CHAPTER I

MANAGEMENT OF FERTILIZER MARKETING SYSTEMS

1.1 INTRODUCTION

Agriculture still forms the backbone of the Indian Economy. It has been the basic source of livelihood for centuries. Despite concerted efforts for industrialization, agriculture occupies a very important place in the national economy. Development of rural India is of national importance. Agriculture contributes to a major portion of the national income. Its contributions to the growth of the national economy are many fold. It dominates the economy in providing employment to a high proportion of working population. Over 76% of the population is engaged in this sector. Agriculture has been an important source of supply of raw materials to a significant proportion of the industries which include sugar, cotton textiles, food processing etc; Agriculture plays a dominant role in the field of exports also.\(^2\)

Agricultural development has shown a high degree of interdependence with the infrastructure industry—the transportation, warehousing, packaging (Jute/HDPE). Cooperative distribution channels and other service sector industries have tremendously grown. The purchasing power as also the standard of living of the rural masses have improved consequent to the development in agriculture. Fertilizer has a dominant role to play in increasing the agricultural productivity, improving the purchasing power and thereby stimulating the rural markets for consumer products and consumer durable.

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\(^2\) Ghosh A. G "Indian Economy" 1985 page 178, Published by the world press (P) Ltd., Calcutta 70002.
Fertilizer is the most effective and the most expensive of all the farm inputs. In India, Fertilizer has acquired a tremendous significance in the last two decades. The close linkage among HYV program, fertilizer consumption and food production in India are obvious as reflected in the graph given on page 2a. Promoting the use of adequate doses of fertilizers has been a major component of the agricultural strategy that ushered the "Green Revolution" in India. As a natural sequence to this strategy, marketing of fertilizers has become vital in the economic system of the country.  

A study undertaken by 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 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.

3 Dr. Swaminathan. M.S. "A study of the Marketing of Fertilizers in India" by Dr.Ramaswamy, Madras. (1985) pp 5 & 6. Published by the author at Madras.


Concurrent growth in area under high yielding varieties, fertiliser consumption and food production 1966-67 to 1984-85
Source: Economic Survey 91-92 Government of India Ministry of Finance, New Delhi
Under the concept of Green Revolution and the Grow More Food Campaign programs, the agricultural sector forged ahead during the last forty years. It has been possible to attain self-sufficiency in food grain requirement and achieve a record production of 183 million tonnes per annum in the recent years. The decadal data from 1981 to 1991 shown in graph 3a indicates the growth of food production. This suggests the key role played by fertilizer industry in the food production of the country. Despite all these progress the rate of growth has not been adequate.

The fertilizer industry now consists of private, public and cooperative sectors.

The relative production capacities are given in the following table

**Table No. 1.**

**Capacities of Fertilizer Production**  
**Sector wise 1993**

<table>
<thead>
<tr>
<th></th>
<th>Nitrogen (N)</th>
<th>Phosphate (P)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>000T</td>
<td>%</td>
<td>000T</td>
</tr>
<tr>
<td>Public</td>
<td>4872</td>
<td>47</td>
<td>910</td>
</tr>
<tr>
<td>Cooperative</td>
<td>1866</td>
<td>18</td>
<td>320</td>
</tr>
<tr>
<td>Private</td>
<td>3655</td>
<td>35</td>
<td>59</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10393</td>
<td>100</td>
<td>3002</td>
</tr>
</tbody>
</table>

Source: FAI Fertilizer Statistics- 92-93. p. I-23 Table compiled

Public and cooperative sectors, dominate the industry with 65% of the share for N and 41 for P. In the aggregate these sectors dominate both in terms of production and marketing. A graph depicting sector wise capacities is given in page 3b.
CAPACITIES OF FERTILIZER PRODUCTION
SECTOR WISE 1993

NITROGEN

PHOSPHATE

Public
4672

Cooperative
1866

Private
3666

Public
6782

Cooperative
2186

Private
6427
By the turn of the century, according to planning commission estimates, the capacity would reach a level of 10 million tonnes for N and for P 3 million tons. Trend in the development of fertilizer production capacities during the Five year plan periods are given in graph on page 17. The proportion of public sector would be 47%, cooperatives 18% and private 35% for Nitrogen. For P the public sector would be 30%, coop. 11% and the private sector 59%. The public sector and the cooperative sector would be the major sources of production and supply. The production and marketing decisions would have significant impact on these sectors in the long run.

Manufacturers have been dealing with imported products in addition to their own productions. The volumes marketed by most of the public and cooperative sector manufacturers were significantly higher than their own production.

There are fifty four large scale fertilizer units manufacturing a wide variety of nitrogenous and complex / phosphate fertilizers in the public, private and cooperative sector. A map indicating location of fertilizer factories and an exhibit are given in pages 4a and 4b. Besides there are 87 units producing single super phosphate (SSP)\(^6\). Which indicate a high degree of spread of the SSP units in the country and the related logistics of marketing.

Nitrogen and Phosphate capacities are the highest in the western zone with 3.2 Million tonnes and 33% of the units for N and 1.1 million tonnes for P with 36 units. Eastern Zone has the least capacity both for N & P and the number of units are also least.\(^7\)

The total fertilizer products indigenously produced is 10.5 million tonnes in terms of nitrogen and phosphate. In India Potash is not produced for the

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\(^7\) FAI : Fertilizer News Sept 1993.
LOCATION OF NITROGENOUS AND COMPLEX FERTILISER FACTORIES
(N & NP/NPK)
(As on 1-10-1993)

IN PRODUCTION
UNDER IMPLEMENTATION
APPROVED IN PRINCIPLE
## GENUS AND COMPLEX FERTILIZER FACTORIES

**Location & Production**

<table>
<thead>
<tr>
<th>No.</th>
<th>State/Name of the factory and location</th>
<th>End product</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Rashtriya Chemicals &amp; Fertilisers (R CFL), Trombay (I to V)</td>
<td>Urea, Nitrophosphate, Ammonium, Urea</td>
</tr>
<tr>
<td>28</td>
<td>RCFL, Thal (Vashit) (2 plants)</td>
<td>Urea</td>
</tr>
<tr>
<td>29</td>
<td>SAIL (Fertiliser Plant), Rourkela</td>
<td>CAN</td>
</tr>
<tr>
<td>30</td>
<td>SAIL, Rourkela</td>
<td>AS</td>
</tr>
<tr>
<td>31</td>
<td>FCI, Talcher</td>
<td>Urea</td>
</tr>
<tr>
<td>32</td>
<td>Paradeep Phosphates, Paradeep (I &amp; II)</td>
<td>DAP</td>
</tr>
<tr>
<td>33</td>
<td>NFL, Nagpur (I &amp; II)</td>
<td>CAN, Urea</td>
</tr>
<tr>
<td>34</td>
<td>NFL, Bhatinda</td>
<td>Urea</td>
</tr>
<tr>
<td>35</td>
<td>Punjab National Fertilizers &amp; Chemicals, Naya Nagal</td>
<td>ACI</td>
</tr>
<tr>
<td>36</td>
<td>Shriram Fertilizers &amp; Chemicals (SFC), Kodaikanal</td>
<td>Urea</td>
</tr>
<tr>
<td>37</td>
<td>EID-Parry (India) Ennore</td>
<td>APS, <strong>APS</strong></td>
</tr>
<tr>
<td>38</td>
<td>Madras Fertilizers (MFL), Manall</td>
<td>Urea, DAP, NPK, $Urea</td>
</tr>
<tr>
<td>39</td>
<td>Neyveli Lignite Corp. N, Neyveli</td>
<td>Urea</td>
</tr>
<tr>
<td>40</td>
<td>Southern Petrochemical Industries Corp. (SPIC), Tuticorin</td>
<td>Urea, DAP, NPK</td>
</tr>
<tr>
<td>41</td>
<td>Tuticorin Alkali Chemicals and Fertilizers, Tuticorin</td>
<td>ACI</td>
</tr>
<tr>
<td>42</td>
<td>FCI, Goriakhpur</td>
<td>Urea</td>
</tr>
<tr>
<td>43</td>
<td>ICI India, Pantik</td>
<td>Urea</td>
</tr>
<tr>
<td>44</td>
<td>IFFCO, Aania</td>
<td>Urea, $Urea</td>
</tr>
<tr>
<td>45</td>
<td>IFFCO, Phulpur</td>
<td>Urea, $Urea</td>
</tr>
<tr>
<td>46</td>
<td>Indo Gulf Fertilizers &amp; Chemicals Corporation, Jajidishpur</td>
<td>Urea</td>
</tr>
<tr>
<td>47</td>
<td>HFCL, Durgapur</td>
<td>Urea</td>
</tr>
<tr>
<td>48</td>
<td>Hindustan Lever, Haida</td>
<td>DAP</td>
</tr>
<tr>
<td>49</td>
<td>IISCO, Bumpur-Kulti</td>
<td>AS</td>
</tr>
<tr>
<td>50</td>
<td>SAIL, Durgapur</td>
<td>AS</td>
</tr>
<tr>
<td>51</td>
<td>Chambal Fertilizers &amp; Chemicals, Gadapan, Kodaikanal</td>
<td>$Urea</td>
</tr>
<tr>
<td>52</td>
<td>Bindal Agro-Chem., Shahjanpur</td>
<td>Urea</td>
</tr>
<tr>
<td>53</td>
<td>Tata Chemicals, Babrala</td>
<td>Urea</td>
</tr>
<tr>
<td>54</td>
<td>HFCL, Haidia</td>
<td>Urea, NPK/NPKs</td>
</tr>
</tbody>
</table>

*Under implementation*  
$ = Approved in principle  
# = Based on Bombay High Court's Order.
entire requirement for direct use and for production of complex fertilizers, potash is imported. Under the eighth plan additional capacity is being created with 8 additional units, in addition to improving the production capacity of existing units. The working Group set up by the planning commission has recommended that additional capacity has to be created such that the supply and demand gap for nitrogen should be kept at a minimum. The Current gap between Demand and Supply is given in table No. 2.

**Table No. 2**  
**The projected Demand / Supply Gap by 1994-95**  

<table>
<thead>
<tr>
<th></th>
<th>Nitrogen (N)</th>
<th>Phosphate (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>10.00</td>
<td>4.55</td>
</tr>
<tr>
<td>Production</td>
<td>8.90</td>
<td>3.20</td>
</tr>
<tr>
<td>Gap</td>
<td>1.10</td>
<td>1.35</td>
</tr>
</tbody>
</table>


The table no.2 provides the extent of gap to be filled by imports. Inspite of steep increase in production on to about 9 million tons of Nitrogen and over 3 million tonnes of phosphates. The gap is also widening year after year due to increase in consumption.

It was anticipated that by the end of the VII plan that the production capacity and the actual production would substantially increase and would narrow down the gap. But the tempo of creation of new and additional capacity has come down due to Governmental policies on subsidies and price control. The private investment in the fertilizer industry is shying away. On the other hand the consumption has been growing leaving a gap of 1.40 million tonnes of Nitrogen and 1.35 million tonnes of Phosphate. The gap is filled by imports. and additional capacities would be planned for the turn of the century. The map in 5 provides statewise production during 1992-93.

The utilization of the capacity had been showing a steep increase year after year both for nitrogen and phosphates. In case of nitrogen the capacity
PRODUCTION OF N & P - 1993

ZONE WISE - '0000T

<table>
<thead>
<tr>
<th>Zone</th>
<th>N</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAST</td>
<td>591</td>
<td>403</td>
</tr>
<tr>
<td>NORTH</td>
<td>1983</td>
<td>103</td>
</tr>
<tr>
<td>SOUTH</td>
<td>1317</td>
<td>830</td>
</tr>
<tr>
<td>WEST</td>
<td>3539</td>
<td>985</td>
</tr>
</tbody>
</table>

7430 2321
utilization increased from 52.8% in 1980-81 to 83% in 1989-90. During the same period in case of phosphate the increase was from 65.9% to 86.8%.

Table No. 3
Capacity utilization trend
Percentages

<table>
<thead>
<tr>
<th>Year</th>
<th>Nitrogen (N)</th>
<th>Phosphate (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-81</td>
<td>52.8</td>
<td>65.9</td>
</tr>
<tr>
<td>81-82</td>
<td>66.8</td>
<td>69.3</td>
</tr>
<tr>
<td>82-83</td>
<td>62.7</td>
<td>70.0</td>
</tr>
<tr>
<td>83-84</td>
<td>67.0</td>
<td>70.0</td>
</tr>
<tr>
<td>84-85</td>
<td>74.4</td>
<td>65.9</td>
</tr>
<tr>
<td>85-86</td>
<td>75.5</td>
<td>69.3</td>
</tr>
<tr>
<td>86-87</td>
<td>79.1</td>
<td>80.1</td>
</tr>
<tr>
<td>87-88</td>
<td>77.6</td>
<td>71.5</td>
</tr>
<tr>
<td>88-89</td>
<td>85.2</td>
<td>71.5</td>
</tr>
</tbody>
</table>


Capacity utilization trends are reflected in the graph 6a

There has been a significant increase in the capacity utilization both for Nitrogen and Phosphate during the decade 1980 - 90. This is due to the support given by Government of India for production through the subsidy and increased consumption rates as a result of marketing efforts.

