an analysis of the Indian Fertilizer subsidy issue. The development of the fertilizer industry has been critically reviewed since 1960's. Dr. Saxena observes that the development of fertilizer industry in India is synonymous with a rapidly growing agriculture. The withdrawal of subsidy has created imbalance in the use of fertilizer and will have a serious impact if aggressive marketing is not undertaken in the fertilizer industry immediately. He has made a comparison of the food grains production and the agricultural productivity during 1991-92 and 1992-93, to measure the extent of impact of decontrol on P & K. He observes that the aggravation of the imbalance of NPK use may not show up due to the residual effect of P & K already in the soil. The marginal increase in food production from 167 million tons in 1991-92 to 180 million tons in 1992-92 was only due to the residual effect of the fertilizer already in the soil. It should not give an impression that food production increased despite decrease in the level of fertilizer consumption. During the period however the productivity of wheat decreased from 2397kg/hect to 2350kgl hect. He claims that

60 ‘Sexana ”Indian Fertilizer Subsidy Issue” Fertilizer News, December 1993’
in the absence of corrective steps, the trend would reflect significantly lower food production.

Anand Reddy and Sharma\textsuperscript{61} tend that Government of India should not hesitate to increase the price of urea by at least 15 per cent along with a rise in the concessions given to DAP to balance the use and to solve the problem of unbalanced use of chemical fertilizers. Taking advantage of the lessons learnt from the DAP decontrol urea too may be decontrolled in a phased manner. They have shown concern on the sharp decline in the consumption of Phosphates and Potash due to the recent price hike. The consumption of Nitrogen has increased by 5.8\% while that of Phosphates 22.6\% percent and Potash by 5.4\% percent during the season immediately after the control.

2.5 REVIEW OF LITERATURE ON LOGISTICS MANAGEMENT:

ANDHRA PRADESH PERSPECTIVE

SathyaRao&Sandhya (1994)\textsuperscript{62} in their research paper have reviewed the distribution system of fertilizers in Andhra Pradesh based on secondary data of pertaining to 30 fertilizer plants, located in different states, supplying various fertilizer products such as Urea, Ammonium Sulphate, CAN, SSP, DAP, Complex fertilizers to 22 districts of Andhra Pradesh. A distribution model based on L.P. has been adopted for identifying the districts and the plants on a least transportation cost by rail. A saving of 18% has been arrived at based on this model. The study has not taken in to consideration the movement of fertilizers by road which is quite substantial in Andhra Pradesh (30%). Further the study has not taken in to consideration the cost of secondary transportation which the fertilizer dealer I farmer has to incur. The paper has however highlighted the need and the method of controlling the costs o fertilizer marketing. The paper has brought out the current illogical distribution pattern leading to miss cross movements and long leads.

\textsuperscript{62} ‘SathyaRao&Sandhya (1994) ”Cost reduction in fertilizer Logisticsmanagement A scientific Approach, which appeared in the Decision (A management Journal of IIM Calcutta’
2.6 Conclusion

Several researchers from India and abroad has provided their work on supply chain management in fertilizer industry. Nonetheless there is a large scope of inbound and outbound logistics of supply chain management in fertilizer industry and also in NFCL and is still not touched by any one. Hence I choose this gap to study the supply chain management in fertilizer industry with special reference to NFCL.

In this chapter an elaborate literature study has been made. The literature study has provided basic foundation for the research. An attempt has been made to provide an overview of the supply chain management and logistics management in fertilizer industry, covering the industry's role and importance in the national economy, the several facets of the marketing management, the impact of GOI policies and programs in its growth. There is large proportion of inbound and outbound logistics of supply chain management still not touched by the marketing efforts and the researchers. The importance of SCM and logistics management for NFCL areas are not being served by these researches. In the aggregate this segment provides a large potential. The objective of this research is to identify such key resulting areas of SCM that needed for aggressive marketing of fertilizers. The emerging challenges of the industry in the area of marketing with special reference to the SCM and logistics management of NFCL will be discussed.