

# INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE & MANAGEMENT

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- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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**EMPIRICAL STUDY ON OUTBOUND LOGISTICS OF FERTILIZERS IN NFCL**

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**ABSTRACT**

*"Jai Kisson (the farmer)", the slogan was meant for praising the farmer who produces food grains sufficient to the Indians, and encouraging the farmers to continue in this field. But today the farmer refuses to do the agriculture; the primary sector of India as he is facing many problems including the shortage in the availability of fertilizers. Nagarjuna Fertilizers and Chemicals Limited is major urea producer for the Andhra Pradesh and plays a vital role in the fertilizer industry. Hence the present study focused on the outbound logistics of Nagarjuna Fertilizers and Chemicals Limited, Kakinada. For this study the methodology includes collection of secondary and primary data, sampling design, classification and tabulation of data and diagrammatic and graphical representation of data. Finally the above data is analyzed and reported to conclude that the company is facing outbound logistics problems that can be solved by effective implementation of the suggestions made in this study.*

**KEYWORDS**

fertilizers, outbound logistics, supply chain management.

**INTRODUCTION**

The fertilizer is defined as any material which is natural or artificial, organic or inorganic, supplies one or more of the chemical elements necessary for plant growth. Carbon dioxide, oxygen and hydrogen are directly supplied by air and water and therefore not treated as nutrients by the fertilizer industry. Nagarjuna is an integrated Agriculture group with core competencies in the fields of plant nutrition, protection, irrigation, farm services and food processing. NFCL products and services are designed to provide consumers access to safe, nutritious and tasty food and growers with maximum economic returns. NFCL is one of the most recognized agricultural brands in India. Unlike many industries NFCL's strength is its ability to serve the large base of customers through a wide spread dealer network. NFCL sales operations are managed by the latest SAP system installed in all the marketing offices while NFCL sales personnel maintain direct and continuous contact with the vast dealer network to serve them efficiently.

**REVIEW OF LITERATURE**

According to SathyaRao & Sandhya (1994) in their research paper 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. A study conducted by H.K.LakshmanRao at Madras Fertilizers Ltd. (1986) Public Distribution System 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. According to the Sivaraman committee, 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. According to Saleem Ahmed, Chowdhury and others (1992) 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." In his study Rama Swamy (1985) covers major fertilizer marketing functions. It describes the process of fertilizer marketing in India as existed prior to 80s. It has brought out the Strengths, Weakness, Opportunities and the Threats (SWOT) of the fertilizer marketing system. It also brings out the need and feasibility of containing the marketing costs in the fertilizer industry. 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. 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. According to Lambert and Cooper (2008) operating an integrated supply chain requires a continuous information flow. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. Bowersox and Closs (1996) states that the emphasis on cooperation represents the synergism leading to the highest level of joint achievement. A primary level channel participant is a business that is willing to participate in the inventory ownership responsibility or assume other aspects of financial risk, thus including primary level components

**NEED/IMPORTANCE OF THE STUDY**

The specific need for the study of outbound logistics of fertilizers with special reference to NFCL is to study outbound logistics and sales and services as the agriculture accounts for 14.6 per cent of the country's gross domestic product (GDP) in 2009-10, and 10.23 per cent (provisional) of the total exports and is one of the strongholds of the Indian economy. Furthermore, the sector provides employment to 55 per cent of the work force The Government of India from time to time has taken considerable steps for the development of Agriculture Sector. Fertilizer in the agricultural process is an important vicinity of concern. Fertilizer industry in India has succeeded in meeting the requirements of all kinds of chemical fertilizers in the current years.

**STATEMENT OF THE PROBLEM**

Today the farmer refuses to do the agriculture; the primary sector of India as he is facing many problems including the shortage in the availability of fertilizers. NFCL is major urea producer for the Andhra Pradesh and plays a vital role in the fertilizer industry. Hence the present study focused on to find out and analyzes the bottlenecks in SCM of NFCL and Fertilizer industry.

**OBJECTIVES**

1. To study the supply chain of the Nagarjuna Fertilizers and Chemicals Limited
2. To study and analyze the various outbound logistics of NFCL
3. To make suggestions for improvement.