The above trend of the utilization of the existing capacity, reveals a significant drop more particularly in case of P. The decontrol of P in August 92, and the consequent steep increase in prices affected the demand for P by over 30%. The inventory of products started increasing with the fall in demand and the Fertilizer manufacturing units started cutting back on production. This resulted in the reduction utilization of production capacities. Further the labour problem and availability of raw materials, and easy imports due to de-canalization also affected the capacity utilization.

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YEAR-WISE CAPACITY UTILIZATION (IN PERCENTAGE)

**NITROGEN**

<table>
<thead>
<tr>
<th>Year</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-81</td>
<td>52.8%</td>
</tr>
<tr>
<td>81-82</td>
<td>66.8%</td>
</tr>
<tr>
<td>82-83</td>
<td>62.7%</td>
</tr>
<tr>
<td>83-84</td>
<td>67%</td>
</tr>
<tr>
<td>84-85</td>
<td>74.4%</td>
</tr>
<tr>
<td>85-86</td>
<td>75.5%</td>
</tr>
<tr>
<td>86-87</td>
<td>79.1%</td>
</tr>
<tr>
<td>87-88</td>
<td>77.9%</td>
</tr>
<tr>
<td>88-89</td>
<td>85.2%</td>
</tr>
<tr>
<td>89-90</td>
<td>83%</td>
</tr>
</tbody>
</table>

**PHOSPHATES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-81</td>
<td>85.9%</td>
</tr>
<tr>
<td>81-82</td>
<td>69.3%</td>
</tr>
<tr>
<td>82-83</td>
<td>70%</td>
</tr>
<tr>
<td>83-84</td>
<td>65.9%</td>
</tr>
<tr>
<td>84-85</td>
<td>69.3%</td>
</tr>
<tr>
<td>85-86</td>
<td>80.1%</td>
</tr>
<tr>
<td>86-87</td>
<td>71.5%</td>
</tr>
<tr>
<td>87-88</td>
<td>86.8%</td>
</tr>
<tr>
<td>88-89</td>
<td>65.5%</td>
</tr>
<tr>
<td>89-90</td>
<td>65.5%</td>
</tr>
</tbody>
</table>

Source: Annual Report 90-91, Ministry of Fertilizers, GOI
With a view to attract private additional investment in the Fertilizer Industry, GOI had introduced the Retention Price Scheme (RPS). The scheme was meant to ensure a reasonable return on the investment and facilitating healthy development and growth. The RPS enabled increasing production capacities and increasing the consumption. The graph on page 7a brings out the trends investment in fertilizer industry sectorwise.

The public sector and the cooperative sector together account for a major proportion of the capacity in the fertilizer industry (74% for Nitrogen and 41% for Phosphate) as given in the following table No.4.

**Table No 4.**
Production capacity sector wise - 1985

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Public Sector</th>
<th>N 000 T</th>
<th>P 000 T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fertilizer corporation of India Sindhri/Ramagundum/Gorakpur</td>
<td>836</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Hindustan Fertilizer Corporation Ltd. Namrup</td>
<td>653</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Fertilizers &amp; Chemicals Travancore Ltd. Cochin</td>
<td>311</td>
<td>149</td>
</tr>
<tr>
<td>4.</td>
<td>Rastriya Chemicals &amp; Fertilizers Ltd. Bombay</td>
<td>1000</td>
<td>120</td>
</tr>
<tr>
<td>5.</td>
<td>Madras Fertilizers Ltd. Madras</td>
<td>176</td>
<td>112</td>
</tr>
<tr>
<td>6.</td>
<td>Steel Authority of India Rourkela</td>
<td>120</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Neyveli Lignite Corpn. Neyveli</td>
<td>70</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Paradeep Phosphate Paradeep</td>
<td>130</td>
<td>331</td>
</tr>
<tr>
<td>9.</td>
<td>National Fertilizers Ltd. Nangal</td>
<td>1036</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Total Public Sector</strong></td>
<td><strong>4332</strong></td>
<td><strong>819</strong>*</td>
</tr>
</tbody>
</table>

Cooperative Sector:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Cooperative Sector</th>
<th>N 000 T</th>
<th>P 000 T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Indian Farmers Fertilizer Coop Ltd. Kalol/Kandla/Phulpur/Anola.</td>
<td>864</td>
<td>309</td>
</tr>
<tr>
<td>2.</td>
<td>Krishak Bharathi Coop. Ltd.</td>
<td>668</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Total Coop. Sector</strong></td>
<td><strong>1532</strong></td>
<td><strong>309</strong></td>
</tr>
</tbody>
</table>

*(54%)* *(30%)*
INVESTMENT PATTERN IN FERTILIZER INDUSTRY SECTOR WISE

![Bar Chart]

**Note:** Capacity and investment at the end of each Plan period (Ist to VIIIth)

Source: Fertilizer Statistics 92-93, Published by Fertilizer Association of India, New Delhi
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Public Sector</th>
<th>N 000 T</th>
<th>P 000 T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Private Sector</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Gujarat state fertilizer co, Baroda</td>
<td>236</td>
<td>188</td>
</tr>
<tr>
<td>2</td>
<td>Coramendal Fertilizers Ltd. Vizak</td>
<td>84</td>
<td>104</td>
</tr>
<tr>
<td>3</td>
<td>Sriram Fert. Kota</td>
<td>152</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Zuari Agro Chemicals Ltd., Goa</td>
<td>310</td>
<td>111</td>
</tr>
<tr>
<td>5</td>
<td>SPIC Tuticorin</td>
<td>493</td>
<td>191</td>
</tr>
<tr>
<td>6</td>
<td>Mangalore Chemicals &amp; Fert. Mangalore</td>
<td>181</td>
<td>63</td>
</tr>
<tr>
<td>7</td>
<td>E.I.D. Parry Madras</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><strong>Total Private Sector</strong></td>
<td>2284*</td>
<td>1622*</td>
</tr>
<tr>
<td></td>
<td>(27%)</td>
<td>(59%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td>8148</td>
<td>2750</td>
</tr>
</tbody>
</table>

Source: Ministry of Fertilizers annual report 1985. * includes other small & SSP units.

Although the production capacity is over 8 million tonnes for Nitrogen and 2.8 million tonnes for P the utilization of capacity has not been adequate.

Discussions with a sample of executives reveal that major factors for loss of production were equipment break down, shortage of raw materials, power & water, lack of consistent demand financial constraints (non payment of outstanding subsidies by Govt.). While efforts for increasing the production should continue, the problems confronted by the units in utilizing the capacity should be eliminated.

The Eighth Five Year Plan has given priority to the growth and diversification of agriculture. Even though crop production and productivity have improved significantly over the years, there are striking regional imbalances.
Fertilizer has a dominant role to play in improving the agricultural productivity of the country particularly in the context of steeply decreasing availability of land for agriculture and the urgent need for intensive cultivation. Fertilizer is food for the plant. Crop after crop would remove the nutrients of the soil. It has to be replenished through organic manures and fertilizers. Chemical fertilizers provide the nutrients required for the plants for better growth, higher yields. The consumption of fertilizers is highly correlated to the cost benefit (Economics of fertilizer use).

The Fertilizers Marketing Systems more particularly logistics of fertilizers were oriented to irrigated crops and medium and large farmers. The retail outlets, storage points and other facilities were developed only to serve irrigated tracks. The development of consumption in the non irrigated area and also in remote areas were neglected due to improper logistic management. Irrigation accounts only 27% of the cultivated area in India.9

Farmers and planters are the major customers for the fertilizer products, a small percentage of fertilizers is also used in the production of animal feeds. Fertilizer is a technical products requiring knowledge of its composition and use. The consumers do not have adequate educational background to understand and appreciate the need and importance of the right application of fertilizers. Fertilizer marketing in India has hence become very complex.

India is the fourth largest fertilizer consumer in the world in aggregate terms but ranks only the 9th in terms of consumption per hectare of land even among the developing countries of Asia.10

9 Report of the high powered committee of GOI.
10 Report of the high powered committee of GOI.
During 90-91, the per hectare (arable land) consumption of fertilizer (NPK) was 278 kg in China, 74 kg in India, 102 in Bangladesh, 91 kg in Pakistan, 90 kg in Sri Lanka and 27 kg in Nepal. The productivity of Indian agriculture has been very low. During 90-91, in China the per hectare yield of paddy was 5663 kg, Indonesia 4351 kg, Pakistan 2380 kg, India 2629 kg compared to the world average of 3504 kg. The low productivity of Indian agriculture is largely attributed to inadequate and imbalance application of fertilizers and unscientific cultivation practices.

With comparatively more land available for cultivation in India and also the other resources, there is vast scope for improving the agricultural productivity with better production facilities and improved marketing techniques.

Small and uneconomical size of holdings, improper and traditional techniques of cultivation, inadequate irrigation, lack of timely credit availability, lack of post harvest technologies, insufficient and untimely supplies of agricultural inputs are among the many factors responsible for the slow rate of growth and backwardness of Indian agriculture. In India Agriculture has yet become a commercial venture. Operational holdings has been an important factors in fertilizers consumption. An economical holdings seldom adopted chemical fertilizers because of lack of Marketing and promotional effects for this sector.

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11 Report of the high powered committee of GOI.
12 Report of the high powered committee of GOI.
13 Report of the high powered committee of GOI.
The table given below provides the distribution of operational holdings in India\textsuperscript{14}. The majority of the holdings are either marginal or small. This has adversely affected the commercialization of agriculture.

Table No. 5
Distribution of operational holdings in India

<table>
<thead>
<tr>
<th>Land Holdings</th>
<th>Range (Hect)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal</td>
<td>Less than 1</td>
<td>13.4</td>
</tr>
<tr>
<td>Small</td>
<td>1.0 to 2.0</td>
<td>15.6</td>
</tr>
<tr>
<td>Semi-med</td>
<td>2.0 to 4.0</td>
<td>22.3</td>
</tr>
<tr>
<td>Medium</td>
<td>4.0 to 10.0</td>
<td>28.6</td>
</tr>
<tr>
<td>Large</td>
<td>10.0 &amp; above</td>
<td>20.1</td>
</tr>
</tbody>
</table>

Source: FAI Statistics 92-93.

A graph depicting the distribution of operational holdings in India is given in page 11a.

Nearly 80\% of the farmers who fall in to this category of marginal to medium holdings come in to the group of Customers requiring greater marketing efforts to convince them of the need and benefits of balanced application of fertilizers. Such application is important from the view point of commercialization of agriculture and improving the economics of the use of fertilizers.

With the introduction of Economic planning in 50 -51 and with special emphasis on agricultural development, from the mid sixties the previous trend of stagnation was reversed. There has been a steady increase in the area under cultivation and also the HYV program. The average yield/hect. and also the

\textsuperscript{14} FAI Statistics 92-93.
DISTRIBUTION OF OPERATIONAL HOLDING IN INDIA

- Large: 20.1
- Medium: 28.6
- Semi-medium: 22.3
- Marginal: 13.4
- Small: 15.6
fertilizer application rate has steeply gone up achieving a level of 74 kg/hect in 91-92\textsuperscript{15}.

Fertilizer industry plays a vital role in the agricultural sector. This industry made rapid progress since independence and more particularly during the past decade. The production rose from 39000 T of nutrients in 51-52 to 10 million T in 90-91 and the consumption from less than 70,000 T in 51-52 to over 12.7 million T in 91-92\textsuperscript{16}. In order to meet the steeply growing consumption imports were arrange and priority was given in the Five Year Plans to increase indigenous production.

The study\textsuperscript{17} 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 a inconsistent situation in the fertilizer availability and inefficient public Distribution System

\textsuperscript{15} FAI Annual review 92-93.

\textsuperscript{16} A study conducted by H.K.Lakshman Rao at Madras Fertilizers Ltd. (1985-86).

\textsuperscript{17} FAI Annual review 92-93.
(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\(^\text{18}\), appointed by Government Of India (GOI) for studying the marketing aspects reported in the mid 70s that the marketing and 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.\(^\text{19}\)

At the micro level there is significant variation in the utilization of fertilizers among farmers of even the same area. According to a study under taken by National Council of Economic Research (NCAER) during 1975-76,

\(^{18}\) Report of the high powered committee of GOI.

even in Punjab the top user of fertilizers, 8% of the farmers, which accounted for 24% of the cultivated area, no fertilizer was used.\textsuperscript{20}

Table No.6

**Percentage of Farmers using fertilizer & Area Fertilized**

<table>
<thead>
<tr>
<th>Sample State</th>
<th>% of farmers using fertilizer</th>
<th>% area fertilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>62</td>
<td>42</td>
</tr>
<tr>
<td>Karnataka</td>
<td>49</td>
<td>33</td>
</tr>
<tr>
<td>Kerala</td>
<td>66</td>
<td>73</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>Punjab</td>
<td>92</td>
<td>76</td>
</tr>
<tr>
<td>Maharastra</td>
<td>42</td>
<td>27</td>
</tr>
<tr>
<td>Assam</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>All India</td>
<td>45</td>
<td>33</td>
</tr>
</tbody>
</table>


The above analysis indicates the range of variations 92% in Punjab to 7% in Assam reflecting the need for marketing efforts to improve the proportion of farmers adopting fertilizer and the extent of land fertilized.

Irrigation is available only to 32% of the cultivable land\textsuperscript{21} Zone wise percentage of irrigated area are given in the following table.

\textsuperscript{20} FAI Annual Review 92-93.

\textsuperscript{21} FAI Annual Review 92-93.
Table No.7

Trend in fertilizer consumption per hectare

<table>
<thead>
<tr>
<th>Year</th>
<th>Cons. NPK/kg/Hect</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-71</td>
<td>13.61</td>
</tr>
<tr>
<td>75-76</td>
<td>16.93</td>
</tr>
<tr>
<td>80-81</td>
<td>31.82</td>
</tr>
<tr>
<td>85-86</td>
<td>47.39</td>
</tr>
<tr>
<td>90-91</td>
<td>69.65</td>
</tr>
<tr>
<td>91-92</td>
<td>70.30</td>
</tr>
<tr>
<td>92-93</td>
<td>67.60</td>
</tr>
</tbody>
</table>


Significantly large proportion of cultivated land do not come under irrigated conditions. The application of fertilizers in this category is either negligible or nil.

When technology advocates application of fertilizers to rain fed crops, it has not made much headway in this direction. This is indeed a lack of marketing effort. The fertilizer marketing units must tap the vast potential available from the un-irrigated land through innovative marketing strategy. Promoting dry land cultivation technology, crop insurance and the like.

The per hectare consumption of nutrients which had been consistently going up and reached 70.3 kg in 91-92, for the first time dropped to 67.6 in 92-93 due to steep increase in prices of phosphate and potash in August 92.\textsuperscript{22}

During the two decade period 70-71 and 91-92, the per hectare consumption rate had been phenomenal indicating farmers continued acceptance of fertilizer as a necessary input. Despite increase in prices and

\textsuperscript{22} Report of the high powered committee of GOI 1988.
problems of availability farmers continued the application levels. The set back was observed (from 70 kg/hect. in 1991-92 to 68 kg/hect. in 1992-93 as seen in the table) when the prices of phosphate and potash steeply went up in 92 due to withdrawal of fertilizer subsidy for phosphate and potash.

The farmers survey conducted as a part of this research reveals that fertilizer application has been mostly limited to irrigated and major crops. Adequate promotion for rain fed crops which holds potential has not been attempted in fertilizer marketing system.

In the area of logistics in the fertilizer industry there is vast scope for improvement both at micro and macro levels. The available infra-structural facilities are not adequate even to meet the existing marketing needs-27 million tonnes of fertilizer products (materials) to be transported, warehoused, delivered to over 2.32 lakh dealers spread over six lakh villages annually. The volume to be marketed is estimated to increase to over 40 million tonnes, annually by the turn of the century.23

The high rate of crisscross movement, existence of over supply 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. This has affected the logistics plan at both macro and micro levels.

Governmental controls on pricing movements, production and product mix continued to be heavy until Aug 92 when phosphate potash were decontrolled. This environment coupled with heavy dependence on imports till 80s inhibited the manufacturers in adopting marketing management approach in the fertilizers. With the decontrol of phosphate and potash since Aug.92 the situation has now become favorable for making the marketing system

innovative and responsive to the needs of the farmer. The withdrawal of the subsidy has created a new and challenging environment to the industry. The subsidy which was in vogue for 18 years served a very useful purpose in stimulating both production and consumption. Its withdrawal should be taken as a natural phenomenon and the industry should adjust to the new environment.

The fertilizer industry which grew rapidly during the last four decades has come to a gloom. Both consumption and production rates are declining. The industry does not have the vigor and the vitality to forge ahead for meeting the emerging marketing challenges. The Economic growth of the country depends on the success of this sector.

Fertilizer marketing had essentially been oriented to physical distribution because of the frequently occurring scarcity conditions. Until the 70s greater part of the products were from imports. The situation drastically changed in the 90s with increased domestic production, lower imports, increased awareness of the fertilizer use and benefit, lower controls on pricing and movements. This new situation calls for increased adoption of marketing management principles for improving the productivity of marketing from product orientation to consumer (farmer) orientation.

Modern Marketing management principles envisage Sensing, Serving & Satisfying the needs of the consumers on a continuing basis (Philip Kotlar). This requires understanding the dynamic markets, the over changing consumer needs and capabilities, developing need based products and services, ensuring that right products are provided to the consumers at right time and place. Marketers must move from product and profit orientation to consumer orientation. Fertilizer Industry had been operating under the sheltered marketing environment since 1951.
In the fertilizer Marketing system there had been hardly any consumer orientation. The Public Distribution System (PDS) which had been operating left the farmer with little choice. Therefore under the decontrol system, there is vast scope and need for applying the modern marketing management concepts and principle of managing the Marketing Mix for the mutual benefit of fertilizer manufacturers and the farmers who are the key players in the system. Such an adoption not only helps the Industry but the Economy as a whole in improving the agricultural productivity.

There is now an urgent need for revitalizing the fertilizer marketing system, more particularly in the area of logistics where vast scope exists with both opportunities and challenges.

Fertilizer marketing system must be geared to meet the requirements of the small and marginal farmers in remote and inaccessible areas.

The fertilizer Industry which occupies an important position in the national economy needs revitalization both in the area of production and marketing under the changed highly competitive marketing environment and liberated Government policy. The rate of growth of production and consumption of fertilizers as indicated during the period 1988-92, is inadequate.

Efficiency in the marketing system, consumer orientation and cost minimization are the urgent needs of the industry.

1.2. STATEMENT OF THE PROBLEM

The fertilizer Industry had been growing at a rapid pace during the period 1951 through 1985 and from then on started showing trends of stagnation and since the early part of 1990, declining.
The industry has significantly contributed to the economic development of the country and achieving the food production targets. The stagnant and declining trends are disturbing. Costs have to be controlled. Marketing strategies to be changed to meet the new challenges posed by decontrol and liberalization.

There has been an overall gloom in the fertilizer industry. The consumption and production rates have both come down since 1985-86. It started showing a negative trend since 1992, consequent to decontrol of Phosphate (P) and Potassic (K) fertilizer products. The Industry had been in the sheltered market and did not develop the capability needed for meeting the challenges of the de-control even after support and nurturing for over two decades.

Fertilizer marketing strategies are becoming unrelated to the needs of the farmers. The industry is lacking consumer orientation. The marketing mix requires a change. The industry needs revitalization to cope with the changed policies of the Government.

Fertilizer is a public good. Its increased consumption not only benefits the user, the farmer, but helps in increasing agriculture production which benefits the public at large. There is indeed no competition in the industry. There is no product which competes with fertilizer as a substitute. The efficiency in the industry in the area of production and marketing will benefit the society at large. Reduction in subsidy without affecting the efficiency will benefit the exchequer and thereby the tax burden on the common man. In order to encourage the fertilizer consumption, the farmer must be assured of a fair return on the investment under several risk factors.

The duality of the issue is: increasing consumption of fertilizers even in the context of increased prices of inputs on the one hand and increasing production and creating additional fertilizer production capacities. This calls
for concept marketing: bringing increased awareness of cost - benefit among the different category of consumers (small, marginal and medium farmers, planters, etc.) on the part of increasing consumption. For creating additional production capacities new investment in the fertilizer industry must be made attractive. The farmers must be motivated to accept the real unsubsidized prices of agricultural inputs (fertilizer, seed, pesticide etc).

The growth and development of the Fertilizer Industry has been a significant impact on the national economy. The Industry has a great social relevance. Agricultural productivity and self reliance on food depends to a large extent on the success of this industry. The Fertilizer product has been under the Public Distribution System (PDS) improvement and efficiency in the production and marketing in this system will have a significant rippling favorable effect on the National Economy and the Public.

The industry is facing the problem of stagnant demand when the production capacity is rapidly increasing with the new fertilizer plants coming up. Many plants are at various stages of construction/commissioning. This is a paradox of the industry which is of vital importance to the economic growth of the country.

Wide range of products, analysis, brands, irrational movement, unrealistic consumption forecasting, duplication and ineffective promotion/extension programs, steeply increasing costs and subsidies, duplication of agro information / agro service programs, inadequate infrastructure for logistics and promotion are the current status of the fertilizer marketing systems.

The industry which had been enjoying the support of GOI in terms of subsidy for over 18 years has to equip itself for the change. The industry will now have to face the same market forces, (subject to the social objectives of serving the farming community) as any other consumer products.
Fertilizer industry presents a peculiar panorama in respect of marketing: Multiplicity of product ranges, varied soil conditions / cropping patterns, inadequate infrastructural facilities for Logistics, diverse consumer behavior / capacity to purchase and multiple language.

Currently annually over 27 million tonnes fertilizer products (material) are in the marketing system. This large volume of products have to be packed, transported, warehoused and distributed to over 2.3 lakh retail outlets. Farmers, fertilizer dealers, salesmen and extension agencies have to be motivated in the mission of stimulating consumption. The product has to be marketed to farmers cultivating under rainfed conditions. Fertilizer products must be introduced to non traditional crops which hold vast potential. Facilities such as the soil testing for proper recommendations must be strengthened. The challenges are growing in geometric proportion.

The system has not equipped itself to meet even the current volumes, to the expectations of the consumer, the farmer by providing the right product at the right place and the right time.

The volume of fertilizer products available when all the fertilizer plants which are at various stages of construction / commissioning, is expected to reach a level of 40 million tons annually, by the turn of this century.

The pace at which the industry is moving it is unlikely that it would meet the annual consumption target of 20 million tons of nutrients by the year 2000 from the current level of 12.3 million tons. The food production target of

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240 million tons can be achieved only if the fertilizer consumption is realized.26

These are major problems requiring priority actions of policy makers.

The Fertilizer consumption trends indicate an unsatisfactory growth as seen from the following table:

Table No.8

All India fertilizer consumption trends - NPK

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (Lakh T)</th>
<th>Kg. Hec.</th>
<th>Change % Total</th>
<th>Per annum % Per Hec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-81</td>
<td>55</td>
<td>32</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>85-86</td>
<td>83</td>
<td>47</td>
<td>10.2</td>
<td>9.4</td>
</tr>
<tr>
<td>90-91</td>
<td>125</td>
<td>64</td>
<td>10.1</td>
<td>7.2</td>
</tr>
<tr>
<td>91-92</td>
<td>127</td>
<td>70</td>
<td>1.6</td>
<td>8.6</td>
</tr>
<tr>
<td>92-93</td>
<td>123</td>
<td>68</td>
<td>-3</td>
<td>-3</td>
</tr>
</tbody>
</table>

Source: Compiled from FAI statistics 92-93.

The annual consumption rates both variation in total and per hectare have come down. The annual consumption variation for the first time in forty years, in 92-93 is negative. This is a disturbing phenomena, which needs to be managed effectively. Growth trends in fertilizer consumption is reflected in the graph on page 22a.

The rate of fertilizer consumption was 74 kg/hect, in India, as compared to 102 kg/hect in Bangladesh, 91kg/hect in Pakistan, 90kg /hect in Srilanka, 277kg/hect in china in 1990-9127. In order to meet the food requirement of


27 Report of the high powered committee of GOI
Growth in fertiliser consumption
1951-52 to 1984-85 (in million tonnes)
240 million tonnes annually by the 2000, it is estimated that the per hectare consumption should reach a level of 105kg/hect.\textsuperscript{28}

Rationalization in allocation of products, avoidance of criss cross transportation of fertilizer products, rationalization in product mix and range, avoiding duplication and ineffective communication/extension are among the major marketing decision marketing areas of the industry both at micro and macro level

In order to achieve this task, the marketing system in fertilizer industry which had been traditionally oriented towards production and distribution must take a turn towards consumer oriented approach. The marketing mix (Product, Price, Placement and Promotion) must be more effectively managed keeping the farmer at the focal point.

With the removal of the subsidy for phosphate and potash fertilizer products most of the well known fertilizer products are decontrolled. The industry enjoyed subsidies for phosphate and potash for over 18 years. The issue before the industry is to market the product at unsubsidized prices.

A recently conducted field survey (1993) as a part of this research study reveal that farmers have started using fertilizer product more particularly those containing phosphate and potash in a more judicious manner after decontrol and steep hike in the prices.

The study (1993) has revealed that farmer would accept the increases in prices if they are consistent with inflationary rates. Farmers decision to buy and apply fertilizers largely depend on the availability of the right product at the right price available at the right time and place.

\textsuperscript{28} Report of the high powered committee of GOI
There is however, a over all set back in the consumption of phosphate and potash fertilizers since August 1992 to the extent of 30% and 50% respectively. The annual consumption of NPK has registered a negative growth during 1992-93.