**HYPOTHESES**

1. Null hypothesis (H<sub>0</sub>): There is no capacity underutilized in the industry  
Alternative hypothesis (H<sub>a</sub>): There is 17.12 % of capacity is underutilized in the industry
2. Null hypothesis (H<sub>0</sub>): The Company is not trying to offer the consistent product mix by sourcing traded product from other firms  
Alternative hypothesis (H<sub>a</sub>): The Company is trying to offer the consistent product mix by sourcing traded product from other firms
3. Null hypothesis (H<sub>0</sub>): More production of Urea is not possible than its installed capacity  
Alternative hypothesis (H<sub>a</sub>): More production of Urea is possible than its installed capacity

**RESEARCH METHODOLOGY**

The analysis may be possible by studying the data available in the company. The methodology includes collection of secondary and primary data, sampling design, classification and tabulation of data and diagrammatic and graphical representation of data. Finally the above data is analyzed and reported

The **secondary data** was collected from organization records, management reports, the department of fertilizers and the Fertilizer Association of India and the special project reports to understand the present state of supply chain management primary activities.

The **Primary data** was collected from the truck drivers of in and around the organization as they are key actors in outbound logistics of NFCL with the help of questionnaire.

The **questionnaire** consists of close ended questions of both multiple – choice questions and checklist questions. The questionnaire has two parts. The first part of the questionnaire was relating to social aspects of truck drivers and the second part consisted of economic aspects of truck drivers and a total of 14 questions relating to age, educational qualification, Experience, Income, House details, Own house details, Rent details, marital status, No of children, Education of children, Spouse’s education, Amenities in house, and the problem creators on the road. The sample is selected based on random sampling. The Survey conducted in the city of Kakinada and its surrounding villages through questionnaires to 200 drivers.

**TOOLS FOR DATA ANALYSIS**

The processing and analysis of data was done with the help of the computer software StatistixL (Statistical Package for Social Sciences) and STATISTICS XL software. Mean and other calculations and drawing of tables, charts and the figures are done by using MS Excel.

**Testing of Hypothesis:**

**Chi – square (χ<sup>2</sup>) test** is used to test the ‘goodness of fit’ as it is the very powerful test for testing the significance of the discrepancy between theory and experiment was given by Prof. Karl Pearson. It enabled to find if the deviation of the experiment from theory is just by chance or is it really due to the inadequacy of the theory to fit the observed data.

**FORMULA USED**

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

**MEAN**

The mean (the expected frequencies) in each group or condition is calculated by adding up all the scores in a given condition (for 10years), and then dividing by the number of years (10) in that condition.

**DECISION RULE**

At 5% level of significance and at the degrees of freedom 9 if calculated value of χ<sup>2</sup> is less than the tabulated value accept Null hypothesis and if calculated value of χ<sup>2</sup> is greater than the tabulated value reject Null hypothesis.

**THE CORRELATION COEFFICIENT:** it is to determine the relationship between two properties

The equation for the correlation coefficient is:

$$\text{Correl}(X, Y) = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

Where x and y are the sample means AVERAGE (array1) and AVERAGE (array2).

**RESULTS & DISCUSSION**

**TABLE 5.1: SECTOR -WISE TARGET AND ACTUAL PRODUCTION (MTS) OVER 10 YEARS**

Financial Year	Public sector			Cooperative sector			Private sector			NFCL		
	Target	Actual	% Gap	Target	Actual	% Gap	Target	Actual	% Gap	Target	Actual	% Gap
2001 - 02	8643.2	7396.9	-14	7266.2	7651.2	5.3	20757.9	16951.5	-18.3	1195.0	1186.2	-0.7
2002 - 03	8224.0	7509.3	-8.7	7266.2	7651.2	5.3	20757.9	16951.5	-18.3	1195.0	1186.2	-0.7
2003 - 04	8224.0	7509.3	-8.7	7208.0	7473.9	3.69	19491.6	16720.3	-14.2	1194.6	1193.8	-0.1
2004 - 05	8212.7	7715.7	-6.1	7639.6	7959.7	4.19	19755.0	17936.2	-9.21	1194.6	1392.3	16.5
2005 - 06	8062.9	7502.6	-6.9	7692.4	8209.4	6.72	18821.5	17956.7	-4.59	1194.6	1379.3	15.5
2006 - 07	8202.7	7557.4	-7.9	9471.0	8721.5	-7.91	18597.6	19938.0	7.207	1194.6	1324.0	10.8
2007 - 08	7729.5	6918.6	-10	9976.9	8538.8	-14.4	19725.7	17786.8	-9.83	1194.6	1354.2	13.4
2008 - 09	7625.7	7137.7	-6.4	9390.9	8911.0	-5.11	19819.0	17099.4	-13.7	1429.5	1378.0	-3.6
2009 - 10	7440.9	7686.6	3.3	9430.0	9978.4	5.82	20125.6	19157.2	-4.81	1484.9	1480.1	-0.3
2010 – 11*	3071.0	3042.4	-0.9	4081.9	4460.0	9.26	8904.5	7803.0	-12.4	686.0	695.4	1.37
Total	75436.6	69976.5	-7.2	79423.1	79555.1	0.17	186756.3	168300.6	-9.88	11963.4	12569.5	5.07