Unrealistic demand forecast made by the state agricultural department based on which the GOI made allocations led to problems of oversupply and scarcity. This frequently occurring situation severely affected orderly development of consumption. The unrealistic estimates of requirement made by the state Govt. with a view to get more allocation to the state, often resulted in excessive imports creating a glut situation. Developing a realistic forecasting utilizing all the available data at the grass-root level and developing allocation plans and arranging logistics will greatly improve the efficiency of the fertilizer marketing system and minimizing the cost of operations.

Under these circumstances it is imperative to review the marketing system of the industry to ensure better logistics and greater cost control.

Thus, a study on the Logistics on fertilizers poses some important questions that need to be investigated for improving the marketing efficiency at micro & macro levels and thereby improve the service to the farmers and minimizes the costs.

Research Questions:

1. Which are the key result areas in Fertilizer Marketing System requiring urgent attention of the policy makers and Fertilizer units? How to improve the marketing productivity in the fertilizer industry and how to make it more innovative to reverse the current trends?
2. What are the peculiar problems of the fertilizer marketing in India under the given conditions?

3. Should there be such a wide range of fertilizer products? Do they justify the production and marketing costs?

4. Should the marketing territory for fertilizer units be redefined based on the Logistics?

5. Should subsidy on Nitrogen continue? Would the existing control create an imbalance in consumption?

6. Would increases in prices to unsubsidized levels adversely affect consumption?

7. What are the non-price factors in fertilizer marketing systems which can stimulate consumption?

8. What is the importance of the logistics in the fertilizer marketing?

9. What are the various marketing costs involved and their impact on stimulating and maintaining demand?

10. Can an optimization model be adopted to minimize logistics costs and improve service to farmers?

11. As perceived by farmers, and Fertilizer sales force, what are the key factors influencing fertilizer consumption?

12. What are the buyer’s behavior/reactions towards chemical fertilizers, improved cultivation practices?
13. What are the major source of information and guidance to farmers?

14. Has the soil testing facility and other agronomical services reached the farmers and created the desired impact?

15. What are the strengths and weakness of the cooperative system a marketing channel?

Consequent to the decontrol of phosphates and potash in Aug 92, according to FAI estimates there has been a severe setback in consumption since then the decreases are: phosphate by 17% and potash by 35%.

The impact of lower consumption is also felt in the decreased production. Fertilizer units manufacturing phosphates have cut down their production of phosphatic products. These are major problems of the industry.

Under the protected market fertilizer industry did not adequately develop the marketing capabilities and consumer orientation. A well organized marketing strategy and system would be needed to meet the challenges ahead of the Industry.

Logistics support is an important element in the fertilizer marketing system. Transportation alone accounts for 40% of the marketing cost. The movement of fertilizer products from the plants located in West and north to South and east and vice versa causing criss cross and irrational movement have been the feature of the industry for a long period. Besides this, the product ranges/mix also the promotional mix have been quite irrational.

With the withdrawal of subsidy on phosphate and potash in August 1992, the industry has to encounter new problems survival and growth are challenges for marketing management.
In this changed marketing and GOI policy environment, Optimum utilization of the resources has become the major focus area; for minimizing all around costs of production and marketing. As discussed earlier, transportation alone accounts for 40% of the total marketing costs. The issue confronting the industry is one of growth in the changed environment and meeting the expectations of the GOI and the farming community.

How to improve the marketing productivity of the fertilizer industry and how to make it more and more innovative?

In conclusion issues, are;

1. Ensuring adequate annual growth rate (8%) in Fertilizer production & consumption.

2. Ensuring balanced application of fertilizers and improving the rate of application to 90kg/ hect. from the current 69kg/hect.

3. Promoting improved cultivation practices

4. Making the right product available at the right time and place

5. Infusing modern marketing management approach - through better product mix / ranges and analysis, pricing, logistics and communication.

This study examines some of these problems and issues and also the emerging challenges of fertilizer marketing systems focusing on the logistics which is a vital aspect both in terms of cost and service to farmers.

The present study focuses its attempt to respond to these issues and arrive at inferences that would help decision making both at macro and micro levels.
1.3. **OVERVIEW OF LITERATURE**

Literature and contemporary studies on 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 marketing activity had been largely confined to distribution activities. Fertilizer marketing had been more on the lines of Public Distribution System (PDS) and had little consumer orientation. The literature available are therefore not marketing management oriented. Marketing Research and MIS have been under low key in the industry. In the recent times, Academicians, Researchers and Management executives are focusing attention on the several aspects of the industry.

A detailed survey of the literature has been made with a view to examine the nature and scope of several studies undertaken so far in the field of fertilizer marketing. The objective of this review is to evaluate the current level of knowledge and to focus on the objectives of the present study.

The thoughts and concepts of Fertilizer Marketing executives, Professionals at the Fertilizer Association of India (FAI) New-Delhi, Academicians at Universities, including Agricultural University, Management Schools (IIMs). Contained 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 fertilizer marketing management such as; product range, pricing, subsidy, forecasting methods, promotional strategies, distribution systems, inventory management, MIS, have been made.
The highlights of the concepts discussed, the suggestions and recommendations made in the several literature pertaining to fertilizer marketing, etc. are summarized. The arrangement of the reviews/summaries are not in chronological order but placed according to the functional areas of marketing management.

Saleem Ahmed, Chowdhury and others (1992)\textsuperscript{29} 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 use kg/ha. R 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.

Ramaswamy (1985)\textsuperscript{30} 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


\textsuperscript{30} Ramasamy V.S. (1985). "A study of the marketing of fertilizers in India. Published by the Author, Madras - 4.
feasibility of containing the marketing costs in the fertilizer industry. The importance of logistics management in improving the service levels and minimizing the costs have been brought out. The linkages between fertilizer consumption and food production in India has been brought out with comprehensive statistical data.

Gupta (1984) 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 has been brought out.  

Donald J. Bowersox 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 net work 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.

31 Gupta, Problems and prospects of strengthening cooperatives marketing of fertilizers. FAI annual seminar 1984.

The logistics management has the fundamental responsibility for planning and administrating an operating system capable of realizing this goal. The hallmark of logistics is integration of the varied dimensions and demands for strategic movement and storage. The physical handling of products is pretty much overlooked by marketing executives, problems of physical distribution are too often brushed aside as matters of little importance. The consumer organizational efficiency through the logistics management. Logistical Coordination is concerned with the identification of movement requirements and establishment of plans to integrate overall logistical operations—Product market forecasting, transportation, warehousing.

Commenting on the vital role played by logistics in Marketing, the author stress the need for developing an integrated approach. He says that management of individual logistics activities is often under direction and control of various departments within an organization. Such diffusion of responsibility increases the possibility for duplication and waste, and sometimes hinders mission accomplishments. Similarly, information flow, between organizational units may be fragmented to jeopardize logistical coordination. The environment in which the logistics must be coordinated must be continuously evaluated to make it realistic and cost effective.

Among the least understood areas of business are the institutional activity groupings referred to as distribution or marketing channels. Distribution structure is of fundamental importance, because the channel is the arena in which marketing and logistics culminate customer transaction. Logistical channel consists of a number of independent enterprises which combine to deliver product to the consumer at the right location and at right time. A number of functions should be performed jointly and concurrently by members in the logistical process. The function should be performed with minimum duplication.
The management of Marketing Logistics also depends on the marketing system employed by the organization, the number of tiers, availability of the infrastructure etc.

Vittal (1984) 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 in to 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. Application of quantitative techniques in logistics.  

Seetharaman (1988) have examined the emerging opportunities in agricultural input marketing. Agricultural inputs comprise of a heterogeneous group of products such as fertilizers, seeds, pesticides, farm equipments, irrigation machinery etc. All components of marketing mix in case of fertilizer are decided by government. There is a need to formulate product sub groups and develop appropriate marketing strategy. The fertilizer product is technical in nature. It is becoming increasingly complex for use. In order to exploit the full potential the farmer must be made to understand the product features and their use / benefit. Farmers in India are a highly heterogeneous group. The physical and agricultural infrastructure across the country is not the same this makes the marketing system more complex. There are several similarities

33 FAI seminar 1984 Paper presented.
between marketing of agricultural inputs and industrial marketing. The prominent among them are that both are based on derived demand and are consumed for production. The agricultural input scenario is fast changing due to creation of new capacities - fertilizer, pesticides, etc and the steep rise in the manufacturing costs requiring optimization in production facilities & minimizing the marketing costs. The study brings out that the manufacturers have been adopting an uniform undifferentiated marketing strategy, but the time is opportune to develop specific marketing strategy suited to different segments of farmers. The agri input marketing industries must take full advantage of the governmental supportive measures in their efforts.

Pratap Narayan\textsuperscript{35} brings out the need for control of prices of fertilizers as an effective marketing measure and the important role the policy has played in stimulating the consumption has been emphasized. The study has covered; a brief history of fertilizer pricing in India, subsidy, pricing versus consumption, 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.

Chauhan\textsuperscript{36} (1984) has emphasized the critical importance of promotion and extension in fertilizer marketing system. In his paper he has covered effect of various agronomic practices on fertilizer use efficiency, increasing coverage on high yielding varieties, fertilizer efficiency in dry land cultivation, allocation

\textsuperscript{35} Pratap Narayan - Dynamics of Price and Subsidies in fertilizers, FAI Seminar 1984.

\textsuperscript{36} Chauhan - Promotional Strategy for stimulating fertilizer use - FAI Seminar 1984.
of fertilizers according to their suitability and crop needs, educating the farmers on the related crop management practices, integrated approach to input supply.

Subramaniyan and Nirmala\(^{37}\) (1991) have discussed Static and Dynamic models for estimating fertilizer demand. Several key factors such as relative prices, percentage area under HYV, percentage irrigated area, weather conditions, land intensity, have been taken as input for the demand estimating regression model. The finds of the study point out that a reduction in the relative prices of fertilizer is needed to boost the demand. This may be achieved either by increasing the procurement price or by a decrease in fertilizer price. since the former is difficult to administer the later is adopted through the subsidy scheme. The study also states although the quantum of subsidy is high greater part of it is intra-economy transfer and therefore is no real drain on the exchequer as claimed. The study has made elaborate references on G.V.K. Rao committee report\(^{38}\) on consumer price of fertilizer. The model developed by the authors is not explicit and the parameter estimation needs verification. I have had correspondence with the authors in this regard. The study has limitations in its practical applications

Moosa Raza\(^{39}\) (1988), analyses the extent to which the fertilizer marketing mix has been influenced by Government and develops some policy options for improving the efficiency. Marketing management affects demand cost simultaneously and for a developing country like India, it is essential to strike a balance between the two. The growth of Fertilizer Industry has been


\(^{38}\) Report of the high powered committee on fertilizer consumer prices (July 1988), published by The fertilizer association of India, New Delhi.

largely regulated by government decisions and had very little scope for a flexible marketing mix. Product, Pricing, Promotion and Placement of products. Irrational distribution territories for manufacturers, criss cross movement products (fertilizer manufacturers located in west and north making supplies to consuming centers in the south and vice versa) had been a feature of fertilizer marketing system. Rationalization of movements with allocation of products under ECA has to some extent brought down the costs but still not near the optimum level. Need based promotion mix at district and block level considering the crop pattern, soil condition are essential for improving the efficiency and reducing the costs. The study advocates; shift towards high analysis products, balancing nutrient supply and correcting deficiencies, a more innovative strategy in product allocation at the zonal conferences, realistic requirement estimates by the state governments based on quantitative methods of demand forecasting, etc. Improved utilization of the logistics infrastructure and revitalizing promotional strategies have also been emphasized.\textsuperscript{40}

Bhinde and Pal (1984) have, analyzed\textsuperscript{41} the implications of policy measures on fertilizer consumption. The selected policy measures are; increase in irrigated area, Produce prices; irrigation facilities; etc. One of the important measures to stimulate fertilizer consumption is to improve the economics of its use. The paper discusses the major ways in which the economics of fertilizer use can be increased. The identified factors are:

- Technique related
- Environmental
- Infra-structural
- Economic

\textsuperscript{40} FAI annual seminar 1984. Seminar report published by fertilizer association of India, New Delhi.

\textsuperscript{41} Improving economics of fertilizer use, FAI annual seminar 1984. Seminar report published by FAI, New Delhi.
The technique related factors refer to the method, timing, and form of fertilizer application. Benefit of fertilizer use can be significantly increased by adopting these methods without any extra expenses. The farmers have to convinced of the need and the advantages of adopting these methods. Infrastructural factors refer to the extension and marketing facilities available. Adequate dealer network to ensure, easy availability of right product at the right time and place are equally important factors in improving the economics.

The Economic factors include input- output prices, credit facilities, etc.

The paper brings out the high positive correlation between fertilizer consumption and the irrigation facilities provided.

Shanthi Narayan (1984), has brought\textsuperscript{42} 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 T to nearly 20 million tons/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 analysis 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. The year wise details and the movement by rail/road is in table no.9.