\* Apr2010-August2010

Source: Department of Fertilizers, New Delhi

Table 5.1 shows Sector -Wise Target and actual Production for 10 Years. The actual performance of co operative sector for 10 years is 79555.1 MTs which is 132 MTs more than its intended production i.e. 79423.1 MTs this is better than the remaining two sector. The 2<sup>nd</sup> best is the performance of Public sector as its target performance is 75436.6 MTs and its actual performance is 69976.5 MTs. The least of all is the performance of private sector its actual performance is 168300.6 MTs against to its intended performance 186756.3 MTs.

From this study it can be said that over 17.12 % of capacity is underutilized. It can be improved when the policies of the govt. are implemented effectively. For the government intention is to go ahead with a new investment strategy for the fertilizer sector, especially for urea. This policy seeks to create a 1.5 million-tons capacity for the production of urea over a five year-period. The new policy may provide gas linkage for up to 75 per cent of new capacity created from domestic gas resources, while the rest will have to be met through imports. The Government may provide a subsidy for the price differential between domestic and imported gas.

The proposed policy is for both Greenfield (new plants) and brown field plants, i.e. capacity addition to existing plants or revival of old or closed plants. The proposed policy is based on the current availability of gas within the country and rising trend in global gas prices. The new policy is expected to be announced in the Budget for 2012-13 and then the issue will be placed before the Cabinet for a final decision.



**HYPOTHESIS - 1**

**Null hypothesis (H<sub>0</sub>):** There is no capacity underutilized in the industry

**Alternative hypothesis (H<sub>a</sub>):** There is 17.12 % of capacity is underutilized in the industry

Level of significance: 5%

Degrees of freedom (DF): 3

Calculated value: 178349.1

Table value: 7.82

**Decision:** Reject null hypothesis

**Conclusion:** It's very significant that there is 17.12 % of capacity underutilized in the industry.

**The correlation coefficient result:** between the target and actual capacity utilization is 0.928743 shows positive correlation.

**HYPOTHESIS - 2:**

**Null hypothesis (H<sub>0</sub>):** The Company is not trying to offer the consistent product mix by sourcing traded product from other firms

**Alternative hypothesis (H<sub>a</sub>):** The Company is trying to offer the consistent product mix by sourcing traded product from other firms

Level of significance: 5%

Degrees of freedom (DF): 9

Calculated value: 364340.6

Table value: 16.92

**Decision:** Reject null hypothesis

**Conclusion:** It's very significant that the Company is trying to offer the consistent product mix by sourcing traded product from other firms

**HYPOTHESIS - 3:****TABLE 7.2: INSTALLED CAPACITIES & QUANTITY OF UREA PRODUCED FOR 10 YEARS**

Financial Year	Installed capacity MT/Day	% Change	Quantity produced (MT)	Quantity produced MT/Day	% Change	% increase	% Change
2001 - 02	3000		1221944	3347.792		12	
2002 - 03	3000	0	1187259	3252.764	-3	8	-33
2003 - 04	3000	0	1193960	3271.123	1	9	13
2004 - 05	3000	0	1392538	3815.173	17	27	200
2005 - 06	3000	0	1379220	3778.685	-1	26	-4
2006 - 07	3000	0	1324054	3627.545	-4	21	-19
2007 - 08	3000	0	1354490	3710.932	2	24	14
2008 - 09	3000	0	1378162	3775.786	2	26	8.3
2009 - 10	3620	20.7	1505484.65	4124.615	9	14	-46
2010 - 11	3620	0	1647766.15	4514.428	9	25	79
Average	3124		1358488	3721.884		19.2	