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\textsuperscript{42} Logistics of fertilizer distribution. Paper presented at FAI Annual seminar 1984. Report released by FAI.
Table No.9

Model mix of fertilizer movement

<table>
<thead>
<tr>
<th>Year</th>
<th>Rail</th>
<th>Road</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971-72</td>
<td>94.2</td>
<td>5.8</td>
<td>100</td>
</tr>
<tr>
<td>1976-77</td>
<td>87.0</td>
<td>13.0</td>
<td>100</td>
</tr>
<tr>
<td>1985-86</td>
<td>70.2</td>
<td>29.8</td>
<td>100</td>
</tr>
<tr>
<td>1990-91</td>
<td>65.3</td>
<td>34.7</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: FAI statistics 92-93.

There has been a steep fall in the movement of fertilizers by rail from 94% ton 65% during the 20 year period, mainly because of non availability of adequate covered wagons and the highly competitive rates of the truckers for the road movements. Further the road movement provided greater facility and flexibility to the fertilizer manufacturers than the railways. The railways did not adopt a marketing approach in offering the infrastructure and the administrative support.

Fertilizer products were being transported by rail up to destinations distance range of 250-350 kms till the mid 70s. By early 80s Fertilizer manufacturers started transporting products even beyond 600 kms by road because of the competitive advantage that the truckers provided in terms of quick movements at lower rates. This dwindled the movement of fertilizer by rail. From the point of energy, conservation movement by rail is far more economical. Road movement is 1.6 times more expensive compared to rail from the point of energy conservation.
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.

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.

The CWC, SWC, and also cooperatives/agro industries should also have a marketing approach.

Krishnan Kutty (1993), has covered a sample of eight public sector units for analyzing their performances. These units account for 41.4% of the total Nitrogenous fertilizers and 28.9% of Phosphate fertilizers during 91-92. Despite increase in sales by over 30% these units jointly incurred a heavy loss of Rs.347 cr. The units covered by the study are;

a. Fertilizer corporation of India
b. Fertilizers and chemicals Travancore Ltd
c. Hindustan Fertilizers
d. Madras fertilizers Ltd.

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43 K.Krishnan Kutty, "Deteriorating performance of public sector companies" (The Economic Times, June 3, 93).
e. National fertilizers Ltd.
f. Paradeep fertilizers Ltd.
g. Rastriya Chemicals & Fertilizers Ltd.
h. Pyrites & Phosphates Ltd.

The combined loss of these units went up from Rs. 3931.7 Cr. in 1991 to Rs.5119.7 Cr. in 92. The loss before tax increased from Rs.347 Cr to Rs.395 Cr. These losses are attributed to production costs and marketing costs.

The Economic Times Research Bureau\(^44\) has made an analysis of private sector fertilizer units on their recent performances. The study has covered a sample of 17 leading fertilizer manufacturing companies which indicated an increase of 23. 9 % increase from Rs. 3681 Cr. in 1990-91 to Rs. 4560 cr, in 1991-92. but there was a sharp fall in the profit from Rs. 505Cr to Rs 404 Cr. The study has revealed that with a rise of 12. 3 % in sales of 12 private companies the net profit fell by 23%.

Aruna Parimi (1993), in her study\(^45\), has stated that the two samples (IFFCO & KRIBCO) taken for the study have indicated excellent overall performance.

Karunakaran (1992) has brought out\(^46\) that the Indian Fertilizer marketing Scenario is undergoing a dramatic change and the old ways of promotion and 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

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\(^44\) Economic Times June 3, 1993, Times of India Publication, Bangalore.


fertilizer marketing, the only way to retain the market and win a lasting customer confidence is to resort to individualized marketing. Fertilizer Marketers, 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 (MFL) must become wide spread.

Biswas, Tewatia and Prasad (1992) have analyzed crop response for various levels of fertilizers application and have developed response ratio (total yield /kg divided by total fertilizer applied kg) and have obtained the economics of fertilizer use.

The paper discuss the economics of fertilizer use with special reference to optimizing the dosages under changing conditions.

Venkateswaran (1993), deals with the importance of logistics in marketing management. Logistics is the term used in the military operations denote 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 Bowersox. ". . . 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 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".49

The logistics incorporate a whole set of components such as Transportation, Warehousing, Distribution channel-whole saler 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 economic 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, octroi etc.
* Condition of roads
* Facilities for communication
* Fuel efficient vehicles
* Information on the market

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49 Logistical Management - Shapiro and Heskett. Published by MacGrawhill Publishing House, New Delhi.
In the Indian context there are several impediments. There has been a distinct shift from the rail to road because of the economics and convenience.

The Government of India, Ministry of Agriculture, (1984) constituted a committee to look into the policy which should determine the prices of fertilizers for consumption to ensure proper development of agriculture. Under the chairmanship of Dr. G. V. K.Rao, in 1984 the committee constituted has eleven members. This was a very significant point in the fertilizer industry. The committee went into several aspects of the fertilizer industry and held discussion and interviews with executives in the fertilizer industry for seeking information. The findings and recommendations of the committee had a significant influence on the decision making. A review of the committee's recommendations as provided in the report is provided below:

a. Cultivation of high yielding varieties and multiple cropping will result in a heavy nutrient removal likely to bring serious imbalances in the soil fertility. At present, there is no programme to monitor the soil fertility status in a continuous manner under various cropping systems, in different agro-climatic zones. The committee recommends that such a program should be taken up at the national level, which will make available data in regard to the changing pattern of soil fertility levels so as to formulate necessary policy decisions to ensure that proper soil fertility is sustained to ensure maximum response to fertilizer application.

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50 Report of The High Powered Committee on Fertilizer Consumer Prices under the Chairmanship of Dr.G.V.K.Rao. Published by FAI, New Delhi.
b. Agronomists consider that soil is considered to be an important tool in ensuring the efficient use of fertilizers. There is, however, need to improve the working of the soil testing laboratories in the country. The committee recommends that Regional Soil Testing Laboratories should be established which will regularly monitor the functioning of the existing soil testing laboratories, help in repairing equipment, train the staff at regular intervals to upgrade their skills and provide necessary technology for prescribing the recommendations based on the investment capacity and the size of the holdings of the farmers. This will create confidence in the farmers in adopting the soil testing service for increasing the efficiency of fertilizer use.

c. As against 89 million holdings, the existing soil testing capacity is about 6 million samples per annum. It would take 15 years to analyze each holding. The soil testing capacity in the country is therefore, inadequate and should be raised at least to a level of 10 million samples per annum in five year's time.

d. Looking to the large potential of rainfed areas for increasing agriculture production with the use of fertilizers, the committee felt that a massive national project should be launched for promotion of fertilizer use in rainfed areas. This project should provide facility of advance stock of fertilizers at remote areas by opening additional retail points, organize field demonstration for transfer of technology and strengthen soil testing program to render advice to farmers on optimum and efficient use of fertilizers.

e. Maximum nitrogen losses have been reported under wet land rice cultivation. This can be corrected through deep placement of Nitrogenous fertilizer.
f. In regard to future product pattern, it should be in the form of Urea for nitrogenous fertilizers, DAP as a source for phosphate MOP should be made available to meet the requirements of potash. There are currently 27 grades and analysis of fertilizer products besides several brands. Such large varieties has created logistics and communication problems and steeply increased the marketing costs. Manufacturers must produce only the highest analysis of complex products.

g. The study has revealed that there are no uniform standard for promotion and extension in the fertilizer industry. This has resulted in criss cross and overlapping promotion activities carried out by fertilizer marketers. The large technical man power available with the industry should take up promotion program, including field demonstration and village adoption in consultation with the state Dept of agriculture. This will not only minimize the duplication of efforts but will enable covering large area / farmers and improve the efficiency and cost reduction. The fertilizer salesmen and also extension personnel must be given periodical training to update their technical knowledge so that their communications to farmers and dealers may be effective.

h. Credit to farmers should be sanctioned well before the time of application of fertilizer.

i. The cooperatives have a very important role to play in the marketing of fertilizers in the country. In most states they have a large net work and also command a large marker share compared to private trade. They are required to serve the interior areas. The cooperatives must be given a higher distribution margin to carry out the additional responsibility.
Yadav (1993), in his paper\(^{51}\) has elaborately covered; distribution arrangements, development of marketing plans, uniqueness of fertilizer marketing job (the consumer is unique, the product is unique). The paper has brought out the key role of logistics in the fertilizer marketing

Mittal D.K. (1991) in his analytical paper\(^{52}\) has brought out of the several forces and factors that have acted on the fertilizer pricing system. The paper has made an analysis of the fertilizer price trends over a 20 year period. The paper establishes that low input-out price mix for agriculture is evident from the behavior of the movement of urea, produce prices and prices in general. A comparison of consumer price of urea, the wholesale price index, price index of agricultural products for the period 1974-75 through 1990-91 has been made.

Dual pricing policy for fertilizer has also been discussed. Farmers with large holdings will grab the concessions extended by GOI and state governments on prices for the small and marginal farmers as a part of dual pricing policy. In India, small and marginal farmers account for 76.3% of the total 90 million holdings (68 million farmers). The agricultural minister too has argued that dual pricing is not practical for the Indian conditions and also the allocation of Rs.400 Cr./annum for small and marginal farmers is too meager. The paper has brought out the key issues of the mounting subsidies.

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\(^{51}\) Yadav "Essentials of rural marketing with respect to fertilizer and other agricultural inputs" Fertilizer Marketing News Aug. 93.

The issues brought out primarily are:

a. Can the exchequer bear the burden of menacingly rising subsidies?

b. Is the increase in procurement prices of food grains more inflationary than the rising budget deficits due to fertilizer subsidies?

c. Is the demand for fertilizers sufficiently price elastic to justify low fertilizer prices?

d. Is the fertilizer pricing providing desired incentive for cost efficiency in the fertilizer industry?

e. Does fertilizer pricing not lead to subsidization of urban population at the expense of rural population?

f. Are the fertilizer subsidies together with exemption of agricultural income from tax and the procurement price policy of the government not leading to acute inequalities in the distribution of rural income and wealth because the benefit of all the three goes basically to the large farmers as the smaller ones have neither income that could come under the tax net, nor resources to buy fertilizers, nor surplus agricultural produce that could be procured by the government?

g. In nutshell, is the fertilizer pricing policy leading to ever rising subsidies promoting economic efficiency and socio-economic equity?

These questions require an in-depth examination to determine future course of fertilizer pricing having a bearing on policy regarding price stabilization and distribution of income and wealth.
In the Fertilizer News, critical analysis of the impact of withdrawal of subsidy on phosphate and potash has been made\textsuperscript{53}. The editorial observes that with the increase in fertilizer prices the agricultural operations become costly if farmers continue to adopt the balanced application of fertilizer products. Farmers would switch towards urea and this would adversely affect the agricultural productivity. The small and marginal farmers would be severely affected. Marketers of Phosphate, Complex and potassic fertilizers will have to gear themselves up to develop effective ways and means to get market intelligence regarding product availability, distribution and actual consumption. Equally depressing situation is the reduction in the production of phosphate fertilizer and complex products. Logistics forms the major factor in maintaining and stimulating consumption.

Sarin (1993) identifies\textsuperscript{54} the factors responsible for decreased consumption. According to the sample study carried out, by him, consequent to the steep increase in prices, small and marginal farmers have reduced the consumption of phosphate by 40\% and potash by 80\%. The survey was carried out in 6 districts of Bihar. The farmers compensate the reduction in phosphate and potash by increased consumption of urea and CAN.

The study also reveals that marginal farmers are unable to generate the required cash flow although they are willing to maintain the consumption rate for phosphate & potash, despite hike in the prices of phosphate and potash.


\textsuperscript{54} Sarin "Impact of Decontrol of phosphatic and Potassic Fertilizer - A case study - Fertilizer News, August 1993."
Shrotria and Gupta (1993) in their paper have presented (1993) the findings of the farmers survey conducted in a sample of 6 districts. Decontrol of fertilizer (P & K) has dramatically changed the fertilizer scenario. With the reduction in the consumption levels of phosphate & potash the N:P:K ratio has further widened.

Madhukar Majumdhar & Hansa Modi (1993), have identified certain factors influencing the fertilizer consumption. According to a recent study carried out by them, the demand for fertilizers largely depends on its profitability. The increase in price of fertilizers, in isolation, does not affect the consumption. The returns on the investment is the key factor. Climatic and rain fall conditions, irrigation facilities, availability of products on time at the consuming centers, credit are also important factors.

In order to examine the relative significance of the factors, they have carried out a time series analysis based on the data for the period 1970-1992. According to the model the demand function turns out to be:

\[ Ft = 2.48091 - 0.13565 \times Pt + 0.00143 \times Rt + 0.035081 \times It - 1.20851 \times Mt + 0.01668 \times Ct + 0.08004 \times AHt - 0.11358. \]

Where

\[ Ft = \text{consumption of phosphate per hectare in the year (kg)} \]
\[ Pt = \text{weighted average P prices} \]
\[ Rt = \text{weighted average rain fall received in India (mm)} \]

55 Sarin and Gupta "Impact of Decontrol of Phosphate and Potash Fertilizer on consumption pattern and productivity - short and long term perspective" Fertilizer News August. 1993.

56 Madhukar Majumdhar & Hansa Modi "Decontrol of fertilizer it's impact on consumption" Fertilizer News, August 1993.
\( I_t = \) percentage of gross irrigated area to total gross cropped area in the year \( t \)

\( M_t = \) Area served by retail outlets (000ha)

\( C_t = \) crop loan disbursement (Rs/ha)

\( A_H t = \) percent area under HYV \& total cropped area

\( T = \) Trend variable representing other developments.

The estimated relationship explains 98\% variation in phosphate fertilizer consumption. The above parameters suggest that fertilizer use is highly irrigation elastic with highest positive regression coefficient. Fertilizer use, on the other hand is inelastic to prices in certain ranges and would depend on price of agriculture produce.

Nikhilesh Dholakia & Rakesh Khurana (1988) have contended\(^5\) that Public Distribution System (PDS) is a very important instrument in the hands of the government to ensure easy and adequate availability of essential commodities at fair prices with low distribution costs. Fertilizer being a public good and coming under essential commodities act is covered under the PDS.

Fertilizer has been a scarce commodity for a very long time. The publication covers many key issues of the PDS, the weakness of the current system and non-marketing approach of cooperatives and other institutional agencies have been brought out. The then Minister of Civil Supplies & Cooperation, Mr. A.C. George pointed out...... "I am aware that in the case of some products the distribution costs are very high at 30\% for essential commodities. This is ultimately borne either by the final consumer of subsidized by the GOI. There is something wrong with our distribution system of essential commodities. A thorough review of various cost elements of logistics is needed to remedy the situation."

articles, published and unpublished materials indicate that the aspect of Management of Fertilizer Marketing Systems with focus on logistics has not been covered, primarily because the need was not adequately felt under the GOI control on Production, Pricing and distribution of Fertilizers.

Boyd, Westfall & Stach (1988) have lucidly brought out the importance of Marketing Research in marketing of a public good; Marketing Research can provide much help in the designing of products and developing marketing mix. The aspects of test marketing has been well discussed. Regression analysis can be used in sales forecasting to measure the relationship between the sales and other economic factors which will help better resource utilization and cost reductions. Fertilizer Industry can benefit immensely by adopting Marketing Research methods in understanding and evaluating the markets and marketing strategies.

The annual report (1989-90) of the Ministry of Agriculture, Department of Fertilizer, GOI has reviewed the growth of the fertilizer industry. This is an official document released by the Government of India, periodically. The report has covered the Capacity generation in the Industry in the Public, Cooperative and Private sector, the performance trends, imports, the subsidy aspects and also the projections of demand and production and the GOI policies. The data and information provided therein are valuable for fertilizer marketing systems particularly in the area of Logistics.

The Hand Book on Dealer development (1988) has endeavored to cover all important aspects of fertilizers and management of retail outlets which will


of direct use to retailers in improving their skills. Information on different aspects of fertilizer retailer training which will be useful not only to the dealers and trainers but also to others including Marketing Managers and Academicians. Economics of fertilizer use, Legal aspects of fertilizer use, fertilizer promotion at the point of sale, Credit management, customer relations etc have been covered. The importance of Logistics in fertilizer marketing has been emphasized.

The January 1992 issue of Fertilizer News covers highlights of the annual seminar on (Dec.'91) "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 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 reemphasize the need for effective marketing and focusing on the logistics...."

Among the key aspects of the conclusion are;

a. Rail transportation would continue to be the prominent mode of transportation of fertilizers. Challenges of fertilizer

60 The Hand Book of Dealer Development (1988) Published by Fertilizer Association of India, New Delhi.

b. 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.

c. Cooperatives have played an important role in the past. There is an urgent need to remove the bottlenecks to make the channel stronger.

Singh B.N. and Singh S.B. (1993), bring out the findings of their study conducted in 72 sample farms of Sulthanpur District of U.P. Out of the 72 farms 36 were irrigated farms and 36 were un irrigated. The yield increases in both the categories with the increase in the expenditure on fertilizers showing a high degree of positive correlation. According to the study, the farmers misconception that fertilizer could be harmful on dry land farms has been dispelled after the introduction of HYV. Fertilizer is considered to be one of the most important components of increasing yield even under rainfed conditions.

The study has revealed the economics of fertilizer use and its importance in profit maximization even in unirrigated areas. This is an important aspect in the marketing of fertilizers. The article has discussed the Cobb-Douglas production function for measuring the resource use efficiency:

\[ Y = X^{b1}X^{b2} \]

Where \( Y \) = per hectare output & \( X1 \) = per hectare human labour & \( X2 \) = per hectare fertilizer consumption.

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The model, utilizing the data of the study, has indicated the scope for increasing the investment on fertilizers for improving the productivity and profitability. However there is no scope further increasing the human labour. The study has revealed that application levels of fertilizers both in irrigated and un irrigated areas are much lower than the optimum level in small and medium sized holdings. The farmers with larger holdings were applying higher levels of fertilizer in comparison the marginal farmers. The yield level increase as the investment in fertilizer increased in both the cases. This article has given some insights on the sub optimally in fertilizer usage pattern. The fertilizer marketing system can use this information in developing the marketing strategies.

Thakkar (1993) has observed\textsuperscript{63} that in the emerging free market environment, considerations of reducing costs and improving the efficiency have added significance. Consequently, the emphasis will have to be on improving on the existing product, encouraging product diversification to meet the demands of specific crops and agro-climatic conditions, besides lowering the cost for the farmer." He adds that fertilizer logistics and improvement in the marketing and physical infrastructure are vital reversing the declining trend in consumption. The existing infrastructure is far inadequate to handle the projected consumption estimate of 21 million Tons per annum by the year 2005, by the National Informatics Center (NIC).

Dr. A. Shankaram (1994) discusses\textsuperscript{64} the neglect of the farmers' needs in the fertilizer marketing system. The fertilizer units are concerned in promoting their brands and products without giving due consideration to the needs of soil and crop pattern. According to him the fertilizer industry and the promotional agencies are in senseless efforts in marketing.

\textsuperscript{63} Thakkar J.L. "Need for a perspective plan for fertilizer sector in India "Economic Times Dec.6, 1993.

\textsuperscript{64} Sankaram A. " Fertilizer Needs & Food production " The Hindu " Jan 19, 1993.
recommendations and the product ranges make no sense. What is required in fertilizer marketing is not promoting more use of the fertilizers but better and more economical use. He projects that even with 7.5 million tons of NPK it would be possible to meet the food grains target of 240 million tonnes required by the projected population of a billion by the year 2000. The industry should focus on more specific fertilizer products, logistics and the economics of its use. Fertilizer industry in India is over engineered with no reference to the agronomic references. Promoting products that are not in the best interests of the farmer. The farmer buys and pays high prices for the products that the crops do not need. The withdrawal of the subsidy on P & K has created high imbalance in the application with the result more N than required is being applied which is not only dangerous to the crops but also to the ecology. Excessive use of N will result in increase of pests and release of N to atmosphere which will destroy ozone at higher attitudes.

Hand Book on Fertilizer usage (1986) published by Fertilizer Association of India provides basic information on fertilizer industry in a simple language. It is a very useful reference for administrators, researchers, fertilizer marketing personnel, extension agencies, providers of infrastructural facilities and Dept. of Agriculture. The book provides very useful information on several aspects of the industry, including; Organic manure & biological sources of plant nutrients, Soil fertility and its maintenance, Importance of chemical fertilizers-Nitrogenous, Phosphatic & potassic also Complex, Mixed fertilizers. Efficient use of fertilizers, Economics of fertilizers use, Fertilizer legislation and Fertilizer control order (FCO). The book is of immense value for Fertilizer marketing Personnel and academicians. For this research work this book has armers through salesmen, Soil testing facilities on which significant marketing costs are involved. Even the fertilizer dealer do not rank prominently in stimulating demand and providing the information needed by the farmers. These are vital indicators for fertilizer marketing system.
Sathya Rao & Sandhya (1994) 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 Andra Pradesh (30%). Further the study has not taken in to consideration the cost of secondary transportation which the fertilizer dealer / farmer has to incur. The paper has however highlighted the need and the method of controlling the costs of fertilizer marketing. The paper has brought out the current illogical distribution pattern leading to criss cross movements and long leads.

The Study on the Impact of credit on Fertilizer consumption (1986), made by the Fertilizer Association of India, New Delhi, brings out the key role played by credit in stimulating fertilizer consumption. According to the report. Credit has been a vital link in the process of accelerating fertilizer consumption. The seventh plan had laid special thrust on adequate availability to realise the targeted increase in fertilizer consumption and agricultural production. The importance of credit availability has increased many fold in the recent years. The findings of the study indicate that 80% of the dealers depend on credit for financing the fertilizer trade. Estimated credit needs was Rs. 15000 Cr. per annum in 1989-90. The commercial banks and the informal sector were found to provide funds for periods generally exceeding three months. The cost of credit tend to be higher (15-20%), the rates of the informal sectors were found to be even higher at 21%. The fertilizer manufacturers generally allow interest free credit or cash rebate to dealers in lieu thereof. The

study revealed that the recovery rates were poor. The proportion of dealers selling fertilizers on credit was found to be low. It was found that farmers tend to grow cereals for better profitability. The consumption of N was found to be predominant and the use of P and K less significant. It was found that overwhelming number of farmers did not avail credit because of the delays and the high rate of interests. Farmers were found to borrow from sources which allow longer period for repayment.

Sexana (1994)\textsuperscript{66} 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 under taken 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 tonnes in 1991-92 to 180 million tonnes 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 2350kg/ hect. He claims that in the absence of corrective steps, the trend would reflect significantly lower food production.

\textsuperscript{66} Sexana "Indian Fertilizer Subsidy Issue" Fertilizer News, December 1993.
Table No.10

Comparison of food grains production and yield levels

<table>
<thead>
<tr>
<th>Crop</th>
<th>1991-92</th>
<th></th>
<th>1992-93</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>74</td>
<td>1741</td>
<td>72</td>
<td>1745</td>
</tr>
<tr>
<td>Wheat</td>
<td>26</td>
<td>778</td>
<td>37</td>
<td>1040</td>
</tr>
<tr>
<td>Pulses</td>
<td>12</td>
<td>534</td>
<td>15</td>
<td>616</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>1374</td>
<td>180</td>
<td>1446</td>
</tr>
</tbody>
</table>


The above table reflects increase in pulses production and also yield levels. This is due to the special pulses program launched by GOI and the inputs provided at highly subsidised rates.

Anand Reddy and Sharma\textsuperscript{67} contend 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 Pottash due to the recent price hike. The consumption of Nitrogen has increased by 5.8 per cent while that of Phosphates 22.6 percent and Pottash by 5.4 percent during the season immediately after the control. They claim that for ensuring balance

fertilization cost benefit must be made more attractive for use of P and K. The subsidy should be brought to zero level in a phased manner.

Professor Kaulgi68 has discussed the suitability of adopting a transportation model for statewise and unitwise allocation of fertilizer products for optimizing the movements and to avoid criss cross transportation. His study as indicated the allocation of marketing territories as follows.

<table>
<thead>
<tr>
<th>Manufacturers</th>
<th>Location of plant</th>
<th>States of Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Existing Territory</td>
</tr>
<tr>
<td>MFL</td>
<td>Madras Tamil Nadu</td>
<td>AP, KN, KE, PY</td>
</tr>
<tr>
<td>SPIC</td>
<td>Madras Tamil Nadu</td>
<td>AP, KN, TN, PY, MP, MH</td>
</tr>
<tr>
<td>RCF</td>
<td>Trombay Maharashtra</td>
<td>BH, WB, UP, AP, MH, RJ, KN</td>
</tr>
</tbody>
</table>

This study brings out vast scope for redefining the territory of fertilizers manufacturers.

Review of the Report of a Village Level Study

Fertilizer Association of India, Southern Region, Madras under took a study covering farmers and fertilizer dealers in south India69. The primary

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69 Lakshman Rao, H.K (Deputy General Manager, MFL, A member of the study team). The study was undertaken by the Fertilizer Association of India,
The aim of this study was to estimate crop-wise nutrient application rates for major crops in southern India. The study also attempted to identify key factors for farmers' buying behaviour and also to estimate the reach and impact of several promotional and extension programs undertaken by the fertilizer manufacturing units and the Department of agriculture. The study attempted to obtain key factors influencing their purchase decisions and the fertilizer usage pattern for several crops under irrigated and rainfed conditions.

Since the study was of some relevance to the research topic, the reports of the study have been reviewed and the highlights discussed. The survey was undertaken in the villages of Andhra Pradesh, Tamil Nadu, Karnataka, Kerala and the union territory (UT), Pondicherry during 1990-91. By the time of finalising this research, reports of Andhra Pradesh, Tamil Nadu, Pondicherry and Kerala were released. This review covers these reports.

Farmers' survey to estimate the use of fertilizers in the southern states (Andhra Pradesh, Tamil Nadu, Kerala) was undertaken by the Fertilizer Association of India (FAI), Southern regional office, Madras during 1990-91.