Source: NFCL Annual Reports 2002 to 2011

**INTERPRETATION**

Table 7.2 shows the Installed capacity & Quantity of Urea produced for 10Years. It shows that the installed capacity for Urea is 3000 MT/Day from the year 2001 to 2009 and in the year 2009 to 2011 the installed capacity is 3620 MT/Day with an increase of 20.7%. Whereas the actual quantity of Urea produced per day is an average of 19.2% more than its installed capacity. From the year 2004 – 05 to 2010 – 11 the Urea produced per day is an average of 19% more than its installed capacity i.e. in 2004 - 05 it is 27%, in 2005 - 06 it is 26%, in 2006 - 07 it is 21%, in 2007 - 08 it is 24%, in 2008 - 09 it is 26%, in 2009 - 10 it is 14% and in 2010 - 11 it is 25% more production per day. Where as in 2005 – 06, -1% change is there from the previous year and in 2006 – 07, -4% change from the previous year. This lower production was on account of lower allocation received by the Company from the Government of India. The supply of natural gas and Naphtha was satisfactory throughout the year.

From this study it is clear that more production of Urea is possible than its installed capacity and the company is performing well in conversion of ammonia to Urea. So it is suggested that the govt. should allocate more than the current allocations to the existing firms so that the industry will gain its self sufficiency for Urea.

**Null hypothesis (H<sub>0</sub>):** More production of Urea is not possible than its installed capacity

**Alternative hypothesis (H<sub>a</sub>):** More production of Urea is possible than its installed capacity

Level of significance: 5%

Degrees of freedom (DF): 9

Calculated value: 135077.3

Table value:

**Decision:** Reject null hypothesis

**Conclusion:** it's very significant that More production of Urea is possible than its installed capacity and the company is performing well in conversion of ammonia to Urea

**The correlation coefficient result:** Between the installed capacity and quantity of urea produced is 0.805158609 shows positive correlation.

**FINDINGS**

1. It is found that in the fertilizer industry over 17.12 % of installed capacity is underutilized.
2. It tells that only in the years 2001 – 02, 2002 - 03, 2003 – 04 and 2008 - 09, 2009 – 10 the company's performance is less against to its intended performance (output) but over a period of 10 years the company gained 5.07 % more production than its intended output.
3. It's found that, in NFCL there is 5.07% increase in utilization of installed capacity is due to the company's advanced technology from Kellogg Brown and Root Process, HaldorTopsoe.
4. The company is trying to offer the consistent product mix by sourcing traded product from other firms.
5. More production of Urea is possible than its installed capacity and the company is performing well in conversion of ammonia to Urea.

**RECOMMENDATIONS**

1. The output can be improved when the policies of the govt. are implemented effectively. For the government intention is to go ahead with a new investment strategy for the fertilizer sector, especially for urea. This policy seeks to create a 1.5 million-tons capacity for the production of urea over a five year-period.

2. The govt. should make more Natural gas allocations to fertilizer industry so that the industry can increase its production.
3. The govt. should keep higher targets and make more allocations to the company so that the company can meet its targets at an ease.
4. The govt. should pursue the demand and supply very keenly so that it can fill the gap.
5. If the company wants to offer the complete product mix to its end users at affordable price the company should go by manufacturing rather than sourcing from others.
6. If the company can maintain its own logistics and its operations it will gain more advantages in reducing the value of distribution expenses to considerable extent.
7. The Company should concentrate on more movements through road than the present mode of transportation.

## CONCLUSIONS

The whole study was based on the secondary data as there is less scope of primary data. Hence the chi square test has been used to test its significance and it was concluded that though there was surplus in the supply of fertilizers from both the company and the industry at large there is supply chain outbound logistics problems which resulted in the shortage of availability of the fertilizers to the end user the farmer.

## SCOPE FOR FURTHER RESEARCH

The recommended future study may be on the use of I.T and technology like vacuum loaders, flexible closed conveyer belts which are used in bagging plants for bulk urea loading for imports, flexible transport vehicles and multipurpose warehousing system.

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