The study was primarily aimed at estimating crop-wise nutrient application rates in the southern states for major crops. Besides obtaining fertilizer application details, information on related aspects such as factors influencing the decision making process of farmers, extent of adoption of improved agricultural practices, farmers' purchase behaviour etc. was collected. The field survey covered an aggregate 4000 farmers in the four southern states and the UT of Pondicherry. Many aspects of Fertilizer Marketing Systems focusing on the logistics were also included as secondary objectives of the study.

Southern Region Madras, during 1990-91.
The sample study 'Consumer behaviour on fertilizers usage' conducted as a part of this research covering 210 farmers in 14 villages of Tamil Nadu and Andhra Pradesh (1994) also corroborates some of the findings of the FAI study.

Details of the villages covered and the number of farmers included are given below:

**Table No.11**

**Fertilizer survey in the Southern Region**

**Coverage**

<table>
<thead>
<tr>
<th>State</th>
<th>Villages</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>217</td>
<td>1085</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>216</td>
<td>1125</td>
</tr>
<tr>
<td>Kerala</td>
<td>141</td>
<td>698</td>
</tr>
<tr>
<td>Pondicherry</td>
<td>12</td>
<td>76</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>586</td>
<td>2984</td>
</tr>
</tbody>
</table>

Source: Survey reports - FAI Southern Region, Madras.

**HIGHLIGHTS:**

**Andhra Pradesh & Kerala:**

The study covered 1085 farmers in 217 villages representing all the 22 Districts of Andhra Pradesh. In the state of Kerala the southern most state in India 700 farmers were covered. A multistage sampling technique was employed. The objective of the study was to identify the key factors influencing the fertilizer consumption, the adequacy of logistics for fertilizer marketing at the grass root level etc. A comprehensive questionnaire was used to obtain the details through trained investigators. (Questionnaire in the Appendix).
In order to provide an overview of the agricultural & marketing environment of the states in which the study was carried out, a profile of Andhra Pradesh & Kerala are provided:

Table No.12

A profile of Andhra Pradesh & Kerala

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Key Elements</th>
<th>Andhra</th>
<th>Kerala</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Geographical area (hect.)</td>
<td>27440</td>
<td>3885</td>
</tr>
<tr>
<td>2.</td>
<td>Gross cropped area (hect.)</td>
<td>13258</td>
<td>2964</td>
</tr>
<tr>
<td>3.</td>
<td>Gross irrigated area (hect.)</td>
<td>5454</td>
<td>406</td>
</tr>
<tr>
<td>4.</td>
<td>HYV-paddy (hect.)</td>
<td>3638</td>
<td>393</td>
</tr>
<tr>
<td>4.</td>
<td>Fertilizer consumption NPK (000T) - 1991-92</td>
<td>128</td>
<td>95</td>
</tr>
<tr>
<td>5.</td>
<td>Dealer Network - 1991-92</td>
<td>12836</td>
<td>9413</td>
</tr>
<tr>
<td>6.</td>
<td>Storage Capacity (000T)</td>
<td>1051</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Per Hectare cons. NPK</td>
<td>122</td>
<td>82</td>
</tr>
</tbody>
</table>

Source: FAI Southern region Madras

Summary of the findings:

Andhra Pradesh:

1. Fifty percent of the farmers responded were literates and a significantly large number of the literates were from farmers of large holdings.

2. Farming is the main occupation of 84% of the respondents.

3. Irrigated crops contributed for 79.4% of the fertilizer consumption.

4. Three fourths of the respondents obtained requirements of fertilizer and other inputs from private dealers and 83% bought fertilizers from
dealers outside the village since the local dealers did not have the stock of the type of fertilizers needed by them.

5. While deciding on the type and quantity of fertilizer to be purchased, majority of farmers were guided by their own past experience.

**Farmers Ranking of the reasons**

Table No.13

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Own experience</td>
<td>I</td>
</tr>
<tr>
<td>b)</td>
<td>Based on friends advice</td>
<td>II</td>
</tr>
<tr>
<td>c)</td>
<td>Farm radio</td>
<td>III</td>
</tr>
<tr>
<td>d)</td>
<td>Literature of Agri. Dept.</td>
<td>IV</td>
</tr>
<tr>
<td>e)</td>
<td>Literature of fert firms</td>
<td>V</td>
</tr>
<tr>
<td>f)</td>
<td>Fertilizer salesmen</td>
<td>VI</td>
</tr>
<tr>
<td>g)</td>
<td>Soil testing</td>
<td>VII</td>
</tr>
</tbody>
</table>

Source: Survey report FAI southern region Madras.

According to the findings of the survey fertilizer application is not widespread but confined to a few crops that too under irrigated conditions. Irrigated crops accounted for 79.4% of the total fertilizer consumption and paddy alone accounted for 54.7% of the total consumption. This reveals the large potential
available for consumption in other major crops and of crops under irrigated conditions.

The consumption is also not even the coastal Andhra accounted for 46.4%, Rayalaseema for 16% and Telengana for 37.6% of the total consumption of the state.

Table No.14
Fertilizer consumption by crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>64.1</td>
<td>51.6</td>
<td>41.5</td>
<td>57.4</td>
</tr>
<tr>
<td>Groundnut</td>
<td>5.3</td>
<td>16.2</td>
<td>14.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>9.7</td>
<td>6.6</td>
<td>14.6</td>
<td>9.0</td>
</tr>
<tr>
<td>Cotton</td>
<td>5.7</td>
<td>7.7</td>
<td>4.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Chillies</td>
<td>3.7</td>
<td>5.1</td>
<td>6.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Others</td>
<td>11.5</td>
<td>12.8</td>
<td>18.6</td>
<td>12.7</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Irrigated crops</td>
<td>84.6</td>
<td>71.9</td>
<td>77.5</td>
<td>79.4</td>
</tr>
<tr>
<td>Un irrigated</td>
<td>15.4</td>
<td>28.1</td>
<td>22.5</td>
<td>20.6</td>
</tr>
</tbody>
</table>

Source: compiled from the report on The farmers’ survey FAI_SR.

The above analysis indicates the vast scope and potential for consumption by non-traditional crops particularly, sugarcane, cotton, chillies and also the Dry land cultivation.

The study revealed that small farmers, in order to maximize the yields, applied doses higher than required. This requires effective communication programs on proper use of fertilizer products to improve the economics of fertilizer use among small and marginal farmers.
Kerala

1. Seven hundred farmers were covered in the sample survey. The respondents were from small & medium (46%), Medium (35%) and large (19%) holdings.

2. Since this state has the highest literacy level in India, the literacy among the responding farmers were also very high - 98% among small farmers (less than one hectare), 97% among medium farmers (between one and two hectare land) and 98% among large farmers (over 2 Hectare land).

   This is an important feedback to fertilizer marketers for developing mass media communication through press and pamphlets.

3. Unlike in other states where the dependence on farming is high among farmers in Kerala, only 62% depended exclusively on farming. Farmers have secondary occupation to support their income.

4. Irrigation facility is high in this state 96% of the respondents reported that they were cultivating irrigated lands.

   This is an important information for the fertilizer marketers since fertilizer consumption is largely depended on the availability of assured irrigation. According to the multiple regression model discussed in chapter IV, the same conclusions were arrived. Fertilizer marketing in such a favorable situation, can maximize the consumption by conversion of potential demand.

5. Eighty eight percent of the respondent fertilizers reported that they purchased their requirements from the outlets from the village itself.
This reveals that for development of consumption adequate dealer network close to consuming points is essential

6. An analysis of the factors influencing consumption decisions of the farmers reveals that farmers are primarily guided by their own experience.

**Ranking of factors influencing purchase decisions of farmers**

**Table No.15**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own experience</td>
<td>I</td>
</tr>
<tr>
<td>Friends</td>
<td>II</td>
</tr>
<tr>
<td>Farm radio</td>
<td>III</td>
</tr>
<tr>
<td>Soil testing</td>
<td>IV</td>
</tr>
<tr>
<td>Dealers</td>
<td>V</td>
</tr>
<tr>
<td>Agri. Dept</td>
<td>VI</td>
</tr>
<tr>
<td>Fertilizer Salesmen</td>
<td>VII</td>
</tr>
<tr>
<td>Dept Literature</td>
<td>VIII</td>
</tr>
</tbody>
</table>

Source: survey report FAI southern region Madras.

7. Paddy and coconut together accounted for 66% of the total State consumption of fertilizers.

An analysis of the percentage share of consumption by various crops shows wide variations.
Table No. 16
Share of consumption of fertilizers by crops
Percentages

<table>
<thead>
<tr>
<th>Crops</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>50.1</td>
<td>43.0</td>
<td>38.5</td>
<td>42.2</td>
</tr>
<tr>
<td>Coconut</td>
<td>20.8</td>
<td>19.9</td>
<td>22.4</td>
<td>21.3</td>
</tr>
<tr>
<td>Rubber</td>
<td>14.0</td>
<td>20.2</td>
<td>22.2</td>
<td>20.1</td>
</tr>
<tr>
<td>Banana</td>
<td>6.5</td>
<td>7.6</td>
<td>4.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Others</td>
<td>8.6</td>
<td>9.3</td>
<td>12.1</td>
<td>10.3</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

This analysis provides a pointer on where the marketer should concentrate to increase the consumption.

Tamil Nadu & Pondicherry:
Tamil Nadu:

The sample survey carried in Tamil Nadu covered 1125 randomly selected farmers in 216 villages spread over in all the districts of the state. Forty seven percent of the farmers covered were small farmers, with land holding size less than 2 hect. 33% medium with holdings ranging between 2 to 4 hect and 29% of the farmers belong to the large category with holdings over 4 hect.

Over 80% of the farmers covered in the survey were literates. Large holding group had the highest literacy. Seventy two percent of the respondents reported that they solely depended on farming. Forty six percent of the farmers had irrigated land and 17% had only rainfed. Ninety percent reported that they applied both chemical fertilizers and organic manure.
Fifty five percent of the farmers preferred to get their fertilizer and other inputs from private dealers even if meant traveling beyond 2 kms, since they were confident of getting the right type of fertilizers. In case of farmers depending on cooperative retail societies they would have to buy whatever product was available. Large and medium sized holding farmers buy their fertilizer and other inputs on credit. The proportions of such farmers are 55% & 53% respectively.

Table No.17
Category Responding Purchase pattern (%)

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Size</th>
<th>Cash</th>
<th>Credit</th>
<th>Both</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>506</td>
<td>53</td>
<td>18</td>
<td>29</td>
<td>100</td>
</tr>
<tr>
<td>Medium</td>
<td>353</td>
<td>45</td>
<td>18</td>
<td>37</td>
<td>100</td>
</tr>
<tr>
<td>Large</td>
<td>212</td>
<td>47</td>
<td>18</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>All</td>
<td>1071</td>
<td>49</td>
<td>18</td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>


The analysis reveals that the small and medium farmers who are the target group for this facilities are unable to utilize this facilities and the large holding farmers are managing to get the facility. Fertilizer marketing men as also the credit offering agencies to evaluate the system for taking corrective action.

When the factors influencing the decision of farmers on the use of fertilizers was analyzed the following ranking of the reasons emerged:
Table No.18
Factors influencing farmer's decision

<table>
<thead>
<tr>
<th>Factors</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers own experience</td>
<td>I</td>
</tr>
<tr>
<td>Other farmers</td>
<td>II</td>
</tr>
<tr>
<td>Agri- Dept. literature</td>
<td>III</td>
</tr>
<tr>
<td>Fertilizer Dealer</td>
<td>IV</td>
</tr>
<tr>
<td>Govt. Officials</td>
<td>V</td>
</tr>
<tr>
<td>Radio broadcasts</td>
<td>VI</td>
</tr>
<tr>
<td>Soilt testing</td>
<td>VII</td>
</tr>
<tr>
<td>Fert. Salesmen</td>
<td>VII</td>
</tr>
<tr>
<td>Literature given by</td>
<td></td>
</tr>
<tr>
<td>Fert. companies</td>
<td>IX</td>
</tr>
</tbody>
</table>

Source: survey report FAI, southern region, Madras.

The above analysis indicates that fertilizer marketing organizations have not been adequately influencing the farmers through salesmen, Soil testing facilities on which significant marketing costs are involved. Even the fertilizer dealer do not rank prominently in stimulating demand and providing the information needed by the farmers. These are vital indicators for fertilizer marketing system.

Pondicherry:

Pondicherry is relatively a small territory compared to other states in south India. With a gross cropped area of 42000 hect, the states consumption is less than one percent of the southern region comprising of Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Pondicherry.
The survey in this state covered 76 farmers in 12 sample villages to examine the fertilizer consumption pattern and obtain a profile of the farmers and their purchase behaviour pattern.

An overwhelming majority (96%) of farmers who responded depended only on farming. Nearly 100% of the farmers applied fertilizers. Eighty percent of the farmers obtained their fertilizers through cooperatives. The cooperatives stocked the fertilizers that the farmers needed. About 90% of the respondents adopted improved agricultural practices.

The study supports the hypothesis that fertilizer consumption can be substantially stimulated by non-price marketing efforts which includes improving the logistics to make the right products available at the right time. Development of retail outlets, making the soil testing facility more effective, motivating the fertilizer salesmen for effective communication and extension. Making available credit on time. Among the macro level decisions are improving the irrigation facilities, making available the seeds and agro-chemicals, improving infrastructural facilities such as storage facilities roads, mass communications.

Fertilizer Communication in Pondicherry in heavily skewed towards irrigated areas as nearly 82% of the consumption of NPK is to the irrigated crops as seen from the table 19.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Percentage Consumption (NPK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated</td>
<td>81.8</td>
</tr>
<tr>
<td>Plantation</td>
<td>9.2</td>
</tr>
<tr>
<td>Rain fed</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
There is vast scope for promoting fertilizer use for rainfed crops which has a large area under cultivation. Paddy accounted for 44.5% of the total consumption. Marketing efforts should be focused on other crops such as groundnut, cotton, banana, sugar cane, chilies.

The study of the literature has brought into focus the several key aspects of fertilizer marketing systems as viewed by fertilizer, marketing executives, government officials, academicians, management institutes, etc. The literature study has covered Books, Reports, Papers presented at seminar/workshop, Research study conducted on various aspects of Fertilizer Marketing, Newspaper Reports, Annual Reports, etc. The problems and issues confronting industry as also the challenges and opportunities the environment offering system for fertilizer marketing system are brought out. The importance of logistics and need for understanding the farmers purchase behaviour pattern have been well brought out in this review. The review on report of farmer study reveals the problems and issues of marketing at village level and also the feedback of farmers. The review of literature strengthened the research domain and the importance of logistics in fertilizer marketing management which is the focus of this result.
1.4 OBJECTIVES OF THE STUDY

The study aims to achieve the following objectives:

a. to examine the conceptual issues in the management of fertilizer marketing

b. to carry out a disaggregate analysis of the marketing costs

c. to attempt the building of an optimization model for fertilizer marketing in South India

d. to build an innovative strategy for the improved logistics of fertilizer marketing in India,

e. to conduct a survey of the fertilizer consumers and to study their perceptions

f. to build a transportation model using secondary data

g. To provide insights into the several facets of the fertilizer industry, to researchers & academicians for further research in the Fertilizer Marketing System.

f. To identify further areas for research
1.5 METHODOLOGY

In this study, descriptive and analytical methodology have been adopted. Elaborate reviews of the literature and fertilizer industry, Marketing Management, Logistics Management, Public Distribution System have been made. Empirical data from key aspects of fertilizer marketing forms the basis for analysis.

For analysis of the primary data and secondary data collected from field survey, Multiple Regression Analysis (MRA), Linear trend based on time series analysis, SQC, and transportation model have been adopted.

The information obtained from the review of the literature study have been adopted wherever it was found relevant to the objective of the research.

Discussions were held with the marketing executives of fertilizer marketing units to seek their views on the Strengths, Weakness, opportunities and the Threats (SWOT) of the current marketing system and the policy environment.

Statistical data on consumption trends, Production, utilization of capacities, prices, per hectare consumption rates, retail network, performance of cooperatives, distribution plans under Essential Commodities Act (ECA), available with the publications of Fertilizer Association of India, new Delhi as also its Regional office at Madras haven been collected and analysed. Data and information available from the annual review of the Ministry of fertilizer Government of India have been adopted.

Major analysis and discussions are based on the fund of secondary data available with the industry association (FAI), Ministry of Agriculture, Ministry of fertilizers, Promotion & Extension agencies, Railways and the warehousing corporations.
Secondary data has been obtained for micro level analysis and developing the optimization model from the Fertilizer Association of India, Dept. of Agriculture, and Ministry of Fertilizers, Government of India.

For analysing the impact of the current fertilizer marketing system from the point of view of the consumer, the Farmer and to study the consumer behaviour and reaction to the marketing mix of the industry (product, price, promotion & placement of products) a sample survey covering 210 farmers of different land holdings, education background, cultivation practices in 14 randomly selected villages was undertaken in Feb-Mar. 1994. A structured Questionnaire was used to obtain their response through a personal interview. The questions were close ended with several alternatives for the respondent to choose. The field survey was administered utilising the services of M.B.A. students as interviewers. The interview was conducted in the local language. An intensive orientation was given to the students for conducting the interviews. A self tabulation technique was adopted for recording the responses. This is a unique technique to minimize the bias of the interviews and to speed up the data tabulation and analysis (Questionnaire in annexure).

A survey of the front line sales force of a large scale cooperative sector fertilizer manufacturer and marketer; IFFCO was also carried out to get the understanding of the fertilizer sales personnel on their perception of the farmers’ decision making process with regard to purchase and use of fertilizer and other agro- inputs. This survey also obtained information on the adequacy and the service levels of the retail network from 52 salel executives who had exposure to fertilizer marketing ranging from 5 to 15 years.

Consumption statistics of urea for a five year period from 87-92 for each of the 71 centroid (in most cases, the districts) were obtained from the Agricultural & Fertilizer Statistics (an annual publication of the FAI- Southern Region) for the sample years 1986 through 1992. In order to develop an optimization model for fertilizer allocation (least cost basis), product (urea)

The annual reviews released by the Fertilizer Association for these periods have also been used to obtain latest consumption, production and import data.

Road distances from each of the supply points (fertilizer plants) to each of the central in kms were obtained. The aggregate product (urea) availability from the sources was matched with the aggregate requirements of the 71 consuming points with a view to make the L.P. model a balanced one

Urea was chosen for developing the model as this product is still under GOI control and enjoys the subsidy. Urea is a universal product used by all farmers the maximum quantity of fertilizer sold is Urea During 1992-93 out of the total of 27 million tons of fertilizer consumed Urea alone accounted for 14 million tons, nearly 50% (Fertilizer News Sept 93.p 86). Urea is required by all crops as it provides Nitrogen. Application of other products depends on the specific crop and soil conditions. Allocation of urea is made under the provision of the Essential Commodities Act (ECA) by the Ministry of Agriculture GOI, in consultation with the Ministry of Fertilizers GOI and the State Dept of Agriculture, bi-annually for the Agricultural Seasons Kharif (April - Sept) and Rabi (Oct- Mar). The supply plan is drawn up for each Fertilizer Manufacturing unit producing urea based on the anticipated production and the capacity. The plan is drawn district wise and month wise. The manufacturing units are required to adhere to the plan for making supplies to become eligible for the subsidy. The state Government Dept. of Agriculture will monitor the supplies of each Fertilizer manufacturing unit making supplies to the state.
The other Fertilizer products do not now come under the purview of the ECA are those products containing Phosphates (P) and Potash (K) such as DAP, Complex Fertilizers, Super phosphate, MOP.

Sales forecasting, though crucial, is among the grey areas of marketing particularly logistics system. All benefits and problems, emerge from realistic or unrealistic forecasts. Without proper sales forecast, efficient logistics, promotion, field monitoring cannot be effectively made and the desired marketing goals cannot be attained. In order to explain the method of developing forecasting with the wealth of data available with the units and also the industry association (FAI) Auto-regression technique has been demonstrated for grass root and corporate level planning. Auto-regression technique for sales forecasting is found appropriate both at micro and macro levels.

Five year NPK consumption for each state was obtained to develop a short-term sales forecasting model based on statistical trend analysis. The annual forecasted quantity has been used to estimate the monthly requirement, based on the past five year fertilizer off take pattern. The objective of this exercise was to develop a realistic short-term forecast for logistic plan. The purpose of this exercise was to make the tested technique available to the industry at large.

Basic data on marketing costs on several elements of marketing mix were obtained from two large scale fertilizer manufacturing units (MFL & SPIC) were obtained to develop a regression relationship between the major cost elements and the sales performance.

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70 This method was tested and adopted in Madras Fertilizers Ltd (MFL) which resulted in a substantial saving besides improving the service to farmers.
A linear Multiple Regression Model has been developed for the following factors in order to obtain the relative impact of each of the factors on the consumption;

1. Fertilizer consumption in terms of nutrients - Y. Dependent variable.
2. Cross cropped area - X1 Independent variable
3. Area under HYV - X2
4. Gross irrigated area-X3 Independent variable
5. Weather conditions- X4
6. Price ratio -X5

Data pertaining to the above factors were obtained for the period 1970-71 through 1991-92;

Utilizing computer linear multiple regression model of the form; \( Y = A + A_1X_1 + A_2X_2 + A_3X_3 + A_4X_4 + A_5X_5 + A_6X_6 + A_7X_7 \) was developed to obtain the regression coefficients and R squared values for interpretation and testing the hypothesis of the relationships.

A similar model was developed for the marketing cost data obtained from two large scale fertilizer manufacturing units for a period of five years. The objective was to measure the benefit that can be derived from the expenses incurred on these items. This would guide Fertilizer marketing at micro level to monitor the marketing budgets and thereby control the costs.

Annual reports of a sample of fertilizer manufacturing units from public, cooperative and private sectors were obtained for a detailed analysis of the marketing programs and strategies.

Study reports of Fertilizer Association of India New Delhi and the Southern Regional center Madras were obtained for a close review. In order to get inputs on farmers buying behavior , identifying the factors influencing the
fertilizer consumption and to measure the impact of the decontrol on phosphate and potash, a sample field survey was conducted in villages close to Madras.

A number of large scale fertilizer manufacturers were contacted by sending letters and questionnaire seeking information on production, marketing costs, marketing territories, retail net work, product allocation under ECA for last five years, sales statistics, subsidy received from government, utilization of soil testing facilities etc.

The two and a half decades of experience in the fertilizer marketing of the author at MFL has had its weightage in the analysis and interpretations.

The data pertaining to the fertilizer industry marketing mix - Product, Price, Placement & Promotion (4Ps) have been analyzed and interpreted.

1.6 LIMITATIONS OF THE STUDY

This study is based on the secondary data obtained from an exhaustive survey of literature, detailed Statistics on Fertilizer Industry covering Production, Consumption, Imports, Marketing, Prices, logistics etc; from the Fertilizer statistics and other periodicals published by the Fertilizer Association of India (FAI) and detailed discussions with fertilizer marketing executives. Primary data collection and analysis has been restricted to farmers survey in 14 villages and 210 farmers of Tamil Nadu/Andhra Pradesh. A second sample survey in 2 villages covering 52 farmers was also undertaken.

The research questionnaire seeking information on production, marketing costs, subsidy claimed/received etc, was mailed to 65 chief executives of fertilizer organizations. Close follow up was made but the response was not encouraging. It was later understood that the Fertilizer Units which were drawing the subsidy had reservations (limitations) in providing the inputs on the marketing systems and costs for optimization.
few responses received from the industry were quite sketchy and were not adequate enough for using in the model development. Further the few respondents desired that they should not be quoted. For developing the optimization model as an illustration only the seven major fertilizer manufacturing units located in south India and their production capacities of urea have been considered. Besides, in order to obtain the least cost solutions from the model, instead of the actual cost of movement of products from supply sources to the consuming centers, the road distances, are taken as the input data. In order to forecast the state wise demand for the period last five year district wise consumption data has been used. A Time Series Analysis based on the least square method has been adopted for each of the states while the trend may be quadratic or exponential. The demand of the states have been aggregated and adjusted proportionately to match the total requirement in order to make the transportation model a balanced one.

For analyzing the marketing costs details obtained from only two major fertilizer manufacturing units (MFL & SPIC) have been adopted. Since there was a high degree of reluctance on the part of the manufacturers to share the details. Consumption has been aggregated to district levels (centroids) the point of consumption considered for the model can be away from the actual villages where the consumption takes place. However these points will be within the same district/centroids.

These are some of the limitations of the study

1.7 SIGNIFICANCE

The Fertilizer Industry which had been growing and developing at a fast rate has started a declining trend since 1986. In order arrest the trend and to revitalize the industry certain major policy decisions both at macro and micro level are necessary. It is through efficient marketing management system that the consumption and customer satisfaction can be maximized. When
consumption is stimulated it provides the required impetus for utilization of the production capacities. Efficiency in fertilizer logistics is among the essential requirements for improving the fertilizer consumption.

Under the emerging new marketing and policy environment this study is highly significant. Logistics and demand forecasting have been recognized as the key aspects in fertilizer marketing system based on the detailed literature survey and the discussions with the executives of fertilizer industry.

Minimizing the cost and improving the efficiency of logistics are significant in stimulating fertilizer consumption. The two aspects become the base for other marketing operations like, Promotion, Pricing and developing innovative products.

1.8 CONCLUSION

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 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 it's growth.

There is large proportion of farmers and farm holding still not touched by the marketing efforts. The farmers in the remote and hilly areas are not being served by the industry. In the aggregate this segment provides a large potential. The objective of this research is to identify such potential segments and the needed for aggressive marketing.

The emerging challenges of the industry in the area of marketing with particular reference to the Logistics have been discussed